rosemann & ASSOCIATES P.C.

ARCHITECTURE
INTERIOR DESIGN
ENGINEERING
PLANNING

Specifications

For:

Wilshire Hills III

Lee's Summit, Missouri

Owner:
Wilshire Hills III, L.P.

Project No.: 23034
MHDC No.: 22-057
October 30, 2023

1526 GRAND BOULEVARD KANSAS CITY, MO 64108-1404 P: 816.472.1448

DENVER ▲ KANSAS CITY ▲ ST. LOUIS ▲ ATLANTA

SECTION 000001
PROJECT TITLE PAGE

PROJECT: WILSHIRE HILLS III

OWNER: WILSHIRE HILLS III, L.P.

BY:_____ DATE:_____

ARCHITECT: ROSEMANN & ASSOCIATES, P.C.

BY:_____ DATE:_____

CONTRACTOR: FAIRWAY CONSTRUCTION CO., INC.

BY:_____ DATE:_____

MISSOURI HOUSING DEVELOPMENT COMMISSION:

BY:_____ DATE:_____

END OF SECTION

SECTION 000005

ARCHITECT CERTIFICATION PAGE

ARCHITECT CERTIFICATION

I, DAVID E. HENDRIKSE, HEREBY SPECIFY, PURSUANT TO THE STATE OF MISSOURI THAT THE DOCUMENTS INTENDED TO BE AUTHORIZED BY MY SEAL ARE LIMITED TO:

SPECIFICATION SECTIONS

000001	Project Title Page
000005	Architect Certification Page
000110	Table of Contents
003000	Information Available to Bidders
004000	Agreement
005000	Conditions of the Contract
007000	General Conditions
008000	Supplementary Conditions
009500	MBE_WBE Requirements
011000	Summary
012600	Contract Modification Procedures
012900	Payment Procedures
013000	Administrative Requirements
013100	Project Management and Coordination
013300	Submittal Procedures
014000	Quality Requirements
015000	Temporary Facilities and Controls
015850	Project Signs
016000	Product Requirements
017300	Execution
017700	Closeout Procedures
017823	Operation and Maintenance Data
017839	Project Record Documents
017900	Demonstration and Training
035400	Cast Underlayment
042000	Unit Masonry
055213	Pipe and Tube Railings
062000	Finish Carpentry
066100	Cast Polymer Fabrications
070523	Building Envelope Testing
072100	Thermal Insulation
072126	Blown Insulation
072500	Weather Barriers
073113	Asphalt Shingles
074646	Fiber-Cement Siding
076200	Sheet Metal Flashing and Trim
078400	Firestopping
079200	Joint Sealants
081113	Hollow Metal Doors and Frames
081250	Applied Casing Steel Door Frames
081416	Flush Wood Doors
081433	Stile and Rail Wood Doors

084313	Aluminum-Framed Storefronts
085313	Vinyl Windows
087100	Door Hardware
088000	Glazing
088300	Mirrors
092116	Gypsum Board Assemblies
093000	Tiling
095100	Acoustical Ceilings
096500	Resilient Flooring
096813	Tile Carpeting
096816	Sheet Carpeting
099113	Exterior Painting
099123	Interior Painting
101400	Signage
102800	Toilet, Bath, and Laundry Accessories
103090	Manufactured Electric Fireplaces
104400	Fire Protection Specialties
105500	Postal Specialties
105723	Closet and Utility Shelving
113013	Residential Appliances
142423	Hydraulic Passenger Elevators
122113	Horizontal Louver Blinds
123530	Residential Casework
123600	Countertops
312113	Radon Mitigation
313116	Termite Control

DRAWINGS

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G-002	GENERAL INFORMATION
G-003	PLAN GENERAL NOTES
G-004	GENERAL INFORMATION
G-005	GENERAL INFORMATION
G-006	GENERAL INFORMATION
G-007	GENERAL INFORMATION
G-100	CODE ANALYSIS
G-101	CODE PLANS
G-102	ASSEMBLIES – PARTITION, CEILING, ROOF
G-200	UL ASSEMBLIES
G-201	UL ASSEMBLIES
G-202	UL ASSEMBLIES
G-203	UL ASSEMBLIES
G-204	UL ASSEMBLIES
G-205	UL ASSEMBLIES
G-300	ACCESSIBILITY STANDARDS
G-301	ACCESSIBILITY STANDARDS
G-302	ACCESSIBILITY STANDARDS
G-303	ACCESSIBILITY STANDARDS
AS-101	ARCHITECTURAL SITE AMENITIES
A-101	FIRST FLOOR PLAN
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A-120	FIRST FLOOR REFLECTED CEILING PLAN
A-121	SECOND FLOOR REFLECTED CEILING PLAN
A-122	THIRD FLOOR REFLECTED CEILING PLAN
A-200	EXTERIOR ELEVATIONS
A-201	EXTERIOR ELEVATIONS
A-300	OVERALL BUILDING SECTION
A-301	WALL SECTIONS
A-302	ELEVATOR SECTIONS & DETIALS
A-303	STAIR SECTION & DETAILS
A-304	FRONT CANOPY PLAN / ELEV. / SECTIONS / & DETAILS
A-400	ONE BEDROOM UNIT PLAN – TYPE A
A-401	ONE BEDROOM UNIT PLAN – TYPE B
A-402	TWO BEDROOM UNIT PLAN – TYPE A
A-403	TWO BEDROOM UNIT PLAN – TYPE B
A-404	TWO BEDROOM CORNOR UNIT PLAN – TYPE B
A-410	ENLARGED FLOOR PLANS – COMMON AREAS
A-411	ENLARGED FLOOR PLANS – COMMON AREAS
A-500	DETAILS
A-501	DETAILS
A-502	DETAILS
A-503	SUSPENDED CEILING DETIALS
A-600	WINDOW / DOOR / FINISH SCHEDULES
A-700	INTERIOR ELEVATIONS

AND DISCLAIM ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, REPORTS OR OTHER DOCUMENTS OR INSTRUMENTS RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS FOR WILSHIRE HILLS III IN LEE'S SUMMIT, MISSOURI.

SEAL:

BY: _____ DATE: _____

END OF SECTION 000005

SECTION 000006

CIVIL CERTIFICATION PAGE

CIVIL CERTIFICATION

I, Matthew A. Kriete, HEREBY SPECIFY, PURSUANT TO THE STATE OF MISSOURI THAT THE DOCUMENTS INTENDED TO BE AUTHORIZED BY MY SEAL ARE LIMITED TO:

SPECIFICATION SECTIONS

SECTION NO.	SECTION NAME
221313	FACILITY SANITARY SEWER
311000	SITE CLEARING
312000	EARTH MOVING
321313	CONCRETE PAVING
321373	CONCRETE PAVING JOINT SEALANTS
321723	PAVEMENT MARKINGS
328400	PLANTING IRRIGATION
329200	TURF AND GRASSES
329300	PLANTS
330500	UNDERGROUND UTILITIES
334100	STORM UTILITY DRAINAGE PIPING
SWPPP	STORM WATER POLLUTION PREVENTION PLAN

DRAWINGS

PUBLIC INFRASTRUCTURE IMPROVEMENT PROJECT

Sheet #	Plan Title
C0.01	COVER SHEET
C0.02	GENERAL NOTES
C0.03	TYPICAL ROAD SECTIONS
V1.01-V1.02	BOUNDARY AND TOPOGRAPHIC SURVEY
C1.01	OVERALL PUBLIC PLAN
C1.02-C1.03	WILSHIRE DRIVE EXTENSION ROAD PLAN & PROFILE
C1.04-C1.08	WILSHIRE DRIVE EXTENSION CROSS SECTIONS
C2.01-C2.04	GRADING AND STORM SEWER PLAN
C3.01	STORM SEWER PROFILES
C4.01	SANITARY SEWER EXTENSION PLAN & PROFILE
C5.01	UTILITY EXTENSION PLAN & PROFILE
C6.01	EROSION CONTROL PLAN
C7.01-C7.02	ROAD PLAN DETAILS
C8.01-C8.02	PUBLIC STORM SEWER DETAILS
C9.01	PUBLIC SANITARY SEWER DETAILS
C10.01	PUBLIC WATER DETAILS
C11.01-C11.03	PUBLIC EROSION CONTROL DETAILS

APPENDIX A

City of Lee'S Summit Standards Specifications shall be used whenever necessary for specifications.

LS Section 2100 - Grading and Site Preparation (REVISED JULY 2020)
APWA Section 2100 (NEW AS OF OCT. 2019)
LS Section 2150 - Erosion and Sediment Control (REVISED JULY 2020)
APWA Section 2150
APWA Standard Drawings - Erosion and Sediment Control
LS Section 2200 - Paving (REVISED JULY 2020)
LS Section 2200 - Appendices A&B - Subgrade Stabilization (REVISED JULY 2020)
APWA Section 2200
LS Section 2300 - Incidental Construction (REVISED JULY 2020)
APWA Section 2300
LS Section 2400 - Seeding and Sodding (REVISED JULY 2020)
APWA Section 2400
LS Section 2600 - Storm Sewers (REVISED JULY 2020)
APWA Section 2600 (NEW AS OF 3.3.2020; 2605.2.B.3 on pg. 16)
LS Section 2700 - Structure (REVISED JULY 2020)
APWA Section 2700
LS Section 2800 - Street Lighting
LS Section 2900 - Traffic Signals
LS Section 3000 - Traffic Control, Marking, Signing
LS Section 3500 - Sanitary Sewers (REVISED JULY 2020)
LS Section 3900 - Water Mains (REVISED JULY 2020)

AND DISCLAIM ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, REPORTS OR OTHER DOCUMENTS OR INSTRUMENTS RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS FOR WILSHIRE HILLS III IN LEE'S SUMMIT, MISSOURI.
SEAL:

BY: _____ **DATE:** 6/22/23

END OF SECTION 000006

SECTION 000007

STRUCTURAL CERTIFICATION PAGE

STRUCTURAL CERTIFICATION

I, SCOTT M. ROSEMANN, HEREBY SPECIFY, PURSUANT TO THE STATE OF MISSOURI THAT THE DOCUMENTS INTENDED TO BE AUTHORIZED BY MY SEAL ARE LIMITED TO:

SPECIFICATION SECTIONS

033000	Cast-in-Place Concrete
051200	Structural Steel Framing
061000	Rough Carpentry
061753	Shop-Fabricated Wood Trusses

DRAWINGS

S-001	STRUCTURAL GENERAL NOTES
S-002	STRUCTURAL GENERAL NOTES
S-003	SPECIAL INSPECTIONS
S-101	FOUNDATION PLAN
S-102	2ND FLOOR FRAMING PLAN
S-103	THIRD FLOOR FRAMING PLAN
S-104	ROOF FRAMING PLAN
S-500	STRUCTURAL DETAILS
S-501	STRUCTURAL DETAILS
S-502	STRUCTURAL DETAILS
S-503	STRUCTURAL DETIALS

AND DISCLAIM ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, REPORTS OR OTHER DOCUMENTS OR INSTRUMENTS RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS FOR WILSHIRE HILLS III IN LEE'S SUMMIT, MISSOURI.

SEAL:

BY: _____ DATE: _____

Scott M. Rosemann, P.E.

END OF SECTION 000007

SECTION 000008

MEP CERTIFICATION PAGE

MEP CERTIFICATION

I, MICHAEL RAAF, PE, HEREBY SPECIFY, PURSUANT TO THE STATE OF MISSOURI THAT THE DOCUMENTS INTENDED TO BE AUTHORIZED BY MY SEAL ARE LIMITED TO:

SPECIFICATION SECTIONS

Divisions 21, 22, 23, 26, 27, & 28.

DRAWINGS

MEP000	MEP COVER SHEET
MEP101	MEP SITE PLAN
MEP200	MEP PENETRATION DETAILS
MEP201	MEP PENETRATION DETAILS
M101	FIRST FLOOR HVAC PLAN
M102	SECOND FLOOR HVAC PLAN
M103	THIRD FLOOR HVAC PLAN
M201	ENLARGED UNIT PLANS - HVAC
M301	MECHANICAL SCHEDULES
M401	MECHANICAL DETAILS
P101	FIRST FLOOR PLUMBING PLAN
P102	SECOND FLOOR PLUMBING PLAN
P103	THIRD FLOOR PLUMBING PLAN
P201	ENLARGED UNIT PLANS - PLUMBING
P301	PLUMBING SCHEDULES
P302	PLUMBING DETAILS
E101	FIRST FLOOR LIGHTING PLAN
E102	SECOND FLOOR LIGHTING PLAN
E103	THIRD FLOOR LIGHTING PLAN
E111	ENLARGED UNIT PLANS - LIGHTING
E201	FIRST FLOOR POWER PLAN
E202	SECOND FLOOR POWER PLAN
E203	THIRD FLOOR POWER PLAN
E211	ENLARGED UNIT PLANS - POWER
E301	ELECTRICAL RISER DIAGRAMS
E302	ELECTRICAL SCHEDULES
E303	ELECTRICAL SCHEDULES
E401	ELECTRICAL SCHEDULES/DETAILS
E402	ELECTRICAL DETAILS
SL100	SITE PHOTOMETRICS

AND DISCLAIM ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, REPORTS OR OTHER DOCUMENTS OR INSTRUMENTS RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS FOR WILSHIRE HILLS III IN LEE'S SUMMIT, MISSOURI.

SEAL:

BY: __Michael Raaf_____ DATE: __6/30/23_____

END OF SECTION 000008

SECTION 000110
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END OF SECTION 000110

SECTION 003000
INFORMATION AVAILABLE TO BIDDERS

PART 1 GENERAL

1.01 REPORTS AND SURVEYS:

A. A copy of a geotechnical report with respect to the building site is included with this document:
   1. Title: Subsurface Investigation, Soil Analysis and Foundation Design Recommendations for Wilshire Hills-Phase III; Lee's Summit, Missouri
   2. Date: March 21, 2023
   3. Prepared by: ENGINEERING SURVEYS & SERVICES
   4. This report identifies properties of below-grade conditions and offers recommendations for the design of foundations, prepared primarily for the use of Rosemann & Associates, P.C. and consultants.
   5. This report, by its nature, cannot reveal all conditions that exist on the site. Conditions may be found to vary substantially from this report. The Contractor shall perform site investigations to determine if any discrepancies exist between the Geotechnical Report and actual site conditions. Any design changes resulting from the Contractor's investigations should be brought to the immediate attention of the Architect prior to submitting the bid. The Contractor shall be responsible for including, as part of the original bid and scope of work, any and all necessary costs to properly prepare the site including removal and disposal of any unacceptable materials found and properly preparing subgrade per the Geotechnical Engineering Report.

B. A copy of a SWPPP with respect to the building site is included with this document:
   1. Title: Stormwater Pollution Prevention Plan for Construction Activities at: Public Improvements and Onsite Construction to Serve Wilshire Hills Phase III
   2. Date: June 22, 2023
   3. Prepared by: ENGINEERING SURVEYS & SERVICES
   4. This plan, by its nature, cannot reveal all conditions that exist on the site. Conditions may be found to vary substantially from this plan. The Contractor shall perform site investigations to determine if any discrepancies exist between the plan and actual site conditions. Any design changes resulting from the Contractor's investigations should be brought to the immediate attention of the Architect prior to submitting the bid. The Contractor shall be responsible for including, as part of the original bid and scope of work, any and all necessary costs per the Plan.

C. A copy of a hydraulic report with respect to the building site is included with this document:
   1. Title: Hydraulic Report for Public Improvements to Serve Wilshire Hills III in Lee's Summit, Missouri
   2. Date: June 22, 2023
   3. Prepared by: ENGINEERING SURVEYS & SERVICES
   4. This report, by its nature, cannot reveal all conditions that exist on the site. Conditions may be found to vary substantially from this report. The Contractor shall be responsible for performing site investigations to determine if any discrepancies exist between the Report and actual site conditions. Any design changes resulting from the Contractor's investigations should be brought to the immediate attention of the Architect prior to submitting the bid. The Contractor shall be responsible for including, as part of the original bid and scope of work, any and all necessary costs to properly prepare the site per the Report.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SUBSURFACE INVESTIGATION, SOIL ANALYSIS AND FOUNDATION DESIGN RECOMMENDATIONS

FOR

Wilshire Hills – Phase III

Lee's Summit, Missouri

PREPARED FOR:

JES DEVELOPMENT CO, LC

206 PEACH WAY

COLUMBIA, MISSOURI

ATTN: BRIAN KIMES

MARCH 21, 2023

PREPARED BY:

Engineering Surveys & Services

1113 FAY STREET

COLUMBIA, MO 65201

573-449-2646

MISSOURI ENGINEERING CORPORATION NUMBER 2004005018

COLUMBIA ♦ JEFFERSON CITY ♦ SEDALIA

Engineering Surveys & Services
DELIVERING YOUR VISION ™

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Columbia | 573-449-2646
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Jefferson City | 573-636-3303

March 21, 2023

Mr. Brian Kimes
JES Development Co, LC
206 Peach Way
Columbia, MO 65203

RE: Geotechnical Engineering
Wilshire Hills – Phase III
Lee's Summit, Missouri

Dear Mr. Kimes

We have conducted a subsurface investigation and evaluated subsurface conditions for the above referenced project. The following report includes the results of the investigation and evaluation and our recommendations regarding foundation design and construction considerations.

We appreciate the opportunity to assist you on this project and anticipate inquiries during the design phase. We stand ready to assist during the design phase and through construction with a full range of construction-oriented engineering, surveying, and laboratory services. If we can be of further assistance, please do not hesitate to contact us.

Prepared by,

Randall A. Lee, PE, RG

STATE OF MISSOURI
RANDALL ALAN LEE
NUMBER E-27957
REGISTERED PROFESSIONAL ENGINEER

STATE OF MISSOURI
RANDALL A. LEE
RG 0902
REGISTERED GEOLOGIST

3/21/23

Reviewed by,

Joshua D. Lehmen
VP Laboratory & Field Services

STATE OF MISSOURI
JOSHUA DAVID LEHMEN
NUMBER PE-2012000779
PROFESSIONAL ENGINEER
3/21/23

Enclosures
cc: (email)
Kimes, Lafferty, Covington,
Brown, Crosby, Galliard

File L14879

TABLE OF CONTENTS

1 EXECUTIVE SUMMARY

A supplemental subsurface investigation has been performed for the Phase 3 section of the Wilshire Hills development in Lee's Summit, Missouri. The phasing and layout for the project as referenced in this report are what was considered current at the time of the investigation. The project site is located on Lot 5 in the Wilshire Hills development, immediately south of the Memory Care facility, north of Strother Road and west of the extension of Wilshire Drive. The original geotechnical report for Phases 3 and 4 dated December 7, 2015, was presented to Jeffery E Smith Investments Co., LC. At that time, 11 borings were drilled within this projects area; however, little testing was performed on those samples. A copy of that report can be provided upon request.

The project consists of the construction of a 3-story residential apartment building along with the associated parking, utilities, retaining walls and street extensions. The building will consist of a wood framed structure that is approximately 55,000 square feet in plan and configured in an "L" shape. Finished floor elevation is anticipated to be around 932 feet. Isolated column and continuous footing loads are not expected to exceed 100 kips and 4,000 pounds per lineal foot (plf), respectively.

A total of 10 supplemental borings were drilled for this investigation. Five boring were drilled within or near the footprint of the proposed building, three in the parking lots and one each for the retaining wall and regional detention facility. The borings revealed a thin layer of topsoil and vegetative cover over clay-rich soils. The soil is underlain by shale and limestone. Two soil piles were noted on the site, with one approximately 5 feet and the other 20 feet in height. It is believed that the source of the soil mound is spoils from the development of Phases I and II. Most of the observed material in these piles appeared suitable for use as engineered fill. However, the possibility of encountering isolated pockets of organic and construction debris exists. Unsuitable material should be segregated from the rest of the soil and removed from the site or used in landscape areas.

Site grading will include cuts of up to 13 feet at the western end of the east/west leg of the building and 20 feet for the retaining wall in addition to fills of up to 2 to 3 feet for the northern end of the north/south leg of the building, based on a finished floor elevation of 932 feet. It is anticipated that soil mounds, along with the material cut from along the western slope will be used to raise the site three to four feet.

Shallow foundations are recommended to support the proposed structures. Maximum net allowable bearing capacities of 2,500 and 2,000 pounds per square foot (psf) are recommended for isolated and continuous foundations bearing on native soils or engineered fill, respectively.

Settlement is estimated to be on the order of one inch with less than one half inch differential settlement.

Pavement will include a street and temporary cul-de-sac, multiple parking areas, and various service lanes. Recommendations are included later in this report for both rigid and flexible pavements.

The exploration and analysis of the foundation conditions are considered to be in sufficient detail and scope to form a reasonable basis for design. The recommendations submitted are based on the results of our geotechnical investigation and analysis, and the preliminary design concepts provided by Mr. Scott Rosemann, PE of Rosemann and Associates.

This summary should be used in combination with this complete report as well as our December 7, 2015, report for design considerations. Additional information and details on the investigation and recommendations, not mentioned in this summary, are contained within the report.

2 PROJECT SCOPE

The scope of the investigation included a reconnaissance of the site, a review of all available subsurface data in the vicinity, a subsurface investigation consisting of 10 supplemental soil borings to depths ranging from 5 to 30 feet, laboratory soil testing, and an engineering analysis and evaluation of the foundation materials present at the site.

The purpose of the investigation was to determine the types of subsurface materials present at the site likely to be encountered or affected by the proposed construction; to determine the general engineering characteristics of the various materials; to determine the seismic site class according to the *2018 International Building Codes*; to determine the potential risk of radon levels being above acceptable limits; and to provide a basis for recommendations regarding bearing capacity and compressibility of the foundation and subgrade materials.

3 DESCRIPTION OF THE SITE AND PROJECT

3.1 SITE LOCATION

The site of Wilshire Hills Phase 3 is located in Jackson County, Missouri in the northwest portion of the City of Lee's Summit. The project site is located on Lot 5 in the Wilshire Hills development, immediately south of the Memory Care facility, north of Strother Road and west of the extension of Wilshire Drive. Specifically, the site is in the southwest quarter of Section 17, Township 48 North, Range 31 West of the Fifth Principal Meridian (Latitude: 38.970709; Longitude: -94.336229). See the *Vicinity Map* in the Appendix of this report.

3.2 Project Description

The project consists of the construction of a 3-story residential apartment building along with the associated parking, utilities, retaining walls and street extensions. The building will consist of a wood framed structure that is approximately 55,000 square feet in plan and configured in an "L" shape. Finished floor elevation is anticipated to be around 932 feet. Isolated column and continuous footing loads are not expected to exceed 100 kips 4,000 pounds per lineal foot (plf), respectively.

3.3 Site Description, Topography, and Drainage

The project site has been modified by man. Over the past decade, considerable site grading and construction activities have taken place. In conjunction with the Phase 2 and Memory Care facility construction, most of the Phase 3 and 4 areas were graded in preparation for future development. A box culvert was constructed to convey drainage across the lots east of Lot 5.

This firm was retained to conduct quality assurance testing and construction observations during the construction on Phase 2, Memory Care facility, and the box culvert. Backfill of the box culvert tested by this firm extended to approximately 9 feet to either side of the box. Monitoring of additional fill placement in the vicinity of the box culvert was not requested, at the time.

The site can best be described as sloping to the east, then increasing slightly in elevation east of the box culvert. The western third of the site is graded at a 3H:1V (horizontal to vertical) slope, increasing in elevation to the west. There is approximately 23 feet of vertical relief across the site, with 15 feet of differential within the building pad, most of it within the western third. Additionally, two soil stockpiles were noted in the southeast quarter of the site, one approximately 5 feet and the other 20 feet in height. Source of the material is believed to be remnants of previous development. Site drainage is handled by infiltration and runoff into the drainage channel and box culvert east of Lot 5.

The Lot 5 includes approximately 2.54 acres and is situated on the west edge of the Wilshire Hills Plat, immediately south of the Memory Care residential building.

4 Geology of Area

4.1 General

Lee's Summit, Missouri is located in the Missouri River Scarplands on the Dissected Till Plain. The geology of the area is characterized by residual soils, underlain by Pennsylvanian aged shale and limestone.

4.2 Loess

Loess is a windblown soil with variable proportions of clay, silt and fine sand. Shear strength and compressibility of loess is generally low to moderate, but may vary dependent upon site specific conditions. A clayey silt to silty clay blanketed Lee's Summit at one time. This material is readily erodible and has mostly been removed from the project site.

4.3 Holocene Alluvium

A drainage channel crossed the site in a south to north direction in the eastern section of the property, prior to construction of the box culvert. The area surrounding the channel contains sediment deposits from the Holocene Epoch. Alluvial soils include soil particles suspended in rivers and streams and carried overland during high water, eventually settling out and depositing in the floodplains as flood waters recede. Alluvial deposits typically have low to moderate shear strength and are moderately to highly compressible, but may vary dependent upon site specific conditions. Organic material is common in alluvial deposits.

4.4 Residuum

Residuum develops from underlying limestone and shale as the parent material weathers and breaks down over time. The residuum in the area consists of clay-rich soils with varying amounts of silt and sand. Thickness of the residuum layer is typically between one and 15 feet.

4.5 Pennsylvanian Deposits

Pennsylvanian rock composed of mostly shale interbedded and limestone underlie the project site. The primary formation at the project site is the Kansas City Group. Where shale was encountered, it increased in hardness with depth.

Underlying the shale is limestone. The limestone generally has a fine crystalline structure and is medium to massively bedded in the region. The inclusion of chert is not common, but does occur. The limestone typically exhibits high shear strength and low compressibility characteristics. Limestone can be heavily characterized by karst features, including pinnacles, caves, sinkholes, and filled sinks. A review of available data indicates the nearest known sinkhole activity is approximately one mile from the project site.

Future sinkhole activity is difficult to predict. Sinkholes and caves in this area are in various stages of development and can appear at any time. Activities of man, both on the site and off, can alter surface drainage and other site conditions. These activities could accelerate the development of caves and sinkholes in areas with no evidence of this activity.

5 FIELD INVESTIGATION

Field investigations consisting of a site reconnaissance, a review of subsurface records for the area and the drilling of 10 supplemental soil borings were performed on February 20, 2023. The field investigation and the site reconnaissance were performed in accordance with procedures outlined in ASTM D420.

5.1 DRILLING

Borings were advanced in 10 locations to depths ranging from 5.0 to 30 feet. All drilling was powered with a Geoprobe© drill rig using a carbide tipped finger bit on 4-inch, solid stem augers. Boring locations are shown on the boring plan included in the Appendix of this report. Disturbed samples were obtained from auger cuttings or using a split-barrel sampler in accordance with ASTM D1586. Undisturbed samples were obtained using 3-inch O.D. thin-walled sampling procedures in accordance with ASTM D1587.

Drilling was monitored by a representative from this firm. The representative provided technical direction, logged the borings and test pits, performed field tests, and prepared and transported the samples to the laboratory for testing.

5.2 FIELD TESTS AND MEASUREMENTS

Boring locations were selected based on preliminary plans prepared by this firm. Boring elevations were referenced to a topographic survey prepared by this firm and are assumed accurate to within ± 0.2 feet. Field observations are detailed in the boring logs included in the Appendix of this report.

6 LABORATORY INVESTIGATION

In conjunction with the field investigation, a laboratory investigation was conducted on the sampled materials to determine the engineering properties needed to analyze and predict foundation and subgrade performance. The laboratory investigation included supplementary visual classification, water content tests, unconfined compressive strength tests, dry unit weight measurements, Atterberg limit tests and a "Standard" Proctor test (ASTM D 698). All tests were performed by this firm in accordance with appropriate ASTM procedures. Results may be found in the Appendix of this report.

Laboratory tests performed on soil samples retrieved during the field investigation provided a range of results. The natural moisture contents of the soils were found to range from 11 to 29 percent. The dry density of the undisturbed samples ranged from 94 to 114 pounds per cubic foot (pcf). The cohesion, as measured in the unconfined compression test, was found to range

from a low of 0.6 tons per square foot (tsf) to a high of 1.3 tsf. The Atterberg liquid limits ranged from 41 to 67 percent while the plastic limits ranged from 17 to 26 percent, giving plasticity indices from 20 to 46. This indicates the tested soils have a moderate to high plasticity. The "Standard" proctor was run on the stockpile soils encountered in boring B3 the test provided results of a Maximum Dry Density (MDD) of 108.6 pcf and an Optimum Moisture Content (OMC) of 17.2 percent.

7 SUBSURFACE CONDITIONS

7.1 GENERAL

The materials encountered during the subsurface investigation were visually classified according to ASTM D2488. The materials encountered during the field investigation are described in detail in Boring Logs included in the Appendix of this report. The stratification lines represent approximate boundaries, and the transition may be gradual.

7.2 DESCRIPTION OF SUBSURFACE MATERIALS

The subsurface conditions were consistent over the project site. Generally, the surface layer consists of a thin mantle of topsoil or clay-rich soil with vegetative cover.

The borings in the Phase 3 area encountered a shaley clay layer that was described as tan in color, damp to moist, and stiff to hard in consistency. The shaley clay transitioned into tan and then gray shale. The gray shale layer was noticeably harder than the tan layer. Several of the borings were terminated in the gray shale when the split-barrel sampler reached refusal.

Bedrock in the area consists of Pennsylvanian aged shale and limestone. Borings in which split-barrel sampler refusal was not encountered were advanced to auger refusal on limestone.

7.3 UTILITIES

Underground utilities within the area of investigation include the box culvert, utilities within the NE Manhattan Drive right-of-way, utilities serving the Phase 2 building, and a water line along the northern utility easement of Lot 5. Additional utilities may be encountered during construction. Utility trench backfill material may contain material that is unsuitable for use under the proposed structure. Unsuitable soils will need to be replaced with engineered fill.

8 ENGINEERING ANALYSIS AND RECOMMENDATIONS

8.1 GENERAL

The engineering analysis and recommendations which follow are based upon the results of a geotechnical investigation, analysis, and the preliminary design information for the proposed buildings. If the project scope is altered appreciably or differing geotechnical conditions are encountered than those noted in the Boring Logs, a review of the changes or conditions is recommended to determine their impact upon design.

Shallow spread footings may be used to support the proposed structures. It is recommended that a qualified geotechnical engineer observe all bearing surfaces immediately after excavation and prior to concrete placement to verify the suitability of the bearing surface and bearing material.

8.2 GROUNDWATER

Groundwater was not encountered during this investigation and is not expected to influence construction. The exact location of the groundwater surface should be expected to fluctuate depending on normal seasonal variations in precipitation and other climatic conditions, surface runoff, permeability of onsite soils, continuity of pervious material, and other factors.

8.3 SEISMIC LOADING

In the design of the proposed structures the following seismic parameters may be used. These parameters are based on the *2018 International Building Codes* and are site specific.

1.	Site Class	C
2.	Mapped Spectral Response, Short Periods (Ss)	0.114
3.	Mapped Spectral Response, Short Periods (S1)	0.067
4.	Site Coefficient as a Function of Ss (Fa)	1.2
5.	Site Coefficient as a Function of S1 (Fv)	1.7

8.4 SITE GRADING

Site grading will include cuts of up to 13 feet at the western end of the east/west leg of the building and 20 feet for the retaining wall in addition to fills of up to 2 to 3 feet for the northern end of the north/south leg of the building based on a finished floor elevation of 932 feet. It is anticipated that the soil stockpiles, along with the material cut from along the western slope will be used to raise the site three to four feet.

Construction should not begin until all cuts have been completed and fill placed within the plan area of the proposed structures. Prior to the start of construction, it is recommended that all

vegetation, debris, topsoil and other unsuitable materials be removed from the site. Following completion of excavation and stripping, and prior to fill placement, it is recommended that the subgrade be proof-rolled with a rubber-tired piece of heavy construction equipment such as a fully loaded, tandem-axle dump truck to help identify any soft or unsuitable areas. Areas identified as unsuitable should be overexcavated and reconstructed with engineered fill.

Laboratory tests indicate that some of the existing near surface subgrade, and potentially the on-site stockpile material contains high plasticity soil. Due to the presence of highly plastic soils, it is recommended that the upper 2 feet of subgrade extending to 5 feet beyond the footprint of each building consists of low volume change material. Low volume change material may consist of on-site or imported cohesive soils with a liquid limit less than 50 and a plasticity index less than 30 or a granular fill similar to MoDOT 1007 Type 1/5. Some of the on-site stockpile material may be suitable, however additional testing, including Atterberg Limits, may be required once some of the stockpile is uncovered to verify the soil plasticity. Additionally, it is recommended that the upper one foot of material for the paving areas consist of low volume change material. The use of "wastelime" or lime screenings is not recommended for use under pavements. If the area is to be used for a laydown or all-weather working surface, MoDOT 1007 Type 1/5 aggregate or similar should be used.

8.5 Foundation Recommendations

The building will consist of a wood framed structure that is approximately 55,000 square feet in plan and configured in an "L" shape. Finished floor elevation is anticipated to be around 932 feet. Isolated column and continuous footing loads are not expected to exceed 100 kips 4,000 pounds per lineal foot (plf), respectively.

A shallow spread foundation system bearing on native soils or engineered fill is recommended to support the new structure. Foundations can be designed for a net allowable bearing pressure of 2,500 and 2,000 psf for column and wall foundations, respectively. Continuous footings should be a minimum of 12 inches wide, with isolated footings being at least 36 inches wide. It is recommended for a shallow foundation system, the footings bear on engineered fill, or the stiff to hard shale near the west edge of the property. Frost protection can be provided if the exterior foundations bear a minimum of 36 inches below final grade.

Total settlement is estimated to be on the order of one inch with approximately one-half inch of differential settlement. The full amount of consolidation may not occur for several months following construction. It is recommended that a unit price for rock removal be established in the contract documents, to address the presence of hard shale and limestone.

A perimeter foundation drainage system is recommended to discharge accumulated moisture away from the structure. The perimeter drainage system should consist of a perforated pipe bedded and backfilled with free draining aggregate. The free draining aggregate zone should be

wrapped in geotextile filter fabric with an apparent opening size (ASTM D 4751) of 70 to 100 and minimum trapezoid tear strength (ASTM D 4533) of 50 pounds. The free draining aggregate should be covered with at least 2 feet of compacted low permeability clay soil. Downspouts and gutters should not be designed to flow into the foundation drain system. If continuous foundations or grade beams are "bank poured" the foundation drain may be eliminated.

Trees or other vegetation whose root systems have the ability to remove excessive moisture from the subgrade and foundation soils should not be planted next to the structures.

8.6 RADON

The US Environmental Protection Agency lists Jackson County as having elevated indoor radon screening levels, greater than 4 pCi/L. This rating is based on indoor radon measurements; geology; aerial radioactivity; soil permeability; and foundation type. Geology, soil permeability and anticipated foundation type are addressed here.

Radon is produced by the radioactive decay of uranium. Significant uranium deposits are not known to exist in the Lee's Summit area. Radon is often associated with clastic shale formations, which is found on the project site.

The subsurface profile includes low to moderate permeability clay and shale. With reduced permeability, deep cracks are less likely to form due to loss of moisture. Deep cracks and high permeability can contribute to the presence of radon in a structure.

Radon is most commonly encountered in basements. It is heavier than air and can accumulate in higher concentrations in basement construction. The proposed structure does not include a basement.

It is our professional opinion that the geological conditions of the project site, along with the slab-on-grade design of proposed structure, are such that radon is not likely to exceed acceptable levels in completed buildings.

8.7 RETAINING WALLS

Retaining walls are anticipated along the west edge of the Phase 3 area and is anticipated to be similar to the walls constructed west of the Memory Care facility and Phase 2. Any walls subject to unbalanced earth pressure should be designed for earth pressures equal to or greater than those provided on the following table. For the granular or cohesionless backfill values to be valid the "Structural Backfill" zone must extend 45° from vertical from the heel of the retaining structure's foundation. These load distributions do not include a factor of safety or include the influence of hydrostatic pressures on the wall. Surcharge loads above the top of the wall due to vehicles, equipment, structures, or sloped backfill should be considered in the design as well.

EARTH PRESSURE COEFFICIENTS

The below chart is based on these conditions.

- Equivalent Fluid Pressures are based on a unit soil weight of 125 pcf.
- No groundwater is acting on the wall.
- For active earth pressure, wall must rotate at base, top lateral movement should be between 0.002 and 0.004 times the height of the wall (H).
- Surcharge pressure (S) acts at H/2 above the base.
- Backfill is compacted to a minimum of 95% of Maximum Dry Density (ASTM D698).
- Ignore passive pressure in the frost zone.

Earth Pressure Conditions	Coefficient for Backfill Type	Equivalent Fluid Pressure (psf)	Surcharge Pressure P_1 (psf)	Earth Pressure P_2 (psf)
Active (K_a)	Cohesionless or Granular – 0.30	38	(0.30)S	(38)H
	Low Plasticity Clays (LL<50) – 0.42	53	(0.42)S	(53)H
	High Plasticity Clays (LL≥50) – 0.52	65	(0.52)S	(65)H
At-Rest (K_o)	Cohesionless or Granular – 0.46	58	(0.46)S	(58)H
	Low Plasticity Clays (LL<50) – 0.59	74	(0.59)S	(74)H
	High Plasticity Clays (LL≥50) – 0.69	86	(0.69)S	(86)H
Passive (K_p)	Cohesionless or Granular – 3.4	425	---	---
	Low Plasticity Clays (LL<50) – 2.4	300	---	---
	High Plasticity Clays (LL≥50) – 1.9	240	---	---

A maximum toe pressure of 2,000 psf may be used for design on properly placed engineered fill soils. A coefficient of friction 0.4 may be used to calculate sliding resistance. Shallow temporary below grade excavations should be stable long enough to allow for construction of the foundation and walls of the proposed structure. All excavations should be benched, sloped or shored in accordance with OSHA guidelines. Some sloughing may occur due to weathering and freeze/thaw cycles. Long term excavation slopes and deep excavations should be analyzed prior to construction to ensure that adequate stability is achieved.

8.8 Floor Slab Design

Floor slab loads are estimated to be 150 psf or less. In consideration of this, the floor slabs may be designed using a modulus of subgrade of 100 pounds per cubic inch (pci). If the upper 2 feet of slab subgrade is constructed with low volume change granular material, the floor slabs may be designed using a modulus of subgrade of 200 pounds per cubic inch (pci).

We recommend that the floor slab thickness be a minimum of 4 inches and that the slab subgrade include a capillary break (3/4" to 1" "clean" aggregate) that is 6 inches, to account for variations, with a minimum thickness of 4 inches. A minimum 6 mil thickness polyethylene vapor barrier should be installed beneath the slab to improve its performance. In addition, it is recommended that the slab be reinforced with a minimum of 6 by 6-inch woven wire mesh. Final slab thickness and reinforcing requirements will be determined by the structural engineer.

Prior to placement of the drainage layer of aggregate and if a cohesive soil is used for the slab subgrade, the upper 8 inches of the entire slab soil subgrade should be scarified, moisture conditioned to within 0 to +4 percent of optimum moisture content and recompacted as engineered fill. The drainage aggregate should be compacted by a vibratory plate or smooth roller when placed.

Construction and saw joints are recommended for all slabs-on-grade. Saw and construction joints should be installed such that the panels are nearly square but do not exceed a length to width ratio of 1.4 to 1.0. Maximum panel size depends on several factors including the amount of cement in the mix, the maximum coarse aggregate size, and slab thickness.

Several precautions are normally used to insure adequate long-term performance of the slab on grade. These precautions include the installation of a precipitation removal system involving the use of gutters, downspouts, and landscaping; not allowing water to pond next to the proposed structure during or after construction; and not allowing the subgrade soil to become inundated or desiccated prior to or during the time required for construction of the floor slab.

8.9 Pavement Design and Recommendations

The pavement associated with the project is expected to include parking areas for cars and light trucks as well as access drives, passenger drop off areas, trash collection areas and driving lanes. Because the access drives, passenger drop off and trash collection areas, and driving lanes carry a higher traffic volume and heavier vehicles, it is recommended that the pavement in these areas be designed to be more durable than the pavement in the parking areas. It is preferred that the access drives, drop off areas and trash collection area (heavy duty areas) be constructed with Portland cement concrete. In parking stalls and the light duty drives in-between, the alternative Standard Duty pavement may be used for ease of construction. Recommendations for both asphalt and Portland concrete are provided. Rigid pavements should be reinforced, at a minimum, with 6 by 6-inch welded wire fabric and 1/2-inch epoxy coated dowel bars for transverse joints.

The following pavement design recommendation has taken into account site specific traffic estimates, geotechnical information, and subgrade modification or reinforcement. A California Bearing Ratio (CBR) value of 3 was used to develop the following pavement design recommendations.

HEAVY DUTY

Portland Cement Concrete

8" Portland Cement Concrete (4,000 psi mix)
6" MoDOT Type 1 crushed stone base

Asphaltic Cement Concrete

2" Type `BP-2' Asphaltic Concrete Surface Course
5" MoDOT Plant Mix Bituminous Course
7" MoDOT Type 1 crushed stone base

STANDARD DUTY

Portland Cement Concrete

6" Portland Cement Concrete (4,000 psi mix)
4" MoDOT Type 1 crushed stone base

Alternative;

4" Portland Cement Concrete (4,000 psi mix)
6" MoDOT Type 1 crushed stone base

Asphaltic Cement Concrete

2" Type `BP-2' Asphaltic Concrete Surface Course
2" MoDOT Plant Mix Bituminous Course
6" MoDOT Type 1 crushed stone base

9 CONSTRUCTION CONSIDERATIONS

9.1 SITE PREPARATION

Site preparation will require stripping and grubbing. All debris from previous construction activities in the area should be removed from the site. The potential for additional buried debris in the soil stockpiles on the site and should be anticipated.

All utility trenches should be backfilled in accordance with appropriate controlled engineered fill specifications. All trench excavations should be made with sufficient working space to permit the placing, inspection, and completion of all work including backfill construction. It is recommended

that a representative of the geotechnical engineer be present during fill placement and compaction to assure that adequate compaction is achieved and that proper methods are employed.

9.2 Site Excavation

General site excavation may be accomplished using earthwork equipment such as dozers, excavators, and scrapers. It is recommended that a unit price for rock removal be established in the contract documents, to address the presence of hard shale and limestone.

In areas where the excavation side wall cannot be sloped to meet OSHA requirements, some form of shoring system will be required. Shoring systems may consist of trench boxes, soldier piles and lagging and sheet piles. The same design parameters presented in the retaining wall section may be used for design of the shoring system.

9.3 Slab Subgrade Preparation

The subgrade soils should not be permitted to dry excessively or become inundated prior to or during construction of the floor slab. If subgrade soils are found to be unsuitable or become disturbed by nature or construction activities, these areas should be excavated to a solid base and then regraded with controlled engineered fill.

9.4 Foundation Excavation and Construction

Foundation bearing surfaces should be free of loose soil and standing water, and should be level. Foundation concrete should be placed the same day the foundation is excavated. Deleterious materials or isolated soft spots within the foundation should be overexcavated to suitable base and filled to design bearing elevation with lean concrete.

9.5 Construction Fill and Backfill

Engineered fill is defined as soil or granular fill containing sufficient fines to establish a moisture/density relationship. Engineered fill should be free of frozen soil, organics, rubbish, large rocks, wood, or other deleterious material. Cohesive soils should be uniformly compacted to at least 95 percent of the "Standard" maximum dry density and be within -2 to +4 percent of optimum moisture content as described by ASTM D698. Granular fill, such as MoDOT 1007 Type 1/5, should be compacted to at least 95% of the maximum dry density as determined by the Standard Proctor, ASTM D698. The moisture content should be high enough to provide for proper compaction but low enough to prevent undue pumping. Should the results of the in-place density tests indicate that the specified compaction limits have not been achieved, the area represented by the test should be reworked and retested as required until the specified limits are reached. Proposed fill should be analyzed by the geotechnical engineer as soon as borrow

sources are identified to determine suitability and conformance with the following recommendations.

Soil classified as MH, OH, OL, or PT (high plasticity soils and organic soils) by the Unified Soil Classification System (ASTM D 2487) should not be imported for use as engineered fill. Soils that classify as CH should be analyzed and approved by a qualified geotechnical engineer prior to use on site. Limestone screenings or "wastelime" may be used as the low volume change material for slabs on grade only.

The fill material should be placed in layers, not to exceed eight inches in loose thickness, and should be wetted or dried as required to secure specified compaction. Effective spreading equipment should be used on each lift to obtain a uniform lift thickness prior to compaction. Each layer should be uniformly compacted by means of suitable equipment of the type required by the materials composing the fill. Material that is too wet to permit proper compaction may be stockpiled or spread and permitted to dry assisted by disking, harrowing, or pulverizing until the moisture content is reduced to a satisfactory value. The fill layers should be placed in horizontal lifts. Fill placed on slopes greater than 5H:1V should be benched into the slope. Rocks and stones that exceed the thickness of the 8 inch loose lift layer should be removed and disposed of off the immediate construction site.

Fill and subgrade construction should not be started on foundation soil, partially completed fill, or subgrades that contain frost or ice. Fill should not be constructed of frozen soil. Frozen soil should be removed prior to placing fill material.

9.6 Climatic Considerations

The on-site soils are relatively sensitive to changes in atmospheric conditions and precipitation. These soils are predominantly clay and silt, and are subject to high rates of erosion, rapid loss of shear strength upon wetting, and shrink-swell behavior with changes in moisture content. The greatest impact of climatic conditions will occur within the first few inches of exposed soil surface. The contractor should take positive measures to limit erosion of the site following stripping and up to establishment of ground cover or turf. Earthwork operations may be delayed by heavy precipitation at the site.

10 Warranties and Limitations

This report has been prepared for the exclusive use of Jeffrey E. Smith Investments Co., LC and their consultants for the specific project discussed, in accordance with generally accepted soils engineering practices common to the west Missouri area. No other warranties, expressed or implied, are made.

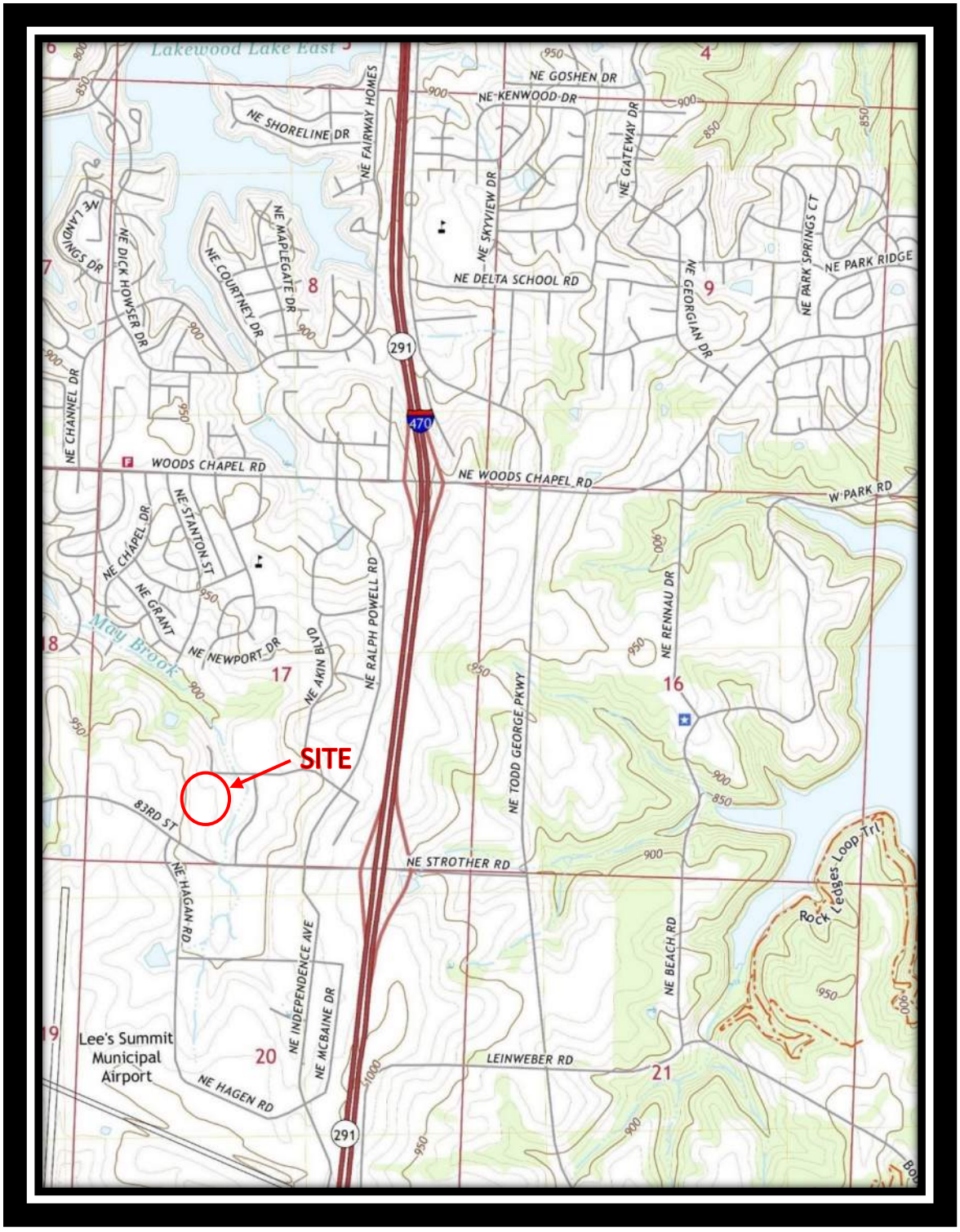
This investigation and report do not constitute a guarantee of subsurface conditions, groundwater conditions, excavation characteristics or construction conditions. We recommend that excavation conditions across the site be evaluated during construction relative to this interpretation of subsurface conditions. Variations in subsurface conditions may occur that require evaluation or revision of geotechnical design parameters or recommendations. If the scope of the project is altered or differing geotechnical conditions are encountered, it would be advisable to review and update our recommendations in consideration of those findings or variations.

Recommendations contained in this report are based on subsurface conditions and proposed designs provided as of this date. The above study and recommendations are applicable only for the conditions and locations described, and for the specific project mentioned. Use of the data contained herein by others may require interpretation or analysis that was not contemplated by our investigation and analysis. The use of this data and any interpretations or conclusions developed by others are the sole responsibility of those firms or individuals.

Factors affecting design and construction often become apparent during detailed design or actual construction that were not anticipated in the pre-design or early design phases. Engineering Surveys and Services is available during design and construction to assist in evaluating these factors and their impact on these geotechnical recommendations.

11 APPENDIX

11.1 VICINITY MAP



11.2 SYMBOLS AND TERMS

LAB NO. 14879

PROJECT: Wilshire Hills – Phase III
Lee's Summit, Missouri

SYMBOLS AND TERMS

SAMPLE TYPES

Auger | Shelby Tube | Split Spoon | Giddings Tube | No Recovery | NX Core Boring | Roller Bit (Tri–Cone) | Concrete Corer | Down Hole Hammer

ABBREVIATIONS

⊗	Unconfined Compression (1)
●	Water Content (2)
+	Plastic (PL) & Liquid (LL) Limit (2)
USCS	Unified Soil Classification System
PI	Plasticity Index
ATD	At Time of Drilling
RQD	Rock Quality Designation
SS	Split Spoon – 1 3/8" I.D., 2" O.D.
ST	Shelby Tube – 3" O.D.
PA	Power Auger
HA	Hand Auger
AS	Auger Sample
S	Cuttings Sample
TV	Hand–Held Torvane

DEFINITIONS

Blows per ft.– Indicates blows per 12 inches of sampler penetration when driven by a 140–pound hammer falling freely 30 inches. The Standard Penetration Resistance is the number of blows for the last 12 inches of penetration of the split–spoon sampler.

NOTES

(1) Shear Strength Data plotted on cohesion scale of Boring Logs.

(2) Classification and Index Properties plotted on Water Content Scale of Boring Logs.

11.3 SUMMARY OF LABORATORY TEST RESULTS

Engineering Surveys & Services

LAB NO. 14879

PROJECT: Wilshire Hills – Phase III
Lee's Summit, Missouri

SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	SAMPLE NO.	DEPTH (FEET)	USCS CLASS	NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (PCF)	ATTERBERG LIMITS LL	PL	PI	UNCONFINED COMPRESSION COHESION (TSF)	STRAIN %	REMARKS
B1	AS1	0.5-2.0	CL	20		47	21	26			
	ST2	2.0-4.0	CL	17		44	24	20			TV=1.5 tsf, PP=4.5tsf
	SS3	7.5-9.0		13							
B3	S1	0-14.0	CL	16		41	21	20			Proctor
	ST2	15.0-15.5	CH	21	103	52	20	32	0.9	2.7	TV=1.5 tsf, PP=3.0 tsf
	SS3	18.5-20.0		22							
	SS4	23.5-25.0		17							
B4	AS1	0.5-3.0	CH	24		52	26	26			
	ST2	3.0-5.0		18	109				0.6	4.5	
	SS3	8.0-9.0		12							
	SS4	13.0-13.5		14							
B5	AS1	1.0-3.0		23							
	ST2	4.0-6.0	CH	27	94	67	21	46	0.7	1.8	TV=1.6 tsf, PP=4.0 tsf
	SS3	9.0-10.5		27							TV=1.4 tsf, PP=3.25 tsf
	ST4	13.5-15.5	CH	22	110	51	25	26	1.1	1.9	
	SS5	18.5-20.0		15							
B7	AS1	1.0-3.0	CL	19		42	22	20			
	AS2	3.0-5.0		28							
B9	AS1	1.0-3.0		26							
	AS2	5.0-8.0	CH	25		50	22	28			
	ST3	8.0-10.0		18	114				1.3	1.9	
	SS4	13.0-14.5		17							
	SS5	18.0-19.0		11							
B10	AS1	1.0-3.0		29							
	AS2	5.0-8.0	CH	24		51	17	34			
	AS3	11.0-13.0		25							

TV = Hand Held Torvane, PP= Pocket Penetrometer

ENGINEERING SURVEYS AND SERVICES
TESTING LABORATORY

1113 Fay Street · Columbia, Missouri 65201· (573) 449-2646
802 El Dorado Drive · Jefferson City, Missouri 65101· (573) 636-3303
1775 West Main Street · Sedalia, MO 65301 · (660) 826-8618

Date: 13 March 2023

Lab No.: **L14879**

LABORATORY COMPACTION CHARACTERISTICS OF SOIL REPORT

Project: Wilshire Hills Phase III

Location: Lee's Summit, Missouri

Client: JES Development Co, LC

Contractor:

Material Information:

Sample No: B3-S1 Date Received: 20 February 2023

Description: Silty Clay: Brownisg gray, moist, firm trace of rust, root hairs. Depth: 0-14'

Source: On-Site Stockpile

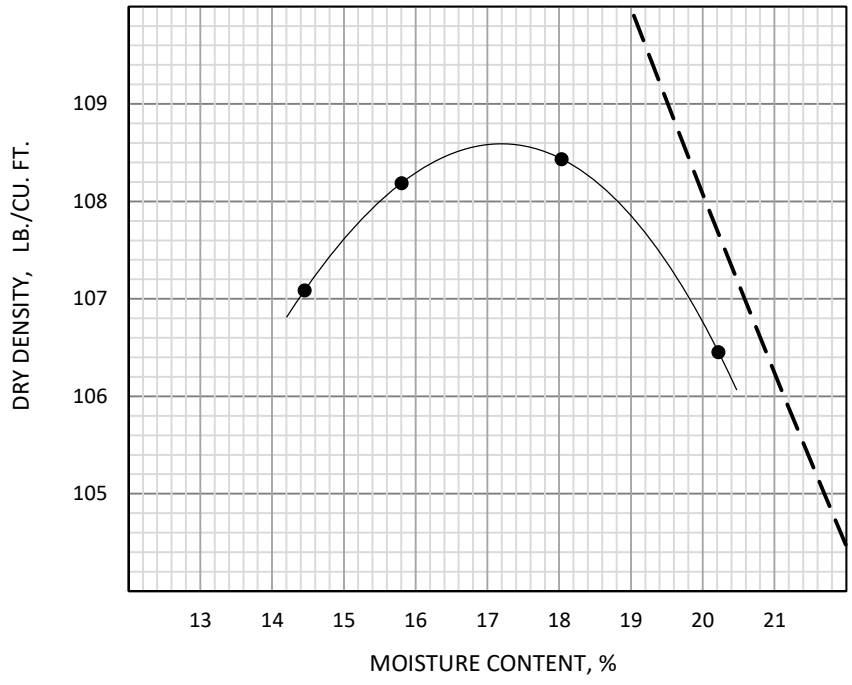
Sampling: On-Site Stockpile by Engineering Surveys and Services Personnel

Laboratory Test Data:

Type of Test: ASTM D 698 Standard Method A Date of Test: 06 March 2023

Sample Preparation: Dry Method Rammer Type: Manual

Test Results:



Graph Legend

Proctor Curve

Zero Air Void Curve for Assumed Specific Gravity = 2.65

MAXIMUM DRY DENSITY

108.6 **LBS./CU. FT.**

OPTIMUM MOISTURE CONTENT

17.2 **%**

ATTERBERG LIMITS ASTM D4318

LL = 41%
PL = 21%
PI = 20%

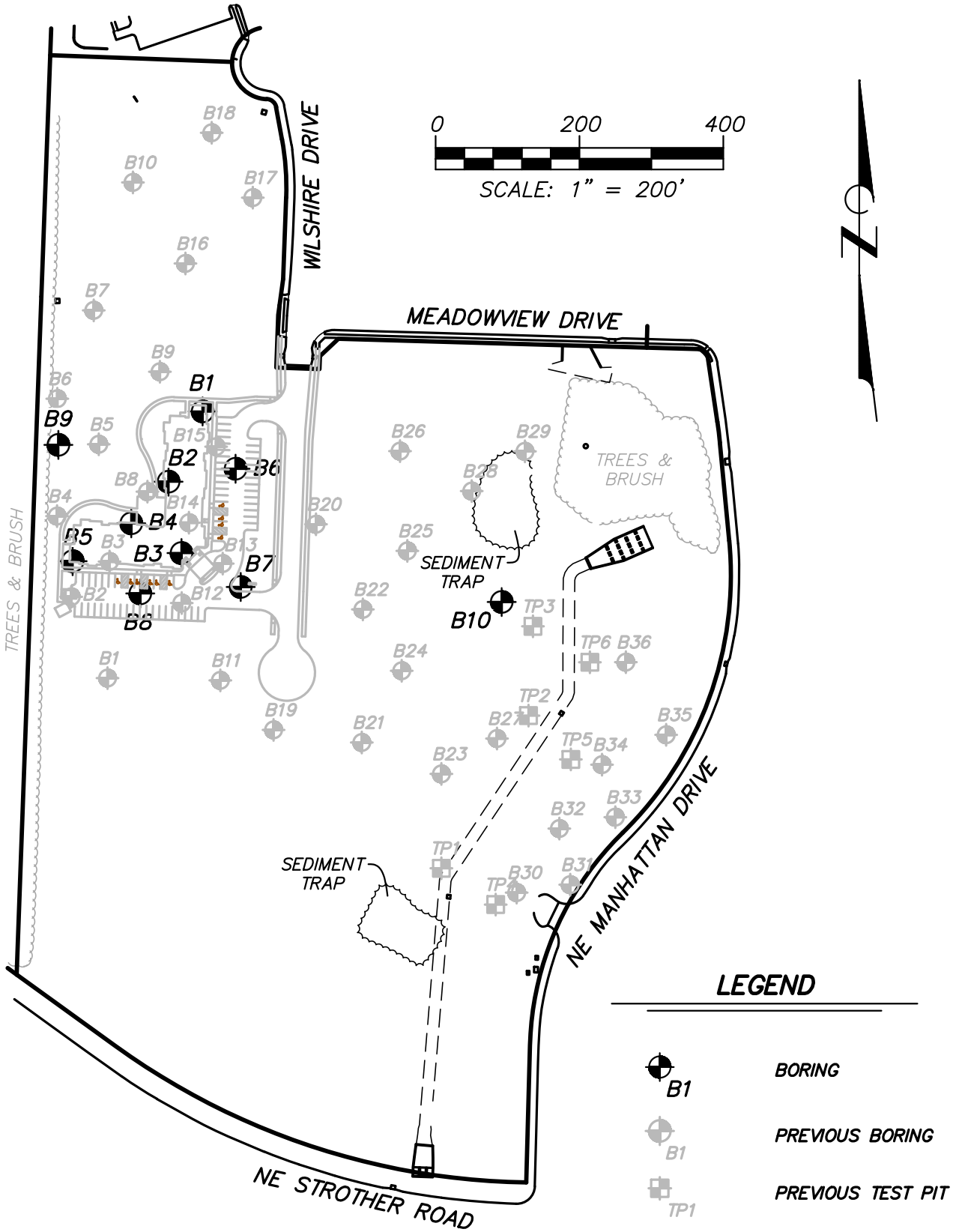
REMARKS: As received moisture = 14.5%

11.4 Plan of Boring Locations

LAB NO. 14879

PROJECT: Wilshire Hills – Phase III
Lee's Summit, Missouri

PLAN OF BORING LOCATIONS



L14879 BORE LOGS.DWG 3/21/2023

Engineering Surveys
& Services

11.5 BORING LOGS

LAB NO. 14879

PROJECT: Wilshire Hills – Phase III
Lee's Summit, Missouri

LOG OF BORING NO. B1

TYPE: 4" Solid Stem Drag Finger Bit

LOCATION: See Plan of Boring Locations
SURF. ELEV.: 929.8'

DEPTH, FT.	SAMPLE TYPE	SOIL DESCRIPTION (TYPE, COLOR, MOISTURE & OTHER)	BLOWS PER FT.	UNIFIED CLASSIFICATION	UNIT DRY WT. LB./CU.FT.
0		TOPSOIL / MORE SO GRASS ROOT ZONE			
		SILTY CLAY: Tan, moist, stiff		CL	
2		SHALEY CLAY: Tan, dry, hard, layered			
4					
6					
8		SHALE: Purplish gray, dry, hard, layered	64	CL	
10					
12					
		SHALE: Purplish gray, dry, hard, layered	50/2"		
14		AUGER REFUSAL ON LIMESTONE			
16					
18					
20					
22					
24					
26					
28					
30					
32					

COHESION, TON/SQ.FT.
0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT — WATER CONTENT,% — LIQUID LIMIT
10 20 30 40 50 60 70

Completion Depth: 14.5'
Date: 20 February, 2023

Depth to Water ATD: Not Encountered

L14879 BORE LOGS.DWG 3/7/2023

Engineering Surveys & Services

LAB NO. 14879

PROJECT: Wilshire Hills – Phase III
Lee's Summit, Missouri

LOG OF BORING NO. B2

TYPE: 4" Solid Stem Drag Finger Bit

LOCATION: See Plan of Boring Locations
SURF. ELEV.: 930.6'

DEPTH, FT.	SAMPLE TYPE	SOIL DESCRIPTION (TYPE, COLOR, MOISTURE & OTHER)	BLOWS PER FT.	UNIFIED CLASSIFICATION	UNIT DRY WT. LB./CU.FT.	COHESION, TON/SQ.FT. (0.2 0.4 0.6 0.8 1.0 1.2 1.4) / PLASTIC LIMIT — WATER CONTENT,% — LIQUID LIMIT (10 20 30 40 50 60 70)
0		TOPSOIL / MORE SO GRASS ROOT ZONE				
2		SILTY CLAY: Tan, moist to dry, stiff				
4		SHALEY CLAY: Tan, dry, hard, layered				
6						
8						
10		SHALE: Purplish gray, dry, hard, layered	68			
12						
14		SHALE: Purplish gray, dry, hard, layered	50/3"			
		AUGER REFUSAL ON LIMESTONE				
16						
18						
20						
22						
24						
26						
28						
30						
32						

Completion Depth: 14.5'
Date: 20 February, 2023

Depth to Water ATD: Not Encountered

L14879 BORE LOGS.DWG 3/7/2023

Engineering Surveys & Services

LAB NO. 14879

PROJECT: Wilshire Hills – Phase III
Lee's Summit, Missouri

LOG OF BORING NO. B3

TYPE: 4" Solid Stem Drag Finger Bit

LOCATION: See Plan of Boring Locations
SURF. ELEV.: 943.5'

DEPTH, FT.	SAMPLE TYPE	SOIL DESCRIPTION (TYPE, COLOR, MOISTURE & OTHER)	BLOWS PER FT.	UNIFIED CLASSIFICATION	UNIT DRY WT. LB./CU.FT.
0		FILL		CL	
14		SILTY CLAY: Orange with mottled gray, moist, firm, some small sand pockets		CH	103
18		SHALEY CLAY: Tannish orange with gray seams, moist, firm	16		
24		CLAYEY SHALE: Tan with some gray, dry, hard	52		

COHESION, TON/SQ.FT.
0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT — WATER CONTENT,% — LIQUID LIMIT
10 20 30 40 50 60 70

Completion Depth: 25.0'
Date: 20 February, 2023

Depth to Water ATD: Not Encountered

L14879 BORE LOGS.DWG 3/7/2023

Engineering Surveys & Services

LAB NO. 14879

PROJECT: Wilshire Hills – Phase III
Lee's Summit, Missouri

LOG OF BORING NO. B4

TYPE: 4" Solid Stem Drag Finger Bit

LOCATION: See Plan of Boring Locations
SURF. ELEV.: 932.4'

DEPTH, FT.	SAMPLE TYPE	SOIL DESCRIPTION (TYPE, COLOR, MOISTURE & OTHER)	BLOWS PER FT.	UNIFIED CLASSIFICATION	UNIT DRY WT. LB./CU.FT.
		TOPSOIL / MORE SO ROOT ZONE			
2		SILTY CLAY: Tan, moist to dry, stiff		CH	
4		SHALEY CLAY: Tannish orange with gray seams, dry, hard, layered			109
6					
8					
8		SHALE: Purplish gray, dry, hard, layered	50/5.5"		
10					
12		-; wet			
14		SHALE: Purplish gray, moist to dry, hard, layered	50/1"		
16		AUGER REFUSAL ON LIMESTONE			
18					
20					
22					
24					
26					
28					
30					
32					

COHESION, TON/SQ.FT.
0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT — WATER CONTENT,% — LIQUID LIMIT
10 20 30 40 50 60 70

Completion Depth: 16.0'
Date: 20 February, 2023

Depth to Water ATD: Not Encountered

L14879 BORE LOGS.DWG 3/7/2023

Engineering Surveys & Services

LAB NO. 14879

PROJECT: Wilshire Hills – Phase III
Lee's Summit, Missouri

LOG OF BORING NO. B5

TYPE: 4" Solid Stem Drag Finger Bit

LOCATION: See Plan of Boring Locations
SURF. ELEV.: 946.6'

DEPTH, FT.	SAMPLE TYPE	SOIL DESCRIPTION (TYPE, COLOR, MOISTURE & OTHER)	BLOWS PER FT.	UNIFIED CLASSIFICATION	UNIT DRY WT. LB./CU.FT.
		TOPSOIL			
2		SANDY SILTY CLAY: Brown with mottled orange, moist, firm			
4		SANDY SILTY CLAY: Brown with mottled orange, moist, firm, blocky		CH	94
6					
8					
10		SHALEY CLAY: Light orange with gray, shale veins, moist, firm, plastic	9		
12					
14		CLAYEY SHALE: Tannish orange, moist to dry, hard		CH	110
16					
18					
20		SHALE: Purplish gray, dry, hard, layered	50/4"		
22					
24					
26					
28					
30					
32					

COHESION, TON/SQ.FT.
0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT — WATER CONTENT,% — LIQUID LIMIT
10 20 30 40 50 60 70

Completion Depth: 20.0'
Date: 20 February, 2023

Depth to Water ATD: Not Encountered

L14879 BORE LOGS.DWG 3/7/2023

Engineering Surveys & Services

LAB NO. 14879

PROJECT: Wilshire Hills – Phase III
Lee's Summit, Missouri

LOG OF BORING NO. B6

TYPE: 4" Solid Stem Drag Finger Bit

LOCATION: See Plan of Boring Locations
SURF. ELEV.: 929.2'

DEPTH, FT.	SAMPLE TYPE	SOIL DESCRIPTION (TYPE, COLOR, MOISTURE & OTHER)	BLOWS PER FT.	UNIFIED CLASSIFICATION	UNIT DRY WT. LB./CU.FT.
		TOPSOIL / MORE SO ROOT ZONE			
2		SANDY SILTY CLAY: Light brown, moist, firm			
4					
6		SHALEY CLAY: Tan, moist, stiff			
8					
10					
12		-; harder shale or limestone			
14		AUGER REFUSAL ON LIMESTONE			
16					
18					
20					
22					
24					
26					
28					
30					
32					

COHESION, TON/SQ.FT. ⊗
0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT — WATER CONTENT,% — LIQUID LIMIT
10 20 30 40 50 60 70

Completion Depth: 13.5'
Date: 20 February, 2023

Depth to Water ATD: Not Encountered

L14879 BORE LOGS.DWG 3/7/2023

Engineering Surveys & Services

LAB NO. 14879

PROJECT: Wilshire Hills – Phase III
Lee's Summit, Missouri

LOG OF BORING NO. B7

TYPE: 4" Solid Stem Drag Finger Bit

LOCATION: See Plan of Boring Locations
SURF. ELEV.: 930.2'

DEPTH, FT.	SAMPLE TYPE	SOIL DESCRIPTION (TYPE, COLOR, MOISTURE & OTHER)	BLOWS PER FT.	UNIFIED CLASSIFICATION	UNIT DRY WT. LB./CU.FT.
		FILL			
2		SILTY CLAY: Grayish brown, moist, firm, trace of fine gravel		CL	
4		SILTY CLAY: Reddish brown, moist, firm, trace of fine sand, plastic			
6					
8					
10					
12					
14					
16					
18					
20					
22					
24					
26					
28					
30					
32					

COHESION, TON/SQ.FT. ⊗
0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT — WATER CONTENT,% — LIQUID LIMIT
10 20 30 40 50 60 70

Completion Depth: 5.0'
Date: 20 February, 2023

Depth to Water ATD: Not Encountered

L14879 BORE LOGS.DWG 3/7/2023

Engineering Surveys & Services

LAB NO. 14879

PROJECT: Wilshire Hills – Phase III
Lee's Summit, Missouri

LOG OF BORING NO. B8

TYPE: 4" Solid Stem Drag Finger Bit

LOCATION: See Plan of Boring Locations
SURF. ELEV.: 935.1'

DEPTH, FT.	SAMPLE TYPE	SOIL DESCRIPTION (TYPE, COLOR, MOISTURE & OTHER)	BLOWS PER FT.	UNIFIED CLASSIFICATION	UNIT DRY WT. LB./CU.FT.
		TOPSOIL / MORE SO ROOT ZONE			
2		SILTY CLAY: Tannish orange, moist, firm			
4		SILTY CLAY: Brownish gray with some tan, moist, firm			

COHESION, TON/SQ.FT. ⊗
0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT — WATER CONTENT,% — LIQUID LIMIT
10 20 30 40 50 60 70

Completion Depth: 5.0'
Date: 20 February, 2023

Depth to Water ATD: Not Encountered

L14879 BORE LOGS.DWG 3/7/2023

Engineering Surveys & Services

LAB NO. 14879

PROJECT: Wilshire Hills – Phase III
Lee's Summit, Missouri

LOG OF BORING NO. B9

TYPE: 4" Solid Stem Drag Finger Bit

LOCATION: See Plan of Boring Locations
SURF. ELEV.: 953.1'

DEPTH, FT.	SAMPLE TYPE	SOIL DESCRIPTION (TYPE, COLOR, MOISTURE & OTHER)	BLOWS PER FT.	UNIFIED CLASSIFICATION	UNIT DRY WT. LB./CU.FT.
		TOPSOIL			
2		SANDY SILTY CLAY: Reddish brown with tan, moist, firm			
4					
6		SILTY CLAY: Reddish brown, moist, firm, plastic		CH	
8		SHALEY CLAY: Tan, moist, stiff			114
10					
12					
14		CLAYEY SHALE: Tan with several gray layers, dry, hard	46		
16					
18		SHALE: Purplish gray, dry, hard, layered	50/4"		
20					
22					
24					
26		SHALE: Purplish gray, dry, hard, layered	50/4"		
28					
30					
32					

COHESION, TON/SQ.FT. ⊗
0.2 0.4 0.6 0.8 1.0 1.2 1.4

PLASTIC LIMIT — WATER CONTENT,% — LIQUID LIMIT
10 20 30 40 50 60 70

Completion Depth: 30.0'
Date: 20 February, 2023

Depth to Water ATD: Not Encountered

L14879 BORE LOGS.DWG 3/7/2023

Engineering Surveys & Services

LAB NO. 14879

PROJECT: Wilshire Hills – Phase III
Lee's Summit, Missouri

LOG OF BORING NO. B10

TYPE: 4" Solid Stem Drag Finger Bit

LOCATION: See Plan of Boring Locations
SURF. ELEV.: 922.5'

DEPTH, FT.	SAMPLE TYPE	SOIL DESCRIPTION (TYPE, COLOR, MOISTURE & OTHER)	BLOWS PER FT.	UNIFIED CLASSIFICATION	UNIT DRY WT. LB./CU.FT.
		TOPSOIL			
2		SANDY SILTY CLAY: Dark brown mixed with some amount of tan, moist to wet, soft			
4					
6		SILTY CLAY: Brown, moist, firm		CH	
8					
10					
12		SHALEY CLAY: Tan, moist, firm			
14		AUGER REFUSAL ON LIMESTONE			
16					
18					
20					
22					
24					
26					
28					
30					
32					

COHESION, TON/SQ.FT.
0.2 0.4 0.6 0.8 1.0 1.2 1.4

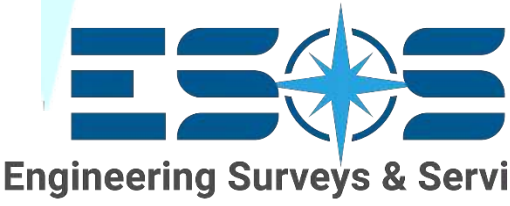
PLASTIC LIMIT — WATER CONTENT,% — LIQUID LIMIT
10 20 30 40 50 60 70

Completion Depth: 14.0'
Date: 20 February, 2023

Depth to Water ATD: Not Encountered

L14879 BORE LOGS.DWG 3/7/2023

Engineering Surveys & Services



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Stormwater Pollution Prevention Plan
for Construction Activities at:

Public Improvements and Onsite Construction to Serve Wilshire Hills Phase III

Wilshire Drive
Lee's Summit, Missouri

Operator(s):

Wilshire Hills III, L.P.
206 Peach Way
Columbia, Missouri 65202
Contact: Brian Kimes (573)424-8811

SWPPP Authorized Representative(s):

(to be filled in by Contractor after award of contract)

Company Name: _____
Company Address: _____
_____
Contact Name: _____
Contact Phone: _____

Prepared by:

Engineering Surveys & Services
1113 Fay Street
Columbia, MO 65201
Phone: 573-449-2646
Missouri Engineering Corp. # 2004005018

Project Number: 15925

6/22/23

SWPPP Preparation Date:

June 22, 2023

Estimated Project Dates:
Project Start Date: September 2023
Project Completion Date: September 2024

TABLE OF CONTENTS

SWPPP APPENDICES

SECTION 1: SWPPP BASICS

1.1 GENERAL PERMITS FOR STORMWATER DISCHARGE FROM CONSTRUCTION SITES

The Clean Water Act and associated federal regulations require nearly all construction site operators engaged in clearing, grading, and excavating activities that disturb one acre or more, including smaller sites in a larger common plan of development or sale, to obtain coverage under a National Pollutant Discharge Elimination System (NPDES) permit for their stormwater discharges. Under the NPDES program, the U.S. Environmental Protection Agency (EPA) has authorized the State of Missouri to implement the federal requirements and issue stormwater permits. The Missouri Department of Natural Resources (MDNR), as administrative agent for the Missouri Clean Water Commission, issues these permits as land disturbance permits. To obtain the permit for compliance with the regulations for land disturbance it is necessary to request coverage under the MDNR Missouri State Operating Permit – General Permit. The permit was obtained through MDNR's ePermitting process available online and is included in Appendix A.

Local requirements by the City of Lee's Summit also require the submittal of their land disturbance permit application and a construction plan(s) prepared for the site. The construction plan(s) consists of two parts: site grading and erosion control map(s)/plan(s), and a site-specific written document that identifies and describes stormwater pollution sources and prevention methods referred to as a Stormwater Pollution Prevention Plan (SWPPP). The SWPPP for the site must be prepared and followed during construction activities in accordance with the state NPDES Permit and local Lee's Summit requirements. Plans and SWPPP must be approved by the City of Lee's Summit prior to commencement of construction activities.

1.2 BEST MANAGEMENT PRACTICES

If sediment and erosion controls and good housekeeping practices are not followed, construction activity can result in the discharge of significant amounts of sediment and other pollutants via stormwater runoff. The term Best Management Practices or BMPs is often used to describe the controls and activities used to prevent stormwater pollution. BMPs can be divided into two main categories – structural and non-structural BMPs. Structural BMPs include silt fences, sedimentation ponds, erosion control blankets, and temporary or permanent seeding, while non-structural BMPs include picking up trash and debris, sweeping up nearby sidewalks and streets, maintaining equipment, and training site staff on erosion and sediment control practices. In this document, the term "BMPs" is used broadly and includes both structural and non structural controls and practices.

1.3 PURPOSE OF STORMWATER POLLUTION PREVENTION PLAN

The purpose of the SWPPP is to ensure the design, implementation, management, and maintenance of BMPs in order to reduce the amount of sediment and other pollutants in storm water discharges associated with the land disturbance activities; comply with Missouri Water Quality Standards; and ensure compliance with the terms and conditions of the land disturbance permits(s). Copies of these permits shall be included in Appendix A. The SWPPP document shall:

- Identify potential sources of stormwater pollution at the construction site
- Describe practices to reduce pollutants in storm water discharges from the construction site.
- Identify procedures the Operator will implement to comply with the terms and conditions of the land disturbance permit(s).

1.4 NOTICE OF INTENT

The Operator has petitioned for storm water discharges associated with the land disturbance activities at this site to be covered by Missouri's MDNR Operating Permit – General Operating Permit and the City of Lee's Summit Land Disturbance Permit. The MDNR permit was obtained through MDNR's ePermitting process available online and is included in Appendix A. The application for the City of Lee's Summit Land Disturbance Permit is included in

Appendix B. This serves as the Notice of Intent (NOI) for the project.

1.5 AUTHORIZED REPRESENTATIVE

All reports, including SWPPPs and inspection reports, must be signed by the Operator or a duly authorized representative of that entity. For this project the Operator has chosen to designate the Contractor as an authorized representative as indicated in the signed statement located in Appendix C.

1.6 RESPONSIBILITIES OF THE CONTRACTOR

The authorized representative, or Contractor, shall be responsible for the management of the discharge of stormwater from the site in accordance with the Missouri NPDES General State Operating Permit, City of Lee's Summit Land Disturbance Permit conditions and the provisions of this SWPPP. The Contractor shall be responsible for implementing all aspects of this SWPPP and conducting the stormwater management practices in accordance with the permit(s). The Contractor shall be responsible for providing qualified inspectors to conduct the inspections required by this SWPPP and for notifying each subcontractor or entity (including utility crews and city employees or their agents) who will perform work at the site of the existence of the SWPPP and what actions or precautions shall be taken while on site to minimize the potential for erosion and damage to BMPs. The Contractor shall be responsible for any enforcement action taken or imposed by federal, state, or local agencies, including the cost of fines, construction delays, and remedial actions resulting from the Contractor's failure to comply with the permit provisions. It shall be the responsibility of the Contractor to make any changes to the SWPPP necessary when the Contractor or any of his subcontractors elects to use borrow or fill or material storage sites, either contiguous to or remote from the construction site, when such sites are used solely for this construction site. Such sites are considered to be part of the construction site covered by the permit and this SWPPP. Off-site borrow, fill, or material storage sites which are used for multiple construction projects are not subject to this requirement, unless specifically required by state or local jurisdictional entity regulations. The Contractor should consider this requirement in negotiating with earthwork subcontractors, since the choice of an off-site borrow, fill, or material storage site may impact their duty to implement, make changes to, and perform inspections required by the SWPPP for the site.

1.7 RESPONSIBILITIES OF THE CONTRACTOR TO OPERATOR

The Contractor shall monitor the suitability of the designated management practices to achieve the stormwater quality provisions of the permit(s) and shall notify the Operator of the need to change management practices if necessary. If changes are ordered by the Operator, an adjustment in the Contractor's fee shall be considered in accordance with the General Conditions of the specifications. However, the Contractor's failure to monitor or report deficiencies to the Operator shall result in the Contractor being liable for fines and construction delays resulting from any federal, state, or local agency enforcement action.

1.8 AUTHORIZED REPRESENTATIVE AND SUBCONTRACTORS CERTIFICATION

The SWPPP Authorized Representative Certification must bear the signature of an authorized representative of the Contractor certifying that they are familiar with the terms and conditions of the MDNR Operating Permit – General Operating Permit, City of Lee's Summit Land Disturbance Permit, and shall comply with the requirements of the SWPPP developed for this construction site. The Authorized Representative is responsible for ensuring that all contractors and subcontractors whose activities provide the potential for storm water pollution comply with the SWPPP. Some Contractors require each subcontractor whose activities provide the potential for storm water pollution to sign the SWPPP Subcontractor's Certification and make the same certification as the Authorized Representative. These forms are located in Appendixes C and D of this document. Copies of these pages shall be created as necessary to accommodate all subcontractors for this project. For easier tracking, a List of Subcontractors is provided in Appendix E to be filled out by the Contractor. All of the signed forms shall be kept in Appendixes C thru F as part of this document.

1.9 ONSITE REQUIREMENTS AND PUBLIC NOTICE

The Contractor shall keep a copy of the SWPPP maps and the SWPPP with all related documents onsite when land disturbance operations are in progress, or other operational activities that may affect the maintenance or integrity of

the BMP structures are in progress. The SWPPP must be made available to any stormwater regulatory authorities upon request.

The Contractor shall post and maintain a copy of the public notification information required in the MDNR Land Disturbance Permit included in Appendix A and the notice included in Appendix K at the main entrance to the site. The public notification sign must be visible from the public road that provides access to the site's main entrance. The public notification sign must remain posted at the site until the permit has been terminated.

SECTION 2: COMPLIANCE WITH FEDERAL, STATE, AND LOCAL REGULATIONS

2.1 GENERAL

The Contractor shall obtain copies of any and all federal, state, and local regulations that are applicable to stormwater management, erosion control, and pollution minimization at this job site and shall comply fully with such regulations. The Contractor shall submit written evidence of such compliance if requested by the Operator or any agent of a regulatory body. The Contractor shall comply with all conditions of the MDNR Operating Permit – General Operating Permit, including the conditions related to maintaining the SWPPP and evidence of compliance with the SWPPP at the job site and allowing regulatory personnel access to the job site and to records in order to determine compliance.

SECTION 3: SITE EVALUATION, ASSESSMENT, AND PLANNING

3.1 PROJECT/SITE INFORMATION

Project/Site Name: Wilshire Hills Phase III
Project Street/Location: Wilshire Drive
City: Lee's Summit State: MO ZIP Code: 64064
County or Similar Subdivision: Boone County

Latitude/Longitude:

Latitude: 38.970009 º (decimal degrees)

Longitude: -94.366822º (decimal degrees)

Method for determining latitude/longitude:

☐ USGS topographic map (specify scale: _____) ☐ EPA Web site ☐ GPS

☒ Other (please specify): Google Earth

Is the project located in Indian country? ☐ Yes ☒ No

If yes, name of Reservation, or if not part of a Reservation, indicate "not applicable." N/A

Is this project considered a federal facility? ☐ Yes ☒ No

NPDES project or permit tracking number*: _____

**(contractor hand write in MDNR General Operating Permit number from Appendix A)*

A general location map (i.e., USGS National map) with enough detail to identify the location of the construction site, direction of storm water flow, the receiving water within one (1) mile of the site, locations of off-site material, waste, borrow, and equipment storage areas (if applicable), and storm water discharge locations as required by MDNR is included in Appendix J.

3.2 CONTACT INFORMATION/RESPONSIBLE PARTIES

Operator(s):

Wilshire Hills III, L.P.
206 Peach Way
Columbia, MO 65203

SWPPP Authorized Representative(s) (can be: general contractor: project/construction manager(s) or site supervisor(s); see also APPENDIX C): *(to be filled in by Contractor after award of contract)*

Company or Organization Name:_____

Address: _____

City, State, Zip Code: _____

Contact Name: _____

Contact Telephone Number: _____

Contact Email: _____

Insert area of control (if more than one operator at site) : _____

_____

Repeat as necessary

General Contractor: (can be Project/Construction Manager(s) or Site Supervisor(s)):
(to be filled in by Contractor after award of contract)

Company or Organization Name:_____

Address: _____

City, State, Zip Code: _____

Contact Name: _____

Contact Telephone Number: _____

Contact Email: _____

Insert area of control (if more than one operator at site) : _____

_____

Repeat as necessary

This SWPPP was Prepared by:

Engineering Surveys & Services
1113 Fay Street
Columbia, MO 65201
Matthew Kriete
Phone: 573-449-2646
mkriete@ess-inc.com

Subcontractor(s):

See Appendix E

Emergency 24-Hour Contact: *(to be filled in by Contractor after award of contract)*

Company or Organization Name:

_____

Contact Name:

_____

Contact Telephone Number:

_____

3.3 NATURE AND SEQUENCE OF CONSTRUCTION ACTIVITY

The general scope of the work for the project is as follows:

The project consists of construction of a 50 unit, three story, senior living building and associated parking lots, sewer and utility systems. Offsite work will include the extension of Wilshire Drive as well as a large regional detention basin for future development. The project shall be built in one phase. Soil disturbing activities will include: clearing and grubbing, installing erosion and sediment controls, grading, installation of underground utilities, building foundations, parking lot construction, and preparation for final seeding, mulching, and landscaping.

What is the function of the construction activity?

☐ Residential ☒ Commercial ☐ Industrial ☐ Road Construction ☐ Linear Utility

☐ Other (please specify):

Estimated Project Start Date: **09 / 07 / 2023**

Estimated Project Completion Date: **09 / 27 / 2024**

3.4 SOILS, SLOPES, VEGETATION, AND CURRENT DRAINAGE PATTERNS

Soil type(s): The current soil type is sandy, silty clay.

Slopes (describe current slopes and note any changes due to grading or fill activities): Pre project the site consisted of previously cleared flat pad along the site frontage. The rear of the site rises steeply at a 3:1 slope to the top of the hill. Post project the majority of the site will be flatter at 2-5% slopes with 3:1 daylight slopes and a large retaining wall along the back portion of the site.

Drainage Patterns (describe current drainage patterns and note any changes due to grading or fill activities): Pre project the site for Wilshire Hills Phase III sheet flows to the east before draining into an existing stream. Post development the site will drain into a designed channel before flowing into a large permanent detention basin. This will discharge into the existing wing walls of the culvert of May Brook Creek.

Pre Project the entirety of the road development drains to the east with an additional 7 acres of offsite water flowing onto the site. This water then drains into to existing sediment basins before entering May Brook Creek.

Vegetation: Pre project the entire site consisted of previously graded agriculture fields with a grass/brush mix. Post project the site will consist of impervious areas and landscaped green space areas.

Other: The site will contain a large 18 foot retaining wall along the west side of the site. This wall will end leaving a large slope in the back yard portion of the site. Wilshire Drive will be extended to its intersection with Strother Road.

3.5 CONSTRUCTION SITE ESTIMATES

The following are estimates of the construction site.

Total site area:	20.78 acres
Construction project area to be disturbed:	8.65 acres
Percentage impervious area before construction:	0.0 %
Runoff coefficient before construction:	0.30
Percentage impervious area after construction:	11.5 %
Runoff coefficient after construction:	0.37

$$[0.30(7.63) + 0.90(1.02)] / 8.65 = 0.00$$

Estimated disturbed area of off-site borrow and fill areas: 0.00 acres

3.6 RECEIVING WATERS

Description of receiving waters: An unnamed tributary of May Brook Creek. These waters are not listed by MDNR as 303d impaired waters or waters subject to Total Maximum Daily Loads (TMDLs). Verification can be found with the current 303d List printed from the MDNR website and placed in Appendix P.

Description of receiving storm sewer systems: City of Lee's Summit storm sewer system.

Stormwater velocity reduction methods at outfall(s): All outfalls will consist of flared end sections with rip-rap and geotextile fabric.

3.7 JURISDICTIONAL WETLANDS AND/OR OTHER SURFACE WATERS

A non-jurisdictional stream, May Brook, is located on the site. It has been previously contained by a box culvert and discharges into an energy dissipator and a protected area. This stream or culvert is not to be disturbed for this project. Verification from the U.S. Corps of Engineers is provided in Appendix R.

3.8 SITE FEATURES AND SENSITIVE AREAS TO BE PROTECTED

Sensitive areas and features are located on the site but there is no disturbance proposed. This area is marked for protection on plans and is not to be disturbed.

3.9 POTENTIAL SOURCES OF POLLUTION

Sediment is the principal stormwater pollutant of concern for this project. There are, however, other pollutants that may be found, usually in substantially smaller amounts, in stormwater runoff from construction sites. Potential sources of pollutants to stormwater runoff from this project are noted in the following table:

Potential Construction Site Pollutants		
Possible Source	Pollutants	Location

	Sediment	Nutrients	Heavy Metals	pH (acids & bases)	Pesticides & herbicides	Oil & grease	Bacteria & viruses	Trash, debris, solids	Other toxic chemicals	
Clearing & Grubbing	X							X		Within clearing limits
Grading & site excavation	X									Within grading limits
Vehicle Tracking	X					X				Construction roads onsite and/or nearest public roadway(s) providing site access
Topsoil stripping & stockpiling	X									Within grading limits
Paving Operations	X							X		Paving areas
Concrete washout & waste			X	X				X		Designated concrete wash out area(s)
Structure construction/painting/ cleaning		X		X				X	X	Structure location(s) & designated wash out area(s)
Demolition and debris disposal	X							X		Demo areas
Dewatering operations	X	X								Where necessary. Typically footing and trenching locations.
Drilling and blasting operations	X			X				X		Where necessary in cut areas.
Material delivery and storage	X	X	X	X	X	X		X	X	Designated staging area(s)
Material use during building process		X	X	X	X	X		X	X	Building construction area(s)
Solid waste (trash and debris)								X	X	Designated trash receptacle(s)
Hazardous waste			X	X	X	X			X	Designated staging area(s) and building construction area(s)
Contaminated spills		X	X	X	X	X			X	Designated staging areas and building construction area(s)
Sanitary/septic waste		X		X			X		X	Designated port-a-potty area(s)
Vehicle/equipment use and storage						X			X	Designated vehicle storage and refuel area(s)
Landscaping operations	X	X						X		Landscaping area(s)

3.10 ENDANGERED SPECIES CERTIFICATION

Is there evidence of endangered/threatened species or critical habitats on or near the project area?

☐ Yes ☒ No

Describe how this determination was made:

Past disturbance shows the area has been graded for urban development. No habitat is currently present.

If yes, describe the species and/or critical habitat: N/A

3.11 MAPS

All site maps for this SWPPP shall be the following civil construction plan sheets prepared for this project:

Sheet #	Plan Title	Plan Date
C0.01	Cover Sheet	Latest sealed date by Civil Engineer and approved by authority having jurisdiction.
C0.02	General Notes	
C0.03	Typical Road Sections	
V1.01-V1.02	Boundary and Topographic Survey	
C1.01	Overall Public Plan	
C1.02-C1.03	Wilshire Drive Extension Road Plan & Profile	
C1.04-C1.08	Wilshire Drive Extension Cross Sections	
C2.01-C2.04	Grading and Storm Sewer Plan	
C3.01	Storm Sewer Profiles	
C4.01	Sanitary Sewer Extension Plan & Profile	
C5.01	Utility Extension Plan & Profile	
C6.01	Erosion Control Plan	
C7.01-C7.02	Road Plan Details	
C8.01-C8.02	Public Storm Sewer Details	
C9.01	Public Sanitary Sewer Details	
C10.01	Public Water Details	
C11.01-C11.03	Public Erosion Control Details	

The Contractor shall make copies of the site maps, fold them, and put them in the onsite SWPPP for documentation. The Contractor shall then track progress and document maintenance or amendments to the SWPPP via dating and redlining these site maps. If a redlined plan becomes to full to be easily legible and understood, simply date and fold it, put it in the onsite SWPPP for documentation, and start a new one. That way, there is a good hard copy record of what has occurred onsite.

Site maps should show the construction activities and stormwater management practices for each major phase of construction (initial grading, infrastructure, construction, and stabilization). Site maps should identify the following features:

- € Stormwater flow and discharges
- € Areas and features to be protected
- € Disturbed areas (locations and timing of activities)
- € Clearing limits
- € Identify locations of structural and non-structural BMPs
- € Identify locations of Post-construction BMPs
- € Areas of stabilization
- € Indicate locations of material, waste, borrow, or equipment storage

The site maps should show changes that have been made to the construction site, and BMPs and stabilization methods as the site progresses. The SWPPP shall be kept up to date, so redline the site maps with the locations and dates of any changes being made. Also include the current locations of the following:

- € Portable toilets
- € Material storage, vehicle and equipment fueling and maintenance areas
- € Concrete, paint and stucco washouts
- € Dumpster containers
- € Spill kits
- € Stockpiles
- € All other BMPs and whatever changes have been done to them

- € Environmentally sensitive areas
- € Stream buffers
- € SWPPP amendments

SECTION 4: EROSION AND SEDIMENT CONTROL BMPS

4.1 GENERAL

The BMPs shall be constructed or applied in accordance with this SWPPP, maps or construction plans, and all State or local requirements. Good engineering practices shall be used if there is a lack of information or changes are proposed for a BMP. The Contractor shall install the BMPs in the order indicated in the construction plans. BMPs shall be applied within the timeframe specified in the permit.

The Contractor shall be responsible for implementing all aspects of the SWPPP, including all BMPs. The Contractor may designate these tasks to certain subcontractors as they see fit, but the ultimate responsibility for implementing these BMPs and ensuring their proper functioning remains with the Contractor. An Implementation Schedule can be found in Appendix G.

To ensure that controls are adequately implemented, it is important that the work crews who install the BMPs are experienced or adequately trained. Improperly installed BMPs have little or no effect and may adversely affect the pollution of stormwater. It is important that all workers on the construction site are aware of the BMPs so they do not inadvertently disturb or remove them.

Additional information for BMPs are available in the latest version of: "Protecting Water Quality: a field guide to erosion, sediment and stormwater best management practices for development sites in Missouri and Kansas", available on the MDNR website.

4.2 MINIMIZE DISTURBED AREA AND PROTECT NATURAL FEATURES AND SOIL

BMP:	**Topsoiling: Removal, Stockpiling, and Replacement**
Responsible Staff:	
Location:	Within project grading areas only.
Installation Schedule:	After all perimeter erosion and sediment controls are in place and after clearing and grubbing is completed.
Description:	
Topsoil shall meet the definition provided in the specifications. If specifications are not provided it shall be defined as the top layer of the soil profile usually richest in organic matter and nutrients consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches (50 mm) in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials. A pH range of 5.0-7.5 is acceptable. Topsoil will be stripped to a minimum depth of 4" or as indicated in the geotechnical report or specifications for the project. Depths of removal may also vary as encountered in the field and directed by the geotechnical engineer. The topsoil will be stockpiled where indicated in the civil construction plans. The stockpile(s) will be in areas that will not interfere with construction phases and at least 15 feet away from concentrated flows. A silt fence shall immediately be installed around the perimeter of each stockpile, in accordance with silt fence design specifications per this SWPPP. If stockpiles are to remain for longer than 14 days, they shall be temporarily seeded as indicated in this SWPPP. Stockpiles that will remain longer than 6 months shall be permanently seeded as indicated in this SWPPP. All rough grading operations within landscape areas shall be completed 4" below finish grade to allow the placement of 4" of topsoil (or depth per specifications). To provide an optimum	

growing medium and allow for rainfall infiltration, the topsoil shall be placed in one lift with light compaction not to exceed 85-90% maximum dry density according to ASTM D698. Do not drive over any areas of topsoil placement to avoid further compaction.
Maintenance & Inspection:
All areas shall be inspected during routine SWPPP inspections to ensure the stockpiles and surrounding silt fence(s) are stable and functioning as intended. Inspect the silt fence(s) per the silt fence BMP description in this SWPPP. If required, inspect vegetation establishment on stockpile and correct as necessary. Inspect topsoil that has been spread for erosion, over compaction, and poor vegetation establishment. Correct over compacted areas by tilling 4" deep and smoothing and reseeding or sodding. Determine cause of erosion and correct as necessary immediately. Fertilize, reseed and mulch, (or resod if required) and water all areas of poor vegetation establishment.

Removal Requirements:	At the completion of the project, remove all silt fence from stockpiles. Remove all stockpiles by spreading leftover topsoil onsite in areas directed by Operator. Seed, mulch, and water all disturbed areas.

4.3 PHASE CONSTRUCTION ACTIVITY

BMP:	**Phased Grading**
Responsible Staff:	
Location:	Project grading limits.
Installation Schedule:	Per the Sequence of Events on the civil construction plans Cover Sheet.
Description:	
Onsite grading will be composed of three stages: initial, intermediate, and final grading. Each stage of grading and its required BMPs are indicated in the civil construction plans. To minimize potential erosion, only areas where immediate earthwork is needed shall be graded. Erosion and sediment controls shall be implemented immediately after construction but no later than 14 days after construction ceases.	
Maintenance & Inspection:	
Responsible staff shall be constantly aware of the construction schedule and make whatever adjustments may be necessary to minimize the amount of disturbed area at any one time. Inspections shall be made weekly to ensure all graded areas are property stabilized immediately after completion of construction or if there will be a break in land disturbance activities longer than 14 days.	

4.4 PERMANENT STRUCTURAL BMPs

BMP:	**Inlet Filters**
Responsible Staff:	
Location:	Where indicated in the civil construction plans.
Installation Schedule:	Per the Sequence of Events on the civil construction plans Cover Sheet.
Description:	
Inlet filters are manufactured cleanable/maintainable filters placed inside storm sewer structures designed to remove trash, debris, coarse sediments, and sometimes oil from stormwater runoff entering the inlet. They are typically installed just below the frame and grate or sill opening of the inlet structure. Install per the manufacturer's written instructions.	
Maintenance & Inspection:	
All units shall be inspected during routine SWPPP inspections for proper functioning, clogging, sediment build up, structural integrity, and as recommended by the manufacturer. Clean the filters and remove all trash, debris,	

fluids, and sediment from all units every month minimum, or as recommended by the manufacturer, during construction. Items removed from unit(s) shall be disposed of offsite as legally allowed. All repairs/maintenance shall be done immediately.

BMP:	**Rip-Rap**
Responsible Staff:	
Location:	Where indicated in the civil construction plans.
Installation Schedule:	Immediately after completion of storm sewer outlet structure and/or completion of finish grading in rip-rap area(s).
Description:	
Rip-rap consists of large rock placed over a geotextile fabric on the ground around in areas of concentrated stormwater flow. Typically these areas are immediately downstream of storm sewer flared end sections and at basin emergency spillways. The can also line drainage channels and stream banks. The purpose of rim-rap is to provide a rough, stable media that will slow the stormwater down as it overland flows across the rip-rap. This reduction in velocity will reduce erosion. Install as detailed in the civil construction plans.	
Maintenance & Inspection:	
All rip-rap shall be inspected during routine SWPPP inspections for proper functioning, stability, trash build up, clogging, piping, scour holes, dislodged rock, and structural integrity. Remove all weed and brush growth and apply herbicide at least once during the growing season. All repairs/maintenance shall be done immediately.	

BMP:	**Vegetated Swales/Channels**
Responsible Staff:	
Location:	Where indicated in the civil construction plans.
Installation Schedule:	Per the Sequence of Events on the civil construction plans Cover Sheet.
Description:	
Vegetated swales/channels consist of broad, shallow, constructed channels with a dense stand of turf grass covering. They may have an erosion control blanket for added erosion protection and typically have a trapezoidal cross section. Their intent is to convey concentrated overland flow in a slow manner to promote infiltration and reduce erosion/maintenance. Install as detailed in the civil construction plans.	
Maintenance & Inspection:	
All swales/channels shall be inspected during routine SWPPP inspections for proper vegetation establishment, functioning, stability, trash build up, clogging, piping, sediment, scour holes, and erosion. Remove sediment when it has reached 1/3 of the total design depth of the swale. If installed, inspect the erosion control blanket for proper function and verify there is no erosion under the blanket. All repairs/maintenance shall be done immediately.	

4.5 TEMPORARY STRUCTURAL BMPs

BMP:	**Silt Fence**
Responsible Staff:	
Location:	Where indicated on the civil construction plans & as necessary.
Installation Schedule:	Per the Sequence of Events on the civil construction plans Cover Sheet.
Description:	

Silt fence consists of a geotextile fabric that is attached to supporting posts and trenched into the ground. This is applied where sheet erosion (not channelized) occurs over small areas. It is typically installed at the same elevation following the contour of the land. Its purpose is to filter sediment laden runoff on the uphill side. Install as detailed in the civil construction plans.	
Maintenance & Inspection:	
All silt fence shall be inspected during routine SWPPP inspections for proper functioning, stability, and general condition. Verify the fence posts are still structurally sound, the fabric is still securely attached to the fence posts, and the fabric is still trenched into the ground with no runoff occurring under the fence. Remove built up sediment when it has reached 1/3 the height of the fence. Take care to avoid undermining the fence during sediment removal. All repairs/maintenance shall be done immediately.	
Removal Requirements:	Remove when the disturbed area draining to the BMP is stabilized. The area is considered stabilized when perennial vegetation or permanent materials (buildings, pavement, etc) cover all areas that have been disturbed. Vegetative cover shall be at least 70% of fully established density over the entire disturbed area that is to be vegetated. Areas disturbed during the removal of the BMP shall be smooth graded and permanently seeded and mulched.

BMP:	**Straw Wattles**
Responsible Staff:	
Location:	Where indicated on the civil construction plans & as necessary.
Installation Schedule:	Per the Sequence of Events on the civil construction plans Cover Sheet.
Description:	
Straw wattles consist of compressed straw fibers compressed in a tubular netting. They typically are 9" or 12" in diameter (sometimes larger) and 10' to 25' lengths. They are typically placed across channel bottoms, or on the contour on hill slopes to break up slope lengths and slow overland flow. They are typically staked in place with wooden stakes. Straw wattles are used to slow water velocity, trap sediment, and enhance revegetation. They are often used in place of silt fence, rock ditch checks, or straw bale ditch checks. Acceptable products are American Excelsior Company AEC Premier Straw Wattles or North American Green Straw Wattles, or approved equal. Straw wattle diameters are shown on the civil construction plans. Install per the manufacturer written instructions.	
Maintenance & Inspection:	
All straw wattles shall be inspected during routine SWPPP inspections for proper functioning, stability, and general condition. Verify the posts are still structurally sound, and the wattle is still trenched into the ground with no runoff occurring under the wattle. Remove built up sediment when it has reached 1/2 the height of the wattle. Take care to avoid undermining the wattle during sediment removal. All repairs/maintenance shall be done immediately.	
Removal Requirements:	Remove when the disturbed area draining to the BMP is stabilized. The area is considered stabilized when perennial vegetation or permanent materials (buildings, pavement, etc) cover all areas that have been disturbed. Vegetative cover shall be at least 70% of fully established density over the entire disturbed area that is to be vegetated. Areas disturbed during the removal of the BMP shall be smooth graded and permanently seeded and mulched.

BMP:	**Sediment Logs / Fiber Rolls**
Responsible Staff:	
Location:	Where indicated on the civil construction plans & as necessary.
Installation Schedule:	Per the Sequence of Events on the civil construction plans Cover Sheet.

Description:	
Sediment logs consist of compressed excelsior, coconut, or other fibers compressed in a tubular netting. They typically are 9" or 12" in diameter (sometimes larger) and 10' to 25' lengths. They are typically placed across channel bottoms, or on the contour on hill slopes to break up slope lengths and slow overland flow. They are typically staked in place with wooden stakes. Sediment logs are used to slow water velocity, trap sediment, and enhance revegetation. They are often used in place of silt fence, rock ditch checks, or straw bale ditch checks. Acceptable products are American Excelsior Company AEC Curlex Sediment Log or or approved equal. Sediment Log diameters are shown on the civil construction plans. Install per the manufacturer written instructions.	
Maintenance & Inspection:	
All sediment logs shall be inspected during routine SWPPP inspections for proper functioning, stability, and general condition. Verify the posts are still structurally sound, and the log is still trenched into the ground with no runoff occurring under the log. Remove built up sediment when it has reached 1/2 the height of the log. Take care to avoid undermining the log during sediment removal. All repairs/maintenance shall be done immediately.	
Removal Requirements:	Remove when the disturbed area draining to the BMP is stabilized. The area is considered stabilized when perennial vegetation or permanent materials (buildings, pavement, etc) cover all areas that have been disturbed. Vegetative cover shall be at least 70% of fully established density over the entire disturbed area that is to be vegetated. Areas disturbed during the removal of the BMP shall be smooth graded and permanently seeded and mulched.

BMP:	**Diversion Dike**
Responsible Staff:	
Location:	Where indicated on the civil construction plans.
Installation Schedule:	Per the Sequence of Events on the civil construction plans Cover Sheet.
Description:	
Diversion dikes consist of a combination of an earthen ridge and excavated channel constructed to direct sediment laden runoff to another BMP. These are often installed at the perimeter of disturbed areas and can be installed within the grading areas for temporary service. If installed within grading areas, grading activities should be implemented to keep intact the diversion dike for as long as possible. Install as detailed in the civil construction plans.	
Maintenance & Inspection:	
All diversion dikes shall be inspected during routine SWPPP inspections for proper functioning, stability, and general condition. Immediately remove trash/debris from the flow area and rebuild the ridge as needed. Remove built up sediment when it has reached 1/3 the height of the ridge. Take care to avoid undermining the fence during sediment removal. All repairs/maintenance shall be done immediately.	
Removal Requirements:	Remove when the disturbed area draining to the BMP is stabilized. The area is considered stabilized when perennial vegetation or permanent materials (buildings, pavement, etc) cover all areas that have been disturbed. Vegetative cover shall be at least 70% of fully established density over the entire disturbed area that is to be vegetated. Areas disturbed during removal of the BMP shall be smooth graded and permanently seeded and mulched.

BMP:	**Rock Ditch Check**
Responsible Staff:	
Location:	Where indicated on the civil construction plans.
Installation Schedule:	Per the Sequence of Events on the civil construction plans Cover Sheet.

Description:	
Rock ditch checks are used in waterways and swales to reduce concentrated water velocities and energy to drop out sediment, and reduce erosion in swales until permanent vegetation can be established. The center of the ditch check should always be lower than its edges to ensure runoff will flow over the center of the rock check and not the earthen sides where excessive erosion can occur. Install as detailed in the civil construction plans.	
Maintenance & Inspection:	
All ditch checks shall be inspected during routine SWPPP inspections for proper functioning, stability, and general condition. Immediately remove trash/debris and repair any erosion, piping, displaced rock as needed. Remove built up sediment when it has reached 1/3 the height of the rock. Take care to avoid undermining the ditch check during sediment removal. All sediment removed shall be placed as fill in non structural areas or as directed by the Operator. All repairs/maintenance shall be done immediately.	
Removal Requirements:	Remove when the disturbed area draining to the BMP is stabilized. The area is considered stabilized when perennial vegetation or permanent materials (buildings, pavement, etc) cover all areas that have been disturbed. Vegetative cover shall be at least 70% of fully established density over the entire disturbed area that is to be vegetated. Areas disturbed during removal of the BMP shall be smooth graded and permanently seeded and mulched.

BMP:	**Rock Dam**
Responsible Staff:	
Location:	Where indicated on the civil construction plans.
Installation Schedule:	Per the Sequence of Events on the civil construction plans Cover Sheet.
Description:	
Rock dams are used in waterways and swales to reduce concentrated water velocities and energy to drop out sediment, and reduce erosion in swales until permanent vegetation can be established. The center of the dam should always be lower than its edges to ensure runoff will flow down the center of the rock dam and not the earthen sides where excessive erosion can occur. A rock dam is a larger structure than a rock ditch check with a larger upstream ponding area to function more as a temporary sediment trap. Install as detailed in the civil construction plans.	
Maintenance & Inspection:	
All rock dams shall be inspected during routine SWPPP inspections for proper functioning, stability, and general condition. Immediately remove trash/debris and repair any erosion, piping, displaced rock as needed. Remove built up sediment when it has reached 1/2 the height of the rock. Take care to avoid undermining the dam during sediment removal. If the upstream ponding area does not drain between storms, pump out the water to another BMP, remove the sediment, and replace the stone on the upstream face of the dam. All sediment removed shall be placed onsite as fill in non structural areas or as directed by the Operator. All repairs/maintenance shall be done immediately.	
Removal Requirements:	Remove when the disturbed area draining to the BMP is stabilized. The area is considered stabilized when perennial vegetation or permanent materials (buildings, pavement, etc) cover all areas that have been disturbed. Vegetative cover shall be at least 70% of fully established density over the entire disturbed area that is to be vegetated. Areas disturbed during removal of the BMP shall be smooth graded and permanently seeded and mulched.

BMP:	**Sediment Trap**
Responsible Staff:	
Location:	Where indicated on the civil construction plans.
Installation Schedule:	Per the Sequence of Events on the civil construction plans Cover Sheet.

Description:	
Sediment trap can be temporary ponds with structural pipe outfalls that temporarily store sediment laden runoff to allow drop out of the sediment. They can also be permanent detention basins with a filter fabric temporarily wrapped around the permanent outfall structure. Install as detailed in the civil construction plans.	
Maintenance & Inspection:	
All sediment traps shall be inspected during routine SWPPP inspections for proper functioning, stability, and general condition. Immediately remove trash/debris and repair any erosion, piping, displaced rock as needed. Remove built up sediment when it has reached 1/2 the height of the outfall depth. Check the embankment, spillway(s), and outfall structure and pipe for erosion, piping, settlement, seepage, and slumping. If the ponding area does not drain between storms, pump out the water to another BMP, and remove and replace the filter fabric and/or gravel on the outfall structure. All sediment removed shall be placed onsite as fill in non structural areas or as directed by the Operator. All repairs/maintenance shall be done immediately.	
Removal Requirements:	Remove when the disturbed area draining to the BMP is stabilized. The area is considered stabilized when perennial vegetation or permanent materials (buildings, pavement, etc) cover all areas that have been disturbed. Vegetative cover shall be at least 70% of fully established density over the entire disturbed area that is to be vegetated. Areas disturbed during removal of the BMP shall be smooth graded and permanently seeded and mulched.

BMP:	**Silt Fence Inlet Protection**
Responsible Staff:	
Location:	Where indicated on the civil construction plans.
Installation Schedule:	Immediately after construction of each storm sewer inlet.
Description:	
Silt fence inlet protection is reinforced silt fence installed completely around a stormwater inlet to filter and pond sediment laden runoff to allow drop out of the sediment before it drains into the inlet. Install as detailed in the civil construction plans.	
Maintenance & Inspection:	
All inlet protection shall be inspected during routine SWPPP inspections for proper functioning, stability, and general condition. Verify the fabric and wire support is still in good condition with no rips, holes, or signs of stretching or stress. Verify the posts and supports are still structurally sound, the fabric is still securely attached to the posts and supports, and the fabric is still trenched into the ground with no runoff occurring under the fence. Remove built up sediment when it has reached 1/3 the height of the fence. All sediment removed shall be placed onsite as fill in non structural areas or as directed by the Operator. All repairs/maintenance shall be done immediately.	
Removal Requirements:	Remove when the disturbed area draining to the BMP is stabilized. The area is considered stabilized when perennial vegetation or permanent materials (buildings, pavement, etc) cover all areas that have been disturbed. Vegetative cover shall be at least 70% of fully established density over the entire disturbed area that is to be vegetated. Areas disturbed during removal of the BMP shall be smooth graded and permanently seeded and mulched.

BMP:	**Curb Inlet Filters**
Responsible Staff:	
Location:	All existing downstream curb inlets; all new curb inlets; where indicated on the civil construction plans.
Installation Schedule:	Prior to construction at all nearby existing curb inlets downstream from any disturbed

	area. Immediately after paving around each new curb inlet.
Description:	
Curb Inlet filters are manufactured filters temporarily placed over/around/in front of the grate and/or curb intake of curb inlet storm sewer structures and are designed to let stormwater flow through the fibrous material while stopping sediment, debris, and trash. Common systems include Sediment logs, Gutterbuddy, Silt-Savers, and InletSoxx. Install per the manufacturer's written instructions. The filter should overlap both sides of the inlet opening by a minimum 12 inches.	
Maintenance & Inspection:	
All filters shall be inspected during routine SWPPP inspections for proper functioning, clogging, sediment build up, structural integrity, and as recommended by the manufacturer. Clean the filters and remove all trash, debris, fluids, and sediment from all units every month minimum, or as recommended by the manufacturer. Trash/debris removed from unit(s) shall be disposed of offsite as legally allowed. Sediment shall be disposed of onsite in non-structural fill areas. All repairs/maintenance shall be done immediately. Complete replacement of the filter may be required if it is clogged.	
Removal Requirements:	Remove when the disturbed area draining to the BMP is stabilized. The area is considered stabilized when perennial vegetation or permanent materials (buildings, pavement, etc) cover all areas that have been disturbed. Vegetative cover shall be at least 70% of fully established density over the entire disturbed area that is to be vegetated. Areas disturbed during removal of the BMP shall be smooth graded and permanently seeded and mulched.

BMP:	**Slope Drains**
Responsible Staff:	
Location:	Where indicated on the civil construction plans.
Installation Schedule:	Per the Sequence of Events on the civil construction plans Cover Sheet.
Description:	
A slope drain is a pipe designed to convey concentrated runoff down the face of a cut or fill slope without causing erosion on the slope face. The area around the pipe inlet can be excavated to function as a small sediment basin. The pipe shall have a stabilized outlet consisting of rip-rap and filter fabric. Install as detailed in the civil construction plans.	
Maintenance & Inspection:	
All slope drains shall be inspected during routine SWPPP inspections for proper functioning, stability, and general condition. Verify the diversion dike along the top of the slope still conveys runoff to the pipe inlet and the pipe is still functioning properly and stable. Inspect the pipe along the slope for signs of movement, piping, leaking or other signs of erosion. If applicable, inspect the sediment basin at the pipe inlet and remove the sediment when it has reached ½ the design depth or as indicated in the civil plans. Verify the stabilized outlet is stable. All sediment removed shall be placed as onsite fill in non structural areas or as directed by the Operator. All repairs/maintenance shall be done immediately.	
Removal Requirements:	Remove when the disturbed area draining to the BMP is stabilized. The area is considered stabilized when perennial vegetation or permanent materials (buildings, pavement, etc) cover all areas that have been disturbed. Vegetative cover shall be at least 70% of fully established density over the entire disturbed area that is to be vegetated. Areas disturbed during removal of the BMP shall be smooth graded and permanently seeded and mulched.

4.6 PERMANENT NON-STRUCTURAL BMPs

BMP:	**Permanent Seeding**
Responsible Staff:	
Location:	All disturbed areas except sodded areas, surfaced areas, solid rock, or areas consisting of primarily broken rock.
Installation Schedule:	Per the Sequence of Events on the civil construction plans Cover Sheet and/or as necessary.

Description:

Permanent seeding is the establishment of perennial vegetation for graded areas that will be undisturbed for longer than 6 months. Permanent seeding and planting shall be performed within 14 days after final grade is reached or within 7 days after final grade is reached if the slope of the area is greater than 3:1 (3 feet horizontal to 1 foot vertical) or if the slope is greater than 3% and greater than 150 feet in length, unless temporary stabilization is applied. Permanent seeding shall be completed per the project specifications or landscape plan. If no specification/plan is provided, the following methods can be applied:

Seedbed Preparation:

For broadcast seeding and drilling, loosen the soil via tilling to a depth of 3 inches. For no-till drilling, the soil does not need to be loosened unless the site has surface compaction. If compacted, till 3 inches deep.

Soil Amendments:

Obtain a minimum of three soil tests from various areas on the site and add fertilizer and lime according to the test results. If soil tests are not available, spread lime evenly at a rate of 92 pounds per 1,000 square feet of area. Spread evenly a 5.5-16-16 fertilizer at a rate of 7 pounds per 1,000 square feet of area. Mix the soil amendments into the top 3 inches of soil.

Seed:

Plant seed ¼ to ½ inch deep or rake in after application. Apply mulch and water immediately after seed application. Water to a depth of 2 inches without causing erosion. Grass seed mixture recommended for use in lawn areas:

Type	% Mix by Weight	Minimum Purity	Minimum Germination	Seeding Rate (lb/acre)
Tall or Turf Fescue (minimum 3 cultivars)	80	98%	90%	150 minimum or as recommended by manufacturer
Annual Rye	20	98%	90%	25 minimum

The percent mixture by weight is for pure live seed (PLS). Weed seed shall not exceed 1.0% by weight of the mix. A seed mix certification shall be approved by the Operator prior to seeding.

Mulch:

All mulch shall consist of clean, bright, plant residues and be free of weed seeds, mold, and rot. No more than 15% of the ground surface shall be visible after mulching. Install per manufacturer's recommendations. Straw mulch shall be applied at a minimum rate of 3,000 lbs/acre.

Planting Dates:

Apply permanent seed and mulch only between the dates of February 1 thru May15 and August 15 thru October 15th. Seeding and mulching outside these dates shall be done according to temporary seeding requirements with reseeding at 50% the permanent seeding rates done during the next allowable permanent seeding planting dates.

Maintenance & Inspection:

All seeded areas shall be inspected during routine SWPPP inspections for erosion, germination, vigorous seedlings, uniform density with at least 70% ground cover, disease, drought stress, and seed wash out. Water 1 inch deep every 7 day stretch with less than ½ inch total rain accumulation until grass is 3 inches tall. Do not mow until grass is 4 inches tall, and then mow at a 3 inch height, minimum. All repairs/maintenance shall be done immediately.

BMP:	**Sodding**
Responsible Staff:	
Location:	Where indicated on the civil construction plans or landscape plans.
Installation Schedule:	Immediately after final grades are achieved and surrounding construction is complete.

Description:

Sodding is the laying of vegetative cover that includes both grass plants and their established root system. Sodding shall be completed per the project specifications or landscape plan. If no specification/plan is provided, the following methods can be applied:

Soil Preparation:

Verify that topsoil have been placed to required thickness and smoothed to finish grades. Loosen the topsoil if it has been compacted by tilling 3 inches deep using small, pneumatic tired equipment that will prevent additional compaction.

Sod:

Sod shall consist of, or a mixture of: turf/tall fescue, Bermuda, Zoysia, or Buffalograss cultivars suitable for the site's climate. Install in staggered rows with offset joints. Lay rows perpendicular to the slope. Tamp or roll all sod immediately after installation to provide root contact with the soil. Water thoroughly to a depth of 2 inches upon installation.

Sodding Dates:

Sodding can be done at any time of the year except when the ground is frozen or there is a ground cover such as snow or ice.

Sodding Dates:

Sodding can be done at any time of the year except when the ground is frozen or there is a ground cover such as snow or ice.

BMP:	**Turf Reinforcement Mats / Erosion Control Blankets**
Responsible Staff:	
Location:	Where indicated on the civil construction plans.
Installation Schedule:	Immediately after completion of topsoil placement and finish grading of the area.

Description:

Permanent turf reinforcement mats control erosion by providing a protective surface cover commonly consisting of straw, coconut, wood, or other plant fibers woven into a plastic, nylon, or cotton net matrix. Install per the manufacturer's written recommendations. Typically permanent grass seed is installed first and the mat is rolled over the seed and then nailed or pinned down. The grass grows up through the mat and the mat and grass work together to prevent surface erosion. Erosion control blankets/mats only function properly if STORMWATER RUNOFF DRAINS OVER THE TOP OF THE BLANKET/MAT. Therefore it is critical that all weeds/vegetation/stumps/etc. be removed and the ground smoothed immediately prior to blanket installation. Then grass seed and fertilizer should be applied followed by the blanket installation as tightly anchored to the ground using adequate staples/pins/anchors.

Maintenance & Inspection:

All blankets shall be inspected during routine SWPPP inspections for proper functioning, stability, and general condition. Inspect for tears, blowouts, erosion, and undermining beneath the blankets. Areas that show erosion shall be repaired by pulling back that portion of the blanket, adding tamped topsoil, reseeding, and resecuring blankets. Blankets that have become dislodged or damaged shall be repaired or replaced and resecured immediately. Trash and debris shall be removed immediately. Vegetation shall be inspected and maintained per the permanent seeding BMP description. All repairs/maintenance shall be done immediately.

4.7 TEMPORARY NON-STRUCTURAL BMPs

BMP:	**Construction Entrance/Exit**
Responsible Staff:	
Location:	Where indicated on the civil construction plans.
Installation Schedule:	Immediately at the start of construction.
Description:	
A temporary rock construction exit is a stone base pad installed to provide an exit area where vehicles can drop the mud and caked soil from their tires to avoid transporting it onto public roads. The mud and dirt that ends up on the street is called "track out" and is the #1 complaint of construction sites. A larger stone should comprise the surface of the exit to vibrate/jar the truck and flex the rubber to encourage mud and soil to drop off. Provide water via a water truck and wash all tires and wheel wells of all vehicles prior to leaving the site. Direct all runoff into a sediment trap set up on the downstream side of the exit pad. Install as detailed in the civil construction plans.	
Maintenance & Inspection:	
All construction exits shall be inspected during routine SWPPP inspections for proper functioning, stability, and general condition. Shovel or wash off the rock surface often to prevent soil build up and clogging of the stone. This may need to be several times a day. If surface becomes smooth or clogged, top-dress with clean 2-3 inch stone immediately. Remove sediment from the sediment trap when it has reached ½ the design depth. All sediment removed shall be placed onsite as fill in non structural areas or as directed by the Operator. All repairs/maintenance shall be done immediately.	
Removal Requirements:	Remove when all disturbed areas are stabilized or all construction vehicles have been permanently demobilized. The area is considered stabilized when perennial vegetation or permanent materials (buildings, pavement, etc) cover all areas that have been disturbed. Vegetative cover shall be at least 70% of fully established density over the entire disturbed area that is to be vegetated. Areas disturbed during removal of the BMP shall be smooth graded and permanently seeded and mulched.

BMP:	**Pavement/Curb & Gutter Sweeping**
Responsible Staff:	
Location:	Where necessary.
Description:	
Pavement/curb & gutter sweeping involves picking up and removing all trash, debris, and sediment from onsite land disturbance activities that has accumulated on all public and private paved surfaces near the project site. This can be done by hand via broom, or via mechanical street sweeping and vacuum machines. The sediment shall be picked up and disposed of as onsite fill, it shall not be washed off the pavement into storm sewers or other drainage ways via pressure washing or water trucks.	
Maintenance & Inspection:	
All onsite and nearby offsite paved surfaces shall be inspected during routine SWPPP inspections for trash, debris, and sediment deposition on the surface. All sediment shall be removed immediately. The cause of the trash, debris, and/or sediment deposition shall be identified and immediately corrected.	

BMP:	**Temporary Seeding**
Responsible Staff:	
Location:	Where required/necessary during the construction process.
Installation Schedule:	As required or necessary.

Description:

Temporary seeding is the establishment of fast-growing annual vegetation on disturbed areas to provide erosion control for up to 6 months. This BMP applies where short-lived vegetation needs to be established before final grading or in a season not suitable for permanent seeding. If an area is expected to be undisturbed for longer than 6 months, permanent perennial vegetation shall be used. Temporary seeding and planting shall be performed within 14 days after grading operations cease or within 7 days after final grade is reached if the slope of the area is greater than 3:1 (3 feet horizontal to 1 foot vertical) or if the slope is greater than 3% and greater than 150 feet in length. Temporary seeding shall be completed per the project specifications or landscape plan. If no specification/plan is provided, the following methods can be applied:

Seedbed Preparation:

Loosen the soil via tilling to a depth of 3 inches.

Soil Amendments:

Obtain a minimum of three soil tests from various areas on the site and add fertilizer and lime according to the test results. If soil tests are not available, spread lime evenly at a rate of 69 pounds per 1,000 square feet of area. Spread evenly a 5.5-16-16 fertilizer at a rate of 6 pounds per 1,000 square feet of area. Mix the soil amendments into the top 3 inches of soil.

Seed:

Plant small grains no more than 1 ½ inches deep. Plant grasses and legumes ¼ to ½ inch deep or rake in after application. Apply mulch and water immediately after seed application. Water to a depth of 2 inches without causing erosion. Seed mixture can be any combination of the following:

Species	Seeding Rate	
	lbs. per Acre	lbs./1,000 square feet
Oats	80	2
Cereals: Rye/Wheat	90-120	2-2.5
Millets, Sudangrass	45-60	1-1.25
Annual Ryegrass	75	2
Annual Lespedeza plus Tall Fescue	15 plus 45	0.5 plus 1

Mulch:

All mulch shall consist of clean, bright, plant residues and be free of weed seeds, mold, and rot. No more than 15% of the ground surface shall be visible after mulching. Install per manufacturer's recommendations. Straw mulch shall be applied at a minimum rate of 3,000 lbs/acre.

Planting Dates:

Apply temporary seed and mulch any time of the year, but do not apply on frozen, ice or snow covered ground.

Maintenance & Inspection:

All seeded areas shall be inspected during routine SWPPP inspections for erosion, germination, vigorous seedlings, uniform density with at least 70% ground cover, disease, drought stress, and seed wash out. Reseed and mulch as necessary. Water when dry. Do not mow or only mow after 6 inches tall and then mow at a 4 inch height, minimum. All repairs/maintenance shall be done immediately.

Removal Requirements:	Remove when the area is ready to be disturbed again.

BMP:	**Temporary Erosion Control Blankets**
Responsible Staff:	
Location:	Where indicated on the civil construction plans.
Installation Schedule:	Immediately after the application area is finish graded.

Description:

Temporary erosion control blankets control erosion by providing a protective surface cover commonly consisting of straw, coconut, wood, or other plant fibers woven into a plastic, nylon, or cotton net matrix. They can also consist of photodegradable netting. Install per the manufacturer's written recommendations. Typically, permanent grass

seed is installed and the mat is rolled over the seed and nailed or pinned down. The grass grows up through the mat and the mat and grass work together to prevent surface erosion for a limited period of time. Eventually the plant fibers in the mat decay and/or the net matrix breaks down typically via the sun's UV rays. By this time, the grass should be fully established, providing the necessary erosion control. Erosion control blankets only function properly if STORMWATER RUNOFF DRAINS OVER THE TOP OF THE BLANKET. Therefore it is critical that all weeds/vegetation/stumps/etc. be removed and the ground smoothed immediately prior to blanket installation. Then grass and fertilizer should be applied followed by the blanket installation as tightly anchored to the ground using adequate staples/pins/anchors.
Maintenance & Inspection:
All blankets shall be inspected during routine SWPPP inspections for proper functioning, stability, and general condition. Inspect for tears, blowouts, erosion, and undermining beneath the blankets. Areas that show erosion shall be repaired by pulling back that portion of the blanket, adding tamped topsoil, reseeding, and resecuring the blankets. Blankets that have become dislodged or damaged shall be repaired or replaced and resecured immediately. Trash and debris shall be removed immediately. Vegetation shall be inspected and maintained per the permanent seeding BMP description. All repairs/maintenance shall be done immediately.

Removal Requirements:	Should be none. If still onsite at the end of the blanket lifespan, verify it is breaking down and is not exposed to possibly get caught in mowing equipment. Repair as necessary.

BMP:	**Soil Roughening**
Responsible Staff:	
Location:	All disturbed slopes 3:1 or steeper.
Installation Schedule:	Immediately after applicable slope has reached plan grade.

Description:
Surface roughening are practices that roughen a slope surface to reduce surface runoff velocities, therefore minimizing soil erosion and sedimentation during construction. Either track walking with a dozer up and down the slope (NOT parallel or along the slope) or using a sheep's foot roller to create minimum 1" dimples are acceptable practices. Immediately after completion of roughening, stabilize the surface via vegetation establishment, rip-rap, or however indicated in the construction plans. Do no roughen with finish grading.
Maintenance & Inspection:
All roughening shall be inspected during routine SWPPP inspections for proper functioning, stability, and general condition. Inspect for erosion. Areas that show erosion shall be repaired immediately. Trash and debris shall be removed immediately. Vegetation shall be inspected and maintained per the permanent or temporary seeding BMP description. All repairs/maintenance shall be done immediately.

Removal Requirements:	None.

BMP:	**Tackifiers and Binders**
Responsible Staff:	
Location:	All permanent and temporary seeded areas.
Installation Schedule:	Immediately after topsoil is placed and final grades are achieved.

Description:
Tackifiers and binders are substances mixed with seed, straw, hay, wood, and/or paper mulch and applied via a sprayed slurry. They cause organic material to bind together, anchoring the seed and mulch to minimize or prevent movement of the material during rain or watering events. They also hold moisture to improve seed germination and survival. They are typically applied via hydroseeding or hydromulching techniques.
Maintenance & Inspection:
All tackifiers and binder applications shall be inspected during routine SWPPP inspections for proper functioning,

stability, and general condition. Inspect to verify it is functioning as intended. Inspect and repair as necessary to ensure intended function. All repairs/modifications shall be made immediately.	
Removal Requirements:	None.

BMP:	**Dust Control & Air Emissions**
Responsible Staff:	
Location:	Where necessary based on current site conditions.
Installation Schedule:	Immediately when current site conditions warrant.
Description:	
Open burning will only be allowed per state and local regulations. Contractor is responsible for obtaining all necessary burning permits. In Missouri, state regulation places a limit on the amount of visible dust that can leave a property boundary. For more information research state regulation 10 CSR 10-6.170. Minimize wind erosion and control dust via the following methods: 1. Cover 30% or more of disturbed surface with non-erodible material. 2. Roughening the disturbed areas to produce ridges perpendicular to the prevailing wind. Ridges should be about six (6) inches in height. 3. Frequent watering of disturbed areas.	
Maintenance & Inspection:	
All dust control shall be inspected during routine SWPPP inspections for proper functioning, stability, and general condition. Verify onsite dust creation is below state and local requirements.	

4.8 ADDITIONAL BMPS

BMP:	**Stormwater Outfalls**
Responsible Staff:	
Location:	Where shown on the construction plans. Contractor shall redline on the SWPPP site maps for clarity.
Installation Schedule:	
Description:	
Stormwater outfalls are all points where stormwater drains away from the outer limits of the project area. These can be swales, creeks, or rivers, or storm sewers that daylight with a flared end section/headwall/end or pipe.	
Maintenance & Inspection:	
All stormwater outfalls and 50 feet downstream shall be inspected during routine SWPPP inspections for proper functioning, stability, erosion, sediment disposition, and general condition. All repairs/maintenance shall be done immediately.	

BMP:	**Retaining Walls**
Responsible Staff:	
Location:	Where shown on the construction plans.
Installation Schedule:	
Description:	
The reinforced concrete or modular block retaining walls and all associated items (walls, underdrains, etc) per the	

construction plans.
Maintenance & Inspection:
All retaining walls and associated items shall be inspected during routine SWPPP inspections for proper functioning, stability, cracks, undercutting of foundation, piping erosion, wetness or movement, and general condition. Repair according to wall design engineer and/or manufacturer's recommendations. Perform all repairs immediately.

BMP:	**Management of Excavation Spoil Materials**
Responsible Staff:	
Location:	Out of the way of construction areas.
Installation Schedule:	
Description:	
Excavation spoil materials result from localized grading that occurs during mass grading for footings, docks/truckwells, utility trenches, geowells, etc. These materials must be properly managed to prevent them from contributing to storm water discharges. The materials generated from the development of this project shall be managed by the following method: mixed with on-site fill, hauled off-site. If they must be temporarily stockpiled, they shall be placed where all storm water runoff will drain to a BMP and temporarily seeded and mulched immediately after construction.	
Maintenance & Inspection:	
All excavation spoil materials shall be inspected during routine SWPPP inspections for proper functioning, stability, erosion, and general condition. Verify all stockpiles drain to properly functioning BMPs and no untreated storm water runoff is occurring. All repairs/maintenance shall be done immediately.	

BMP:	**Dewatering (if necessary)**
Responsible Staff:	
Location:	
Installation Schedule:	
Description:	
Dewatering operations from footing/trench/etc. excavations shall not be discharged offsite without treatment. Turbid dewatering discharge shall be directed to another BMP to allow filtering or settling prior to discharging offsite. *(below to be filled in by Contractor)* Dewatering Methods: Dewatering Maximum Flow: GPM: BMP(s) Dewatering Will be Directed To:	
Maintenance & Inspection:	
All dewatering operations shall be inspected during routine SWPPP inspections for proper functioning, stability, erosion, and general condition. Verify all dewatering discharge drains to properly functioning BMP(s) and no untreated storm water runoff is occurring. Verify the BMP(s) are properly handling the amount of dewatering discharge they are receiving. All repairs/maintenance shall be done immediately.	

SECTION 5: GOOD HOUSEKEEPING BMPS

5.1 MATERIAL HANDLING AND WASTE MANAGEMENT

Substances regulated by federal law under the Resource Conservation and Recovery Act (RCRA) or the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) which are transported, stored or used for maintenance, cleaning or repairs shall be managed according to the provisions of RCRA and CERCLA.

The following materials or substances with known hazardous properties are expected to be present onsite during construction:

Concrete/Additives/Wastes
Detergents
Paints/Solvents
Acids
Solids and construction wastes
Soil stabilization additives
Cleaning solvents
Petroleum based products
Pesticides
Fertilizers
Sanitary wastes

All paints, solvents, petroleum products and petroleum waste products (except fuels) and storage containers (such as drums, cans or cartons) shall be stored such that these materials are not exposed to storm water. Sufficient practices of spill prevention, control and/or management shall be provided to prevent any spills of these pollutants from entering a water of the state. Any containment system used to implement this requirement shall be constructed of materials compatible with the substances contained and shall also prevent the contamination of groundwater. The following are the material management practices that shall be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff. The jobsite superintendent shall be responsible for ensuring that these procedures are followed.

a) Good Housekeeping

The following good housekeeping practices shall be followed onsite during the construction project.

(i) An effort shall be made to store only enough products required to do the job.
(ii) All materials stored onsite shall be stored in a neat, orderly manner and, if possible, under a roof or in a containment area. At a minimum, all containers shall be stored with their lids on when not in use. Drip pans shall be provided under all dispensers.
(iii) Products shall be kept in their original containers with the original manufacturer's label in legible condition.
(iv) Substances shall not be mixed with one another unless recommended by the manufacturer.
(v) Whenever possible, all of a product shall be used up before disposing of the container.
(vi) Manufacturer's recommendations for proper use and disposal shall be followed.
(vii) The job site superintendent shall be responsible for daily inspections to ensure proper use and disposal of materials.
(viii) Fertilizers shall be applied in the minimum amounts recommended by the manufacturer.
(ix) All paint containers shall be tightly sealed and stored when not required for use. Excess paint shall not be dumped into the storm sewer system but shall be properly disposed of according to manufacturer’s instructions and State regulations.

b) Hazardous Products

These practices shall be used to reduce the risks associated with hazardous materials. Material Safety Data Sheets (MSDS’s) for each substance with hazardous properties that is used on the job site shall be obtained and used for the proper management of potential wastes that may result from these products. An MSDS shall be posted in the immediate area where such product is stored and/or used and another copy of each MSDS shall be maintained in the SWPPP file at the job site construction trailer office. Each employee who must handle a substance with hazardous properties shall be instructed on the use of MSDS sheets and the

specific information in the applicable MSDS for the product he/she is using, particularly regarding spill control techniques.

(i) Products shall be kept in original containers with the original labels in legible condition.
(ii) Original labels and material safety data sheets (MSDS's) shall be procured and used for each material.
(iii) If surplus product must be disposed of, manufacturer's or local/state/federal recommended methods for proper disposal shall be followed.

c) Hazardous Waste

All hazardous waste materials shall be disposed of by the Contractor in the manner specified by local, state, and/or federal regulations and by the manufacturer of such products. Site personnel shall be instructed in these practices by the job superintendent, who shall be responsible for seeing that these practices are followed.

d) Product Specific Practices

The following product specific practices shall be followed on the job site.

(i) Petroleum Products

All onsite vehicles shall be monitored for leaks and receive regular preventative maintenance to reduce the chance of leakage. Petroleum products shall be stored in tightly sealed containers that are clearly labeled. Any petroleum storage tanks used onsite shall have an impervious dike or berm containment structure constructed around it to contain any spills which may occur. Drip pans shall be provided for all dispensers. Any asphalt substances used onsite shall be applied according to the manufacturer's recommendations. The location of any fuel tanks and/or equipment storage areas shall be identified on the SWPPP maps by the Contractor once the locations have been determined.

(ii) Fertilizers

Fertilizers shall be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer shall be worked in the soil to limit exposure to stormwater. Storage shall be in a covered shed. The contents of any partially used bags of fertilizer shall be transferred to a sealable plastic bin to avoid spills.

(iii) Paints, Paint Solvents, and Cleaning Solvents

All containers shall be tightly sealed and stored when not in use. Excess paint and solvents shall not be discharged to the storm sewer system but shall be properly disposed of according to manufacturer's instructions or state and federal regulations.

BMP:	**Construction Waste Materials Containment**
Responsible Staff:	
Location:	
Installation Schedule:	
Description:	
All non hazardous waste materials shall be collected and stored in an appropriately covered container and/or securely lidded metal dumpster rented from a local waste management company which must be a solid waste management company licensed to do business in the project area. The dumpster shall comply with all local and state solid waste management regulations.	

All trash and construction debris from the site shall be deposited in the dumpster. The dumpster shall be emptied a minimum of twice per week or more often if necessary, and the trash shall be hauled to a landfill approved by the state for legal disposal offsite. No construction waste or trash materials of any kind shall be buried on site. All personnel shall be instructed regarding the correct procedures for waste disposal.

All waste dumpsters and roll-off containers shall be located in an area where the likelihood of the containers contributing to storm water discharges is negligible. If required, additional BMPs shall be implemented, such as sandbags around the base, to prevent wastes from contributing to storm water discharges. The location of waste dumpsters and roll-off containers shall be identified on the SWPPP maps by the Contractor once the locations have been determined.

Maintenance & Inspection:	
All dumpsters and/or other waste storage areas shall be inspected during routine SWPPP inspections for proper functioning, stability, and general condition. Dumpsters shall be emptied before trash accumulation prevents complete closure of the lid(s). If trash and construction debris are exceeding the dumpster capacity more dumpsters shall be provided or they shall be emptied more often.	
Removal Requirements:	Remove when all waste contributing construction is complete.

BMP:	**Sanitary Facilities**
Responsible Staff:	
Location:	
Installation Schedule:	

Description:	
Temporary sanitary facilities (portable toilets) shall be provided by a licensed portable facility provider in complete compliance with local and state regulation. Facilities shall be sized to accommodate the maximum anticipated work force on any given day. Facilities shall be property anchored to prevent tip over or other uncontrolled movement. All sanitary facilities shall be located in an area where the likelihood of the unit contributing to storm water discharges is negligible. The location of sanitary facilities shall be identified on the SWPPP maps by the Contractor once the locations have been determined.	
Maintenance & Inspection:	
All sanitary facilities shall be inspected during routine SWPPP inspections for proper functioning, stability, and general condition. Sanitary facilities shall be regularly emptied, serviced and repaired. Sanitary waste shall be disposed per all applicable state and local requirements.	
Removal Requirements:	Remove when construction is complete and all construction staff has left the site or when other onsite sanitary facilities are available and permission for their use by construction staff is approved by the Operator.

BMP:	**Hazardous Waste Containment**
Responsible Staff:	
Location:	
Installation Schedule:	

Description:
All hazardous waste materials such as oil filters, petroleum products, paint, and equipment maintenance fluids shall be stored in structurally sound and sealed containers in a designated hazardous materials storage area and segregated from other non-waste materials. Additionally, all hazardous material will be disposed of in accordance

with federal, state, and local regulations. Hazardous waste materials shall not be disposed of into on-site dumpsters.	
Maintenance & Inspection:	
All hazardous storage areas shall be inspected during routine SWPPP inspections for proper functioning, stability, and general condition. The storage areas shall be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Material safety data sheets, material inventory, and emergency contact numbers shall be maintained in the office trailer or other clearly designated area.	
Removal Requirements:	Remove when all hazardous waste contributing construction is complete.

5.2 ESTABLISH PROPER BUILDING MATERIAL STAGING AREAS

BMP:	**Staging Area**
Responsible Staff:	
Location:	
Installation Schedule:	
Description:	
Construction equipment and materials shall be stored at a designed staging area. The staging area is typically located in a proposed parking area and shall consist of an all-weather granular surface that will also be the granular base for the parking lot pavement. The location of all staging areas shall be redlined on the SWPPP maps. Storm water shall be directed away from the staging area.	
Maintenance & Inspection:	
All staging areas shall be inspected during routine SWPPP inspections for proper functioning, stability, and general condition. The staging area(s) shall be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners shall be repaired or replaced as needed to maintain proper function. The granular surface shall be kept clean and inspected for signs of settlement or rutting. All repairs shall be made immediately.	
Removal Requirements:	Remove when all construction materials have been removed and the storage of construction equipment is no longer necessary.

5.3 DESIGNATE WASHOUT AREAS

BMP:	**Concrete Washout Area**
Responsible Staff:	
Location:	Where indicated on the civil construction plans & where necessary to contain all concrete waste and wash water.
Installation Schedule:	After grading and before any infrastructure in constructed.
Description:	
Concrete trucks shall only be allowed to wash out or discharge surplus concrete and wash water in specifically designated areas which have been prepared to prevent contact between the concrete, wash water, and stormwater runoff from the site. The washout may be constructed by creating an aboveground storage area a minimum 10’ x 10’ x 2’ deep from straw bales or sandbags double lined with a10 mil minimum polyethylene sheeting. Washout areas may also be prefabricated units brought to the site to be emptied when full by the company providing the unit. They may also be constructed either by digging a minimum 10’ x 10’ pit 1’ deep and surrounding it with an earthen dike a minimum 1’ tall to give it a total depth of 2’ and lining it with minimum 10 mil polyethylene sheeting. The washout shall be constructed so all stormwater is directed away from the washout area. Size according to anticipated concrete waste produced. The project may require the use of multiple concrete washout areas. All	

concrete washout areas shall be located a minimum 50’ from any stormwater conveyance like a storm sewer or swale and a minimum 100’ from any natural water body like a stream, pond, or lake. Temporary weatherproof signage that says “CONCRETE WASHOUT” in a manner clearly visible by construction truck drivers while driving onsite shall be placed next to each washout. The contractor shall be responsible for coordinating and enforcing proper use of the washout by all construction personnel. The hardened material from the washout(s) shall be hauled offsite and disposed of in the same manner as other non-hazardous construction waste materials or may be broken up and used on site as deemed appropriate by the Contractor and approved by the Operator. Disposal shall be per all applicable solid waste regulations.
Maintenance & Inspection:
All washouts shall be inspected daily to ensure all concrete washing is being discharged into the washout(s), no tears or leaks are present, and to identify when concrete waste needs to be removed. Inspect all signage to ensure it is in good condition and is still legible by all drivers. Remove all concrete waste when it has reached 75% of the storage capacity of the washout. The plastic lining shall be replaced if it is damaged during concrete waste removal. Inspect to verify that no storm water runoff is capable of draining into the washout. All repairs shall be made immediately.

Removal Requirements:	Remove when all concrete construction is complete.

5.4 ESTABLISH PROPER EQUIPMENT/VEHICLE FUELING AND MAINTENANCE PRACTICES

BMP:	**Vehicle/Equipment Fueling and Maintenance**
Responsible Staff:	
Location:	
Installation Schedule:	

Description:
Only minor equipment maintenance shall occur onsite. All major equipment/vehicle maintenance shall be performed off-site. Vehicle/equipment maintenance and fueling area(s) shall be clearly marked and be kept clean and dry. A spill kit shall be kept nearby. Drip pans, drip clothes, or absorbent pads shall be used when replacing spent fluids. Spent fluids shall be collected and stored in appropriate labeled containers in the proper storage areas. Recycle fluids whenever possible. Dispose of fuels, oils, lubricants, solvents, and other hazardous materials offsite per federal, state and local requirements. Petroleum products shall be stored in tightly sealed containers which are clearly labeled. No fueling, servicing, maintenance, or repair of equipment or machinery shall be done within 50 feet of a stormwater drainage way, or within 100 feet of a classified stream, lake/pond, losing stream, or sinkhole.
Maintenance & Inspection:
All equipment/vehicle fueling and maintenance facilities shall be inspected during routine SWPPP inspections for proper functioning, usage, and general condition. Vehicles and equipment shall be inspected on each day of use. Leaks shall be repaired immediately. Any problem vehicle(s) or equipment shall be removed from the project site. Inspect to verify there is an ample supply of spill-cleanup materials onsite.

Removal Requirements:	Remove when the need for construction vehicles onsite is no longer necessary.

5.5 CONTROL EQUIPMENT/VEHICLE WASHING

All equipment/vehicle washing not related to dirt/mud removal at the construction entrance/exit BMP shall be done offsite.

5.6 SPILL PREVENTION AND CONTROL PLAN

BMP:	**Spill Prevention and Response Procedures**
Responsible Staff:	
Spill Prevention & Response Coordinator:	
Installation Schedule:	Training will begin prior to the start of project construction. All other procedures shall begin with the start of project construction.

Description:

All onsite personnel shall be trained in the spill prevention, proper handling, and cleanup procedures of spilled materials. No spilled hazardous materials or hazardous wastes shall be allowed to come in contact with storm water discharges. If such contact occurs, the storm water discharge shall be contained on site until appropriate measures in compliance with state and federal regulations are taken to dispose of the contaminated storm water.

Report to the Operator, Engineer, local Fire Department, Joint Communications, local Sheriff's Department, City of Lee's Summit, MDNR, and EPA any noncompliance with the SWPPP that will endanger public health or the environment. Also, if the spill contains a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under 40CFR110, 40CFR117, and 40CFR302, follow the directions on the Reportable Quantity Release Form which can be found in Appendix M. Any information shall be provided orally immediately after the Contractor becomes aware of the circumstances. A written submission shall also be provided to Engineer, Owner, City of Lee's Summit Public Works, MDNR, and EPA within five (5) days of the time the Contractor becomes aware of the circumstances. The following events require immediate verbal: a) any unanticipated bypass which exceeds any effluent limitation in the permit, b) any upset which exceeds any effluent limitation in the permit, and c) a violation of a maximum daily discharge limitation for any of the pollutants listed by the MDNR in the permit. The written submission shall contain a description of the non-compliance and its cause; the period of non-compliance, including exact dates and times, and if the non-compliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the non-compliance.

a) In order to minimize the potential for a spill of hazardous materials to come into contact with storm water, the following steps shall be implemented:

   (i) All materials with hazardous properties (such as pesticides, petroleum products, fertilizers, detergents, construction chemicals, acids, paints, paint solvents, cleaning solvents, additives for soil stabilization, concrete curing compounds and additives, etc.) shall be stored in a secure location, with their lids on, preferably under cover, when not in use.

   (ii) The minimum practical quantity of all such materials shall be kept on the job site.

   (iii) A spill control and containment kit (containing, for example, absorbent materials, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) shall be provided at the storage site.

   (iv) Manufacturer's recommended methods for spill cleanup shall be clearly posted and site personnel shall be trained regarding these procedures and the location of the information and cleanup supplies.

b) In the event of a spill, the following procedures shall be followed:

   (i) All spills shall be cleaned up immediately after discovery.

   (ii) The spill area shall be kept well ventilated and personnel shall wear appropriate protective clothing to prevent injury from contact with the hazardous substances.

(iii) The project manager and the Engineer of Record shall be notified immediately.

(iv) Spills of toxic or hazardous materials shall be reported to the appropriate federal, state, and/or local government agency, regardless of the size of the spill. Spills of amounts that exceed Reportable Quantities of certain substances specifically mentioned in federal regulations (40 CFR 110, 40 CFR 117, and 40 CFR 302) shall be immediately reported to the EPA National Response Center, telephone 1-800-424-8802. Contact the Operator, Engineer, local Fire Department, Joint Communications, local Sheriff's Department, City of Lee's Summit Public Works, MDNR, and EPA immediately after the onset of a "hazardous condition". The applicant shall notify by telephone and in writing the Department of Natural Resources, Water Pollution Control Program, Post Office Box 176, Jefferson City, MO 65102, 1-800-361-4827, of any oil spills or if hazardous substances are found during the prosecution of work under this permit.

(v) If the spill exceeds a Reportable Quantity, the SWPPP shall be modified within seven (7) calendar days of knowledge of the discharge to provide a description of the release, the circumstances leading to the release, and the date of the release, the plans shall identify measures to prevent the recurrence of such releases and to respond to such releases. The Reportable Quantity Release form located in Appendix M shall be completed in accordance with this requirement.

c) The Spill Prevention and Response Coordinator shall designate the individuals who shall receive spill prevention and response training. These individuals shall each become responsible for a particular phase of prevention and response. The names of these personnel shall be posted in the material storage area and in the office trailer/construction headquarters onsite.

BMP:	**Soil Contamination**
Responsible Staff:	
Spill Prevention & Response Coordinator:	
Installation Schedule:	Training will begin prior to the start of project construction. All other procedures shall begin with the start of project construction.
Description:	
Soil contamination is either solid or liquid hazardous substances mixed with the naturally occurring soil. Soil contamination results when hazardous substances are either spilled or buried directly in the soil or migrate to the soil from a spill that has occurred elsewhere. Soil contamination is typically identified in the field via visual and/or odor means. No soil contamination is known to exist on the site pre construction. If it is suspected contaminated soil has been discovered onsite or if soil contamination occurs resulting from spills of materials with hazardous properties the Operator shall be immediately notified. Immediate contamination procedures per federal, state, and local requirements shall be implemented by the Contractor. A plan to permanently mitigate the contaminated soil shall be developed by the Contractor and Operator that adheres to all federal, state, and local requirements. The plan shall be implemented by the Contractor.	

5.7 ANY ADDITIONAL BMPS

None.

5.8 ALLOWABLE NON-STORMWATER DISCHARGE MANAGEMENT

Certain non-stormwater discharges are allowed under the Missouri State Operating Permit – General Operating Permit for land disturbance, and it is the intent of this SWPPP to allow such discharges. These types of discharges

shall be allowed under the conditions that no pollutants shall be allowed to come in contact with the discharge water prior to or after its discharge. The control measures which have been outlined previously in this SWPPP shall be strictly followed to ensure that no contamination of these non-stormwater discharges takes place. The following allowable non-stormwater discharges which may occur from the job site include:

a) Discharges from firefighting activities
b) Fire hydrant flushing (see note below)
c) Waters used to wash vehicles where detergents are not used
d) Waters used to control dust. Water used in fashion shall only be applied so there is no site runoff.
e) Potable water sources such as waterline flushing (see note below), landscape irrigation, routine exterior building wash down that does not use detergent (see note below)
f) Pavement wash waters where spills or leaks of hazardous materials have not occurred or detergents have not been used
g) Air conditioning condensate
h) Springs and other uncontaminated groundwater, including dewatering ground water infiltration
i) Foundation or footing drains where no contamination with process materials such as solvents is present

NOTE: The Contractor shall neutralize any super-chlorinated water from water distribution pipes before releasing it into the environment. Neutralization techniques are available from the Operator's Engineer.

SECTION 6: INSPECTIONS

6.1 ROUTINE INSPECTIONS

Routine inspections are required at least once every seven (7) calendar days and within 24 hours following a rainfall event that produces runoff. Particular BMP inspection details are included in Sections 4 and 5 of this SWPPP. Written documentation in the form of inspection reports and redlined SWPPP maps must be kept on file with the SWPPP at the jobsite and made available to the Operator, Operator's engineer, USEPA, state and local agencies that have issued land disturbance permits, and any other agency with regulatory authority over stormwater. Inspection report forms are included in Appendix H. In addition, copies of the reports shall be provided by the Contractor to any of these persons, upon request, via mail, email, or facsimile transmission. Also included in Appendix H is a Recommended Inspection Sequence for informational purposes only. Additional inspection requirements are given in the permits in Appendix A.

It is encouraged to take photos during inspections, print them out, and keep them on file with the corresponding inspection report with the onsite SWPPP.

6.2 NON ROUTINE/SPOT INSPECTIONS

High use or high maintenance BMPs (typically construction entrance/exit, street sweeping, trash dumpsters, etc.) should be inspected on a daily basis or as deemed necessary to verify they are functioning properly. Weather reports should be monitored and inspections should take place before large storm events to ensure all BMPs are fully operational before the storm event occurs. Inspect some BMPs during rain events to ensure they are keeping sediment onsite.

6.3 FINAL STABILIZATION

Inspection workload can be reduced by defining certain areas onsite as achieving final stabilization. Final stabilization is defined as when 70% permanent vegetation or permanent materials (buildings, pavement, etc) cover all disturbed areas within the defined area. Once final stabilization is achieved, these areas can me marked on the SWPPP map(s) and inspections can discontinue in these areas only.

6.4 BMP INSPECTORS

A BMP inspection is only as good as the inspector. Therefore it is important that designated inspectors/responsible

parties be qualified, trained personnel. Personnel selected to conduct inspections should be knowledgeable in the principles and practices of erosion and sediment controls, possess the technical skills to assess conditions at the construction site that could impact stormwater quality, and assess the effectiveness of any sediment and erosion control measures selected.

6.5 DESIGNATED INSPECTORS

(to be filled in by Contractor after award of contract, make copies of this form as necessary)

Name: _____ Position: _____

Company Name: _____

Company Address: _____

_____

Inspector Cell Phone: _____ Email: _____

Qualifications: _____

_____

_____

Name: _____ Position: _____

Company Name: _____

Company Address: _____

_____

Inspector Cell Phone: _____ Email: _____

Qualifications: _____

_____

_____

Name: _____ Position: _____

Company Name: _____

Company Address: _____

_____

Inspector Cell Phone: _____ Email: _____

Qualifications: _____

Name: _____ Position: _____

Company Name: _____

Company Address: _____

_____

Inspector Cell Phone: _____ Email: _____

Qualifications: _____

_____

_____

SECTION 7: RECORDKEEPING AND TRAINING

7.1 RECORDKEEPING

The following is a list of records you should keep at your project site bound with the SWPPP and available for inspectors to review:

1. Maintain Copies of Permits and Forms, including:
   - ☐ State Land Disturbance Permit (Appendix A)
   - ☐ Local Land Disturbance Permit - if required (Appendix A)
   - ☐ Notice of Intent (NOI)/Land Disturbance Permit Applications (Appendix B)

2. Certification Records, including:
   - ☐ Authorized Representative Designation (Appendix C)
   - ☐ Authorized Representative Certification (Appendix D)
   - ☐ Subcontractors Certification (Appendix F)

3. Maintain Records of Construction Activities, including:
   - ☐ Implementation Schedule (Appendix G)
   - ☐ Dates & locations when major grading activities occur (see below)
   - ☐ Dates when construction activities temporarily cease on a portion of the site (see below)
   - ☐ Dates when construction activities permanently cease on a portion of the site (see below)
   - ☐ Dates when stabilization measures are initiated on the site (see below)
   - ☐ SWPPP maps showing the location and dates of installation of structural and non-structural BMPs (Section 3.13)
   - ☐ SWPPP maps showing the location and dates of installation of good housekeeping BMPs (Section 3.13)

- ☐ Dates of rainfall and the amount of rainfall (Appendix N)
- ☐ Records of reports filed with regulatory agencies if reportable quantities of hazardous materials spilled (Appendix M)

4. Maintain Inspection & Maintenance Records, including:
   - ☐ Inspection Reports (Appendix H)
   - ☐ SWPPP Amendment Report Form (Appendix I)
   - ☐ Overall SWPPP Amendment Log (Appendix I)

5. General Required Records, including:
   - ☐ List of Subcontractors (Appendix E)
   - ☐ Record Of Personnel Training Activities Form (Appendix L)
   - ☐ TMDL Documentation (303d Impaired Waterway) (Appendix P)
   - ☐ Endangered Species/Critical Habitat Documentation (Appendix Q)
   - ☐ Jurisdictional Wetlands and/or Surface Water Documentation (Appendix R)

6. Termination Records, including:
   - ☐ Notice of Termination from state (Appendix O) (if applicable)
   - ☐ Notice of Termination from Local Authority (Appendix O) (if applicable)
   - ☐ Final Stabilization/Termination Checklist (Appendix O)

7. Additional Required Records, including:
   - ☐ _____
   - ☐ _____
   - ☐ _____
   - ☐ _____

Date(s) & location(s) when major grading activities occur: _____

_____

_____

_____

_____

Date(s), location(s), & reason(s) when construction activities temporarily cease on a portion of the site: _____

_____

_____

Date(s) & location(s) when construction activities permanently cease on a portion of the site: _____

Date(s) & area(s) when an area is either temporarily or permanently stabilized (indicate temporary or permanent): ___

Upon termination of the land disturbance permit, the Contractor shall turn over all SWPP documentation and maps to the Operator. Inspection and maintenance report forms are to be maintained by the Operator for three years following the final stabilization of the site.

7.2 LOG OF CHANGES TO THE SWPPP

The SWPPP is meant to be a dynamic working guide that is to be kept current, effective, and functional in meeting its objectives at all times. Unforeseen or unexpected circumstances can require modification and amendment to the SWPPP. The SWPPP shall be amended whenever there is a change in design, construction, operation, or maintenance at the construction site that has a significant effect on the discharge of pollutants to the waters of the United States that has not been previously addressed in the SWPPP, if inspections or investigations by site staff, local, state, or federal officials determine that discharges are causing water quality exceedances or the SWPPP is ineffective in eliminating or significantly minimizing pollutants in storm water discharges from the construction site, or based on the results of an inspection, or there is a release containing a Hazardous Substance, or Oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Part 110, 40 CFR Part 117, or 40 CFR Part 302 occurs during a 24 hour period, the SWPPP shall be modified to include additional or modified BMPs designed to correct identified problems. Revisions shall be completed within seven (7) calendar days following the inspection. Modifications that are the result of inspections shall be initiated within 24 hours and completed within 48 hours. The Contractor shall be responsible for SWPPP modifications/amendments whenever the following occurs:

a) Addition of new BMP(s) or replacement of failing or failed BMP(s).
b) Design, operation, inspection, or maintenance of BMP(s) is changed.
c) Design/scope/schedule of the construction project is changed that could affect the quality of storm water discharges.
d) Updates/revisions to site maps/plans.
e) Inspections indicate deficiencies in the SWPPP or any BMP.
f) Changes in Operator, contractor(s), subcontractor(s) or other personnel.
g) Federal, state, or local authorities notify the Operator/permittee/contractor in writing of deficiencies found onsite regarding stormwater control.
h) SWPPP is determined to be ineffective in significantly minimizing or controlling erosion and sedimentation (e.g., excessive site erosion or excessive sediment deposits downstream of any stormwater outfall, etc.).
i) If Total Settleable Solids (TSS) from a storm water outfall exceed the amount as defined in the operating permit.

j) Federal, state, or local authorities determine violations of Water Quality Standards may occur or have occurred.

Any such changes to the SWPPP must be made in writing and signed and dated by the Contractor's representative. A form has been provided in Appendix I for this purpose. Modifications of the SWPPP BMPs shall be indicated via redlines on the SWPPP maps. The SWPPP must also be amended to identify any new contractor and/or subcontractor that will be responsible for any aspect of the SWPPP. Notification of any modifications or amendments to the SWPPP must be made in writing to both the Operator and the Operator's Engineer within 7 days of the date such modification or amendment is made.

An overall log of SWPPP amendments shall be kept and included with the onsite SWPPP. An amendment log is included in Appendix I.

7.3 TRAINING

Onsite contractor(s), subcontractor(s), and staff might not be familiar with stormwater BMPs, and they might not understand their role in protecting local rivers, lakes, and coastal waters. Proper training of personnel can be one of the most effective BMPs implemented at a jobsite. The Contractor shall be responsible for basic training of all onsite staff. As with the other steps taken to prevent stormwater problems at the project site, all training conducted for staff, for those with specific stormwater responsibilities, and for subcontractors shall be documented. Training documentation forms are included in Appendix L and shall become an integral part of the onsite SWPPP. Training shall adhere to the following requirements:

Basic training shall educate the attendees on the topics of:

a) An awareness of the SWPPP, its purpose, and the basics of how the purpose is being achieved.
b) Spill prevention and cleanup measures, including prohibition of dumping any material into storm drains or waterways.
c) An understanding of the basic purpose of BMP's, including what BMP's are on site, what they should look like, and how to avoid damaging them.
d) Potential penalties associated with stormwater non compliance.

Entities and subcontractor directly responsible for implementing the SWPPP shall receive comprehensive stormwater training including:

e) The location and type of BMP's being implemented
f) The installation requirements and water quality purpose for each BMP
g) Maintenance procedures for each of the BMP's being implemented
h) Spill prevention and cleanup measures
i) Inspection and maintenance record keeping requirements

Each person working on the site shall be informed of the following:

j) Only designated construction site entrances shall be used for entering and exiting the site
k) Equipment shall be kept away from silt fences, fiber rolls, and other sediment barriers
l) Know the locations of disposal areas, and know the proper practices for trash, concrete and paint washout, hazardous chemicals, etc.
m) Soil, materials, and liquids shall be kept away from paved areas and storm drain inlets. Material shall not be swept or washed into a storm drain
n) Know the location and understand the proper use of spill kits
o) Know the locations of the site's designated protection areas. Equipment shall be kept away from stream banks, valuable trees and shrubs, and steep slopes. Clearly mark these areas
p) Equipment shall be kept off mulched, seeded, or stabilized areas. Clearly mark these areas
q) Know who to contact when problems are identified

SECTION 8: TERMINATION OF PERMIT COVERAGE

Final stabilization is defined by the state Operating Permit – General Operating Permit when perennial vegetation, pavement, buildings, or structures using permanent materials cover all areas that have been disturbed. With respect to areas that have been vegetated, vegetative cover shall be at least 70% of fully established plant density over 100% of the disturbed area. When final stabilization has been achieved over all disturbed areas, and the facility no longer discharges stormwater associated with construction activities, a Final Stabilization/Termination Checklist shall be completed and signed by the Contractor and submitted to the Operator. Once the operator has approved the checklist, the Contractor shall proceed with terminating all land disturbance permits. To terminate the state permit, a Request for Termination of Operating Permit form shall be filed by the Contractor (Appendix O). To terminate the local land disturbance permit, the Contractor shall write a letter to the local authority requesting termination of the permit. The Contractor shall follow up with both the state and local permit authorities to verify the land disturbance permits have been terminated. Verification shall be placed in Appendix O. Termination of all land disturbance permits terminates the Operators and Contractors responsibility to implement the SWPPP.

An Application for Transfer of Operating Permit should be filed when the Operator is no longer the operator of the facility (typically a change of ownership). Once received, the Application and approval letter from the State should be placed in Appendix O of this document. A new MDNR Operating Permit – General Operating Permit should be obtained for the new Operator via the epermitting process described in Section 1. When received, the new General Operating Permit should be placed in Appendix A.

The termination letter should also be submitted when the Operator is no longer the operator of the facility (typically a change of ownership). Once received, the approval letter from the local authority should be placed in Appendix O of this document. A new local land disturbance permit should be obtained for the new Operator. When received, the new permit should be placed in Appendix A.

APPENDIX A

LAND DISTURBANCE PERMIT(S)

APPENDIX B

FILED ONLINE

APPENDIX C

AUTHORIZED REPRESENTATIVE DESIGNATION

AUTHORIZED REPRESENTATIVE DESIGNATION

Construction Site
Wilshire Hills Phase III Public Improvments
Lee's Summit, Jackson County, Missouri

STORM WATER POLLUTION PREVENTION PLAN
DATED June 2023

I, Wilshire Hills LLC hereby designate the person or company specifically described below to be a duly authorized representative for the purpose of overseeing compliance with environmental requirements, including the Missouri State Operating Permit - General Permit by the Missouri Clean Water Commission, any local land disturbance permits, and this Storm Water Pollution Prevention Plan at the above indicated construction site. The designee is authorized to implement, maintain, and enforce all aspects of the Storm Water Pollution Prevention Plan (SWPPP), sign any reports/documents in the (SWPPP), and all other documents required by the land disturbance permit(s). The designee is authorized to amend the SWPPP as deemed necessary to maintain compliance with all environmental requirements.

Authorized Representative:

Company Name: _____

Company Address: _____

_____

Contact Name: _____

Phone Number: _____

By signing this authorization, I confirm that I meet the requirements to make such a designation as set forth in the Missouri Clean Water Commission, Missouri State Operating Permit, General Operating Permit.

Insert Operators Company Name

Operators Signature: _____

Print Name and Title: _____

Date: _____

APPENDIX D

AUTHORIZED REPRESENTATIVE CERTIFICATION

AUTHORIZED REPRESENTATIVE CERTIFICATION

Construction Site
Wilshire Hills Phase III Public Improvements
Lee's Summit, Jackson County, Missouri

STORM WATER POLLUTION PREVENTION PLAN
DATED June 2023

AUTHORIZED REPRESENTATIVE CERTIFICATION:

"I certify under penalty of law that I understand the terms and conditions of the Missouri State Operating Permit - General Operating Permit by the Missouri Clean Water Commission that authorizes the discharge of storm water associated with construction or land disturbance activity from the construction site as part of this certification. Further, by my signature, I understand that I am fully responsible, along with all other contractors and subcontractors signing such certifications who are performing work activities under this contract, to comply with all provisions and requirements of the General Operating Permit and this Storm Water Pollution Prevention Plan. I understand that I, and my company, are legally required under the federal Clean Water Act and the Code of Missouri, to ensure compliance with the terms and conditions of the General Operating Permit and this Storm Water Pollution Prevention Plan (SWPPP) developed under the Missouri Clean Water Law and the National Pollution Discharge Elimination System (NPDES). I further certify that I and my company shall provide all necessary training and continuing education to all applicable personnel and subcontractors to ensure a complete understanding of all provisions and requirements of the General Operating Permit and this Storm Water Pollution Prevention Plan prior to these entities beginning any work activities on this site."

Signature: _____ Date: _____

Print Name & Title: _____

Company Name: _____

Company Address: _____

_____

Phone Number: _____

Scope of Services: _____

_____

_____

_____

_____

_____

APPENDIX E

LIST OF SUBCONTRACTORS

LIST OF SUBCONTRACTORS

Construction Site
Wilshire Hills Phase III Public Improvments
Lee's Summit, Jackson County, Missouri

STORM WATER POLLUTION PREVENTION PLAN
DATED June 2023

(to be filled in by Contractor after award of contract, make copies of this form as necessary)

Subcontractor:

Company or Organization Name: _____

Address:_____

City, State, Zip Code: _____

Contact Name:_____ Phone #: _____

Contact Email: _____

Subcontractor:

Company or Organization Name: _____

Address:_____

City, State, Zip Code: _____

Contact Name:_____ Phone #: _____

Contact Email: _____

Subcontractor:

Company or Organization Name: _____

Address:_____

City, State, Zip Code: _____

Contact Name:_____ Phone #: _____

Contact Email: _____

Subcontractor:

Company or Organization Name: _____

Address:_____

City, State, Zip Code: _____

Contact Name:_____ Phone #: _____

Contact Email: _____

APPENDIX F

SUBCONTRACTORS CERTIFICATION

SUBCONTRACTORS CERTIFICATION

Construction Site
Wilshire Hills Phase III Public Improvments
Lee's Summit, Jackson County, Missouri

STORM WATER POLLUTION PREVENTION PLAN
DATED June 2023

SUBCONTRACTOR'S CERTIFICATION:

"I certify under penalty of law that I understand the terms and conditions of the Missouri State Operating Permit - General Operating Permit by the Missouri Clean Water Commission that authorizes the discharge of storm water associated with construction or land disturbance activity from the construction site as part of this certification. Further, by my signature, I understand that I am fully responsible, along with all other contractors and subcontractors signing such certifications who are performing work activities under this contract, to comply with all provisions and requirements of the General Operating Permit and this Storm Water Pollution Prevention Plan. I understand that I, and my company, are legally required under the federal Clean Water Act and the Code of Missouri, to ensure compliance with the terms and conditions of the General Operating Permit and this Storm Water Pollution Prevention Plan (SWPPP) developed under the Missouri Clean Water Law and the National Pollution Discharge Elimination System (NPDES)."

Signature: _____ Date: _____

Print Name & Title: _____

Company Name: _____

Company Address: _____

_____

Phone Number: _____

Scope of Services: _____

_____

_____

_____

_____

_____

APPENDIX G

IMPLEMENTATION SCHEDULE

IMPLEMENTATION SCHEDULE (Page 1 of 3)
Wilshire Hills Phase III
Wilshire Drive
Lee's Summit, Jackson County, Missouri

To be filled in by the Contractor prior to initiation of construction.

Refer also to the civil plans for Sequence of Events.

Sequence of Events					
Construction Activity	**Proposed Initiation Date**	**Proposed Completion Date**	**Actual Initiation Date**	**Actual Completion Date**	**Contractor Responsible for Implementation**
Phase 1:					
1. Pre-construction meeting for SWPPP training prior to any construction.					
2. Construct temporary construction exit at location shown on plans.					
3. Install perimeter Erosion control barrier as shown.					
4. Install 30,000 square foot stone laydown area with 25' wide access drive from laydown area to construction entrance as soon as practical.					
5. Construct side open inlet, discharge pipe, F.E.S., and rip rap as shown. Install inlet protection.					
6. Strip topsoil in the area and stockpile in designated location. Dig detention basin to given depth along with swales directing water into basin.					
7. Begin clearing and grubbing operations. Clearing and grubbing shall be done only in areas where earthwork will be performed and only in areas where building is planned to commence within 14 days (or 7 days if the slope of the area is greater than 3:1 (3 feet horizontal to 1 foot vertical) or if the slope is greater than 3% and greater than 150 feet in length) after clearing and grubbing.					
8. Commence site grading and excavation of detention basin.					
9. Disturbed areas of the site where construction activity has ceased for more than 14 days (7 days if					

IMPLEMENTATION SCHEDULE (Page 2 of 3)
Wilshire Hills Phase III
Wilshire Drive
Lee's Summit, Jackson County, Missouri

Sequence of Events					
Construction Activity	**Proposed Initiation Date**	**Proposed Completion Date**	**Actual Initiation Date**	**Actual Completion Date**	**Contractor Responsible for Implementation**
the slope of the area is greater than 3:1 (3 feet horizontal to 1 foot vertical) or if the slope is greater than 3% and greater than 150 feet in length) shall be temporarily seeded and watered.					
10. Soil stockpiles shall be watered as needed to prevent wind erosion.					
11. Ensure the detention basin excessive sediment is removed after completion of construction back to shown grading.					
Phase 2:					
1. Install Storm Sewer					
2. Install Water Line					
3. Install Sanitary Sewer					
4. Build Streets, including curb and gutter					
5. Stabilize the entire site					
6. Disturbed areas of the site where construction activity has ceased for more than 14 days (7 days if the slope of the area is greater than 3:1 (3 feet horizontal to 1 foot vertical) or if the slope is greater than 3% and greater than 150 feet in length) shall be temporarily seeded and watered.					
7. Soil stockpiles shall be watered as needed to prevent wind erosion.					

IMPLEMENTATION SCHEDULE (Page 3 of 3)
Wilshire Hills Phase III
Wilshire Drive
Lee's Summit, Jackson County, Missouri

Sequence of Events					
Construction Activity	**Proposed Initiation Date**	**Proposed Completion Date**	**Actual Initiation Date**	**Actual Completion Date**	**Contractor Responsible for Implementation**
8. Ensure the detention basin excessive sediment is removed after completion of construction back to shown grading.					

APPENDIX H

INSPECTION REPORT FORMS

INSPECTION REPORT (Page 1 of 10)
Wilshire Hills Phase III Public Improvements
Wilshire Drive
Lee's Summit, Jackson County, Missouri
NPDES Tracking Number: _____

General Information			
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Inspector's Qualifications	See Section 6 of SWPPP.		
Describe present phase of construction			
Type of Inspection: ❑ Regular (7 calendar day) ❑ Pre-storm event ❑ During storm event ❑ Post-storm event			
Weather Information			
Has there been a storm event since the last inspection? ❑Yes ❑No **If yes, provide:** Storm Start Date & Time: Storm Duration (hrs): Approximate Amount of Precipitation (in):			
Weather at time of this inspection? ❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snowing ❑ High Winds ❑ Other: Temperature:			
Have any discharges occurred since the last inspection? ❑Yes ❑No **If yes, describe:**			
Is there any discharges at the time of inspection? ❑Yes ❑No **If yes, describe:**			

CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name and title: _____

Inspector's Signature: _____ Date: _____

INSPECTION REPORT (Page 2 of 10)
Wilshire Hills Phase III Public Improvements
Wilshire Drive
Lee's Summit, Jackson County, Missouri
NPDES Tracking Number: _____

Site-specific BMPs
Carry a copy of the SWPPP maps during inspections.

Site-Specific BMPs					
BMP	**BMP Installed? (yes, no, or N/A)**	**BMP Maintenance Required? (yes, no, or N/A)**	**Corrective Action Needed and Notes**	**Responsible Party for Corrective Action**	**Implementation Date of Corrective Action**
Site Staff Training on Erosion & Sediment Control					
Site Staff Training on Spill Prevention & Response Plan					
Maintaining Equipment					
Staging Area(s)					
Vehicle/Equipment Maintenance & Fueling Area					
Toilet Facilities					
Maintaining New Vegetated Areas					
Gravel Construction Entrances, Exits, & Laydown					
Concrete Washout Area(s)					
Phasing Land Clearing Activities					
Disposing of Trash & Debris					
Construction Waste Materials Containment					

INSPECTION REPORT (Page 3 of 10)
Wilshire Hills Phase III Public Improvements
Wilshire Drive
Lee's Summit, Jackson County, Missouri
NPDES Tracking Number: _____

Site-Specific BMPs					
BMP	**BMP Installed? (yes, no, or N/A)**	**BMP Maintenance Required? (yes, no, or N/A)**	**Corrective Action Needed and Notes**	**Responsible Party for Corrective Action**	**Implementation Date of Corrective Action**
Hazardous Waste Materials Containment					
Pavement/Curb & Gutter Sweeping					
Curb Inlet Filters Using Gutterbuddy, Sediment Logs, Etc.					
Wind Erosion & Dust Control					
Permanent Diversion Dikes					
Silt Fences					
Sediment Logs / Fiber Rolls					
Topsoil Stockpile and Placement					
Polyacrylamide (PAM) / Floc Logs					
Temporary Diversion Dikes					
Rock Ditch Checks					
Pipe Slope Drains					

INSPECTION REPORT (Page 4 of 10)
Wilshire Hills Phase III Public Improvements
Wilshire Drive
Lee's Summit, Jackson County, Missouri
NPDES Tracking Number: _____

Site-Specific BMPs					
BMP	**BMP Installed? (yes, no, or N/A)**	**BMP Maintenance Required? (yes, no, or N/A)**	**Corrective Action Needed and Notes**	**Responsible Party for Corrective Action**	**Implementation Date of Corrective Action**
Management of Excavation Spoil Materials					
Dewatering into BMP(s)					
Detention Basin #1					
Soil Roughening					
Temporary Seed & Mulch Disturbed Areas					
Storm Sewers					
Storm Sewer Inlet Filter					
ADS Water Quality Unit					
Permanent Outlet Protection using Rip-Rap					
Temporary Inlet Protection using silt fence					
Temporary Outlet Protection using rip-rap					
Vegetated Drainage Swales / Channels					

INSPECTION REPORT (Page 5 of 10)
Wilshire Hills Phase III Public Improvements
Wilshire Drive
Lee's Summit, Jackson County, Missouri
NPDES Tracking Number: _____

Site-Specific BMPs					
BMP	**BMP Installed? (yes, no, or N/A)**	**BMP Maintenance Required? (yes, no, or N/A)**	**Corrective Action Needed and Notes**	**Responsible Party for Corrective Action**	**Implementation Date of Corrective Action**
Rip-rap Swales / Channels					
Rolled Erosion Control Products (mats, blankets, etc.)					
Light Compaction of All Placed Topsoil					
Retaining Wall					
Landscape Installation					
Permanent Seed & Mulch					
Tackifiers & Binders (typically hydroseeding, hydromulching, etc.)					
Grass Sod Placement					
Level Spreader					
Other:					

INSPECTION REPORT (Page 6 of 10)
Wilshire Hills Phase III Public Improvements
Wilshire Drive
Lee's Summit, Jackson County, Missouri
NPDES Tracking Number: _____

General Site Issues
Below are some general site issues that should be assessed during inspections.

General Site Issues					
BMP/activity	**Implemented? (yes, no, or N/A)**	**Maintenance Required? (yes, no, or N/A)**	**Corrective Action Needed and Notes**	**Responsible Party Corrective Action**	**Implementation Date of Corrective Action**
Are all slopes and disturbed areas not actively being worked properly stabilized?					
Are perimeter controls and sediment barriers adequately installed (keyed into substrate) and maintained?					
Are discharge points and receiving waters free of any sediment deposits?					
Are storm drain inlets properly protected?					
Is the construction exit(s) preventing sediment from being tracked onto the street(s)?					
Are the surrounding streets clean and free of mud/dust/trash from the project?					
Is trash/litter from work areas collected and placed in covered dumpsters?					

INSPECTION REPORT (Page 7 of 10)
Wilshire Hills Phase III Public Improvements
Wilshire Drive
Lee's Summit, Jackson County, Missouri
NPDES Tracking Number: _____

General Site Issues					
BMP/activity	**Implemented? (yes, no, or N/A)**	**Maintenance Required? (yes, no, or N/A)**	**Corrective Action Needed and Notes**	**Responsible Party Corrective Action**	**Implementation Date of Corrective Action**
Are washout facilities (e.g., paint, stucco, concrete) available, clearly marked, and maintained?					
Has the on-site SWPPP been updated?					
Other:					

Recommended Inspection Sequence – For information only
You should conduct thorough inspections of the site, making sure to inspect all areas and BMP's. The seven activities listed below are a recommended inspection sequence that will help you conduct a thorough inspection (EPA in *Developing Your Stormwater Pollution Prevention Plan: A Guide for Construction Sites (adapted from MPCA 2004)*.

1. Plan your inspection
   - Create a checklist to use during the inspection (see Inspection Report)
   - Obtain a copy of the site map with BMP locations marked
   - Plan to walk the entire site, including discharge points from the site and any off-site support activities such as concrete batch plants should also be inspected.
   - Follow a consistent pattern each time to ensure you inspect all areas (for example, starting at the lowest point and working uphill)
2. Inspect discharge points and downstream, off-site areas
   - Inspect discharge locations to determine whether erosion and sediment control measures are effective
   - Inspect nearby downstream locations, if feasible
   - Walk *down the street* to inspect off-site areas for signs of discharge. This is important in areas with existing curbs and gutters
   - Inspect downslope municipal catch basin inlets to ensure that they are adequately protected
3. Inspect perimeter controls and slopes
   - Inspect perimeter controls such as silt fences to determine if sediment should be removed
   - Check the structural integrity of the BMP to determine if portions of the BMP need to be replaced
   - Inspect slopes and temporary stockpiles to determine if erosion controls are effective
4. Compare BMP's in the site plan with the construction site conditions
   - Determine whether BMP's are in place as required by the site plan
   - Evaluate whether BMP's have been adequately installed and maintained
   - Look for areas where BMP's are needed but are missing and are not in the SWPPP
5. Inspect construction site entrances
   - Inspect the construction exits to determine if there is tracking of sediment from the site onto the street
   - Refresh or replace the rock in designated entrances
   - Look for evidence of additional construction exits being used that are not in the SWPPP or are not stabilized
   - Sweep the street if there is evidence of sediment
6. Inspect sediment controls
   - Inspect any sediment basins for sediment accumulation
   - Remove sediment when it reduces the capacity of the basin by the specified amount (many permits have specific requirements and include those in the SWPPP)
7. Inspect pollution prevention and good housekeeping practices
   - Inspect trash areas to ensure that waste is properly contained
   - Inspect material storage and staging areas to verify potential pollutant sources are not exposed to stormwater runoff
   - Verify that concrete, paint, and stucco washouts are being used properly and are correctly sized for the volume of wash water
     - Inspect vehicle/equipment fueling and maintenance areas for signs of stormwater pollutant exposure

APPENDIX I

SWPPP AMENDMENT REPORT FORM
&
OVERALL SWPPP AMENDMENT LOG

SWPPP AMENDMENT REPORT FORM
Wilshire Hills Phase III Public Improvements
Lee's Summit, Jackson County, Missouri

(MASTER FORM – copy this page and fill in for each amendment)

AMENDMENT NUMBER: _____

INSPECTOR: _____ DATE: _____

QUALIFICATIONS OF INSPECTOR: _____

_____

_____

CHANGES REQUIRED TO THE STORMWATER POLLUTION PREVENTION PLAN: _____

_____

_____

_____

_____

_____

_____

REASONS FOR CHANGES: _____

_____

_____

_____

_____

_____

TO BE PERFORMED BY: _____

_____

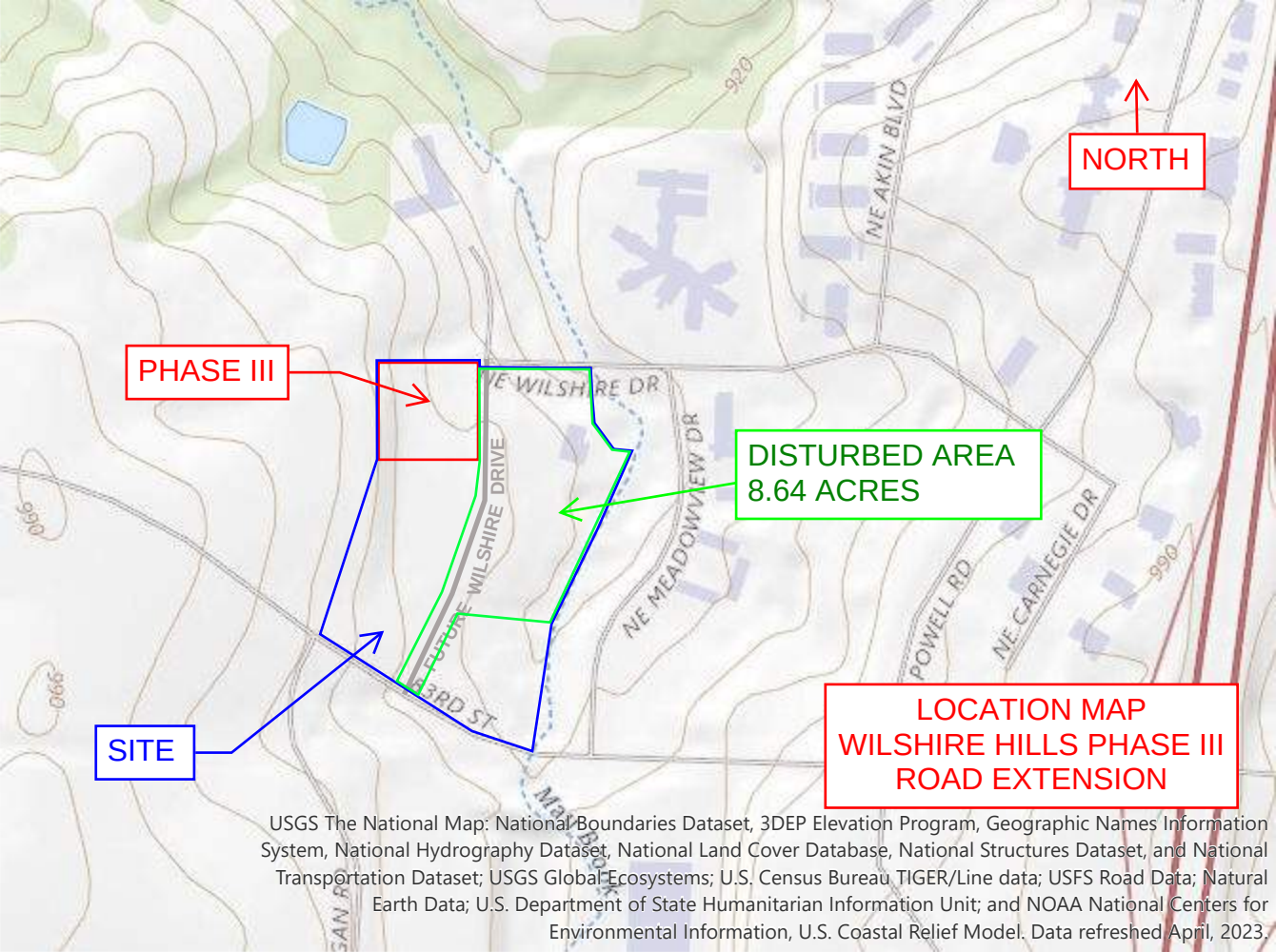
ON OR BEFORE: _____

OVERALL SWPPP AMENDMENT LOG
Wilshire Hills Phase III Public Improvements
Lee's Summit, Jackson County, Missouri

Amendment #	Date	Description of Amendment	Amendment Prepared by (Name and title)

APPENDIX J

GENERAL LOCATION MAP



USGS The National Map: National Boundaries Dataset, 3DEP Elevation Program, Geographic Names Information System, National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; USGS Global Ecosystems; U.S. Census Bureau TIGER/Line data; USFS Road Data; Natural Earth Data; U.S. Department of State Humanitarian Information Unit; and NOAA National Centers for Environmental Information, U.S. Coastal Relief Model. Data refreshed April, 2023.

APPENDIX K

CONSTRUCTION SITE NOTICES

EMERGENCY, SITE, & SWPPP CONTACT INFORMATION
TO BE FILLED OUT BY CONTRACTOR AND POSTED ON-SITE

Emergency: Fire, Police, & Ambulance		Phone:	911
Operator:	**Address:**		
JES Holding Inc Wilshire Hills LLC	206 Peach Way Columbia, MO 65202	Phone:	573-443-2021
24 Hour Contact:	Brian Kimes	Mobile:	573-424-7116
General Contractor:	**Address:**		
		Phone:	
24 Hour Contact:		Mobile:	
24 Hour Contact:		Mobile:	
Subcontractors:	**Company Address / Contact Name:**		
Sub #1:		Phone:	
Sub #2:		Phone:	
Sub #3:		Phone:	
City/County Contact:	Lee's Summit Public Works Department	Phone:	830-257-8000
MDNR:	Water Pollution Control Program	Phone:	1-573-751-1300
National Response Center:		Phone:	1-800-424-8802
SWPPP Location:	Wilshire Drive, Lee's Summit, Jackson County, Missouri		
SWPPP Contact:	Phone:		

APPENDIX L

RECORD OF PERSONNEL TRAINING ACTIVITIES FORM

RECORD OF PERSONNELTRAINING ACTIVITIES FORM
Wilshire Hills Phase III Public Improvements
Lee's Summit, Jackson County, Missouri

Instructor: _____ Date: _____

Instructor Title: _____ Phone #: _____

Course Location: _____

Course Length: _____

SWPPP Training Topic: (check as appropriate)

- ☐ Structural BMPs
- ☐ Non-Structural BMPs
- ☐ Non-Storm Water Management
- ☐ Construction Plans
- ☐ Other: _____
- ☐ SWPPP Basics
- ☐ Good Housekeeping BMPs
- ☐ Waste Management and Materials Pollution Control
- ☐ Emergency Procedures

Specific Training Objective: _____

_____

_____

Attendance Roster: (attach additional pages as necessary)

Name	Company	Telephone Number	Signature

APPENDIX M

REPORTABLE QUANTITY RELEASE FORM

REPORTABLE QUANTITY RELEASE FORM
Wilshire Hills Phase III Public Improvements
Wilshire Drive
Lee's Summit, Jackson County, Missouri

The discharges of hazardous substances or oil in storm water discharges from construction sites shall be prevented or minimized in accordance with the SWPPP. When a release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under 40CFR110, 40CFR117, and 40CFR302 occurs, the following steps shall be taken:

1. All measures shall be taken to contain and abate the spill and to prevent the discharge of the pollutant(s) to storm water or off-site.

2. Notice must be provided to the National Response Center (NRC) at 1-800-424-8802, and MDNR at 1-573-751-1300, in accordance with regulations referenced above as soon as site staff has knowledge of the discharge.

3. Contact the Operator, Engineer, local Fire Department, Joint Communications, local Sheriff's Department, City of Lee's Summit Public Works, MDNR, and EPA immediately upon knowledge of release.

4. The SWPPP shall be modified within seven (7) calendar days of knowledge of the discharge to provide a description of the release, the circumstances leading to the release, and the date of the release. The plans shall identify measures to prevent the recurrence of such releases and to respond to such releases.

Date of Spill	Material Spilled	Approximate Quantity of Spill (in gallons)	Agency(s) Notified	Date of Notification	SWPPP Revision Date

APPENDIX N

RECORD OF RAINFALL

RECORD OF RAINFALL

Wilshire Hills Phase III Public Improvmenets

Year 20___ Lee's Summit, Jackson County, Missouri All rainfall amounts are in inches.

Day	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
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26												
27												
28												
29												
30												
31												
Initials												

APPENDIX O

NOTICE OF TERMINATION(S)
&
FINAL STABILIZATION/TERMINATION CHECKLIST

FINAL STABILIZATION/TERMINATION CHECKLIST

Wilshire Hills Phase III Public Improvements
Lee's Summit, Jackson County, Missouri

☐ All soil disturbing activities are complete.

☐ All construction debris and trash has been removed.

☐ All paved surfaces onsite and in the surrounding area have been cleaned of all onsite sediment, trash, debris, etc.

☐ All Subcontractors have completed and cleaned up their work involving land disturbance/erosion and sediment control. The general contractor has inspected and approved this work.

☐ All temporary BMP's (such as silt fence) have been removed, finish graded, and seed and mulched. Residual sediment has been removed as needed. BMP's that will completely decompose, including some fiber rolls and blankets, may be left in place as approved by Operator.

☐ All areas where erosion-control blankets/mats were installed have been inspected. All loose, exposed blanket has been restapled/staked. If less than 70% blanket area is covered by vegetation, coordinate with Operator to determine solution.

☐ The project is stabilized. (The project is considered stabilized when perennial vegetation, pavement, buildings, or structures using permanent materials cover all areas that have been disturbed. Perennial vegetative cover shall be at least 70% of fully established plant density over 100% of the disturbed area.)

☐ All signs of erosion and sediment deposition have been repaired and are permanently stabilized.

☐ All permanent BMP's are in place and operational. Written maintenance requirements for all permanent BMP's have been provided to the Operator.

☐ All drainage conveyances and inlets/outlets have been installed per plan; all trash/debris has been removed, and are functioning as intended. All Inlet/outlet areas have been inspected to ensure complete stabilization in the surrounding area.

☐ All rip-rap areas are stable and rip-rap that has become dislodged has been replaced.

CONTRACTOR'S CERTIFICATION:

"I certify under penalty of law that all storm water discharges associated with Construction Activity from the identified project that are authorized by the NPDES General Operating Permit, have been eliminated, and that all disturbed areas and soils at the construction site have achieved final stabilization and all temporary erosion and sediment control measures have been removed or will be removed at a scheduled time coordinated with and approved by the Operator."

Name (Print) & Title: _____ _____

Signature: _____ Date: _____

Company Name: _____

Final Stabilization Date: _____

HYDRAULIC REPORT

FOR

Public Improvements to Serve Wilshire Hills III

Lee's Summit, Missouri

PREPARED FOR:

WILSHIRE HILLS III L.P.

206 PEACH WAY

COLUMBIA, MO 54202

JUNE 22, 2023

PREPARED BY:

Engineering Surveys & Services

1113 FAY STREET

COLUMBIA, MO 65201

(573) 449-2646

JOB NUMBER: 15925

6/22/23

STATE OF MISSOURI
MATTHEW AARON KRIETE
NUMBER PE-2007002811
PROFESSIONAL ENGINEER

TABLE OF CONTENTS

1 INTRODUCTION

The project consists of the construction of a public road and associated utilities to connect existing Wilshire Drive to Strother Road in Lee's Summit, MO. The road and associated storm sewer and sanitary sewer extensions will provide service to the future Wilshire Hills Phase III development and additional future development. The project shall be built in two phases. The first phase will be the rough grading of Wilshire Hills Phase III, excavation of the detention basin, and the completion of the road work. Phase II will include the completion of Wilshire Hills Phase III and future projects. Soil disturbing activities will include clearing and grubbing, installing erosion and sediment controls, grading, installation of underground utilities, and preparation for final seeding, mulching, and landscaping. Every part of the stormwater design will be accounted for to follow Lee's Summits stormwater requirements.

2 DESIGN

2.1 Erosion & Sediment Control Design

Design Standard(s):

- *Missouri Department of Natural Resources (MDNR) Protecting Water Quality Field Guide, 2011*

The Civil Site Plans and project Storm Water Pollution and Prevention Plan (SWPPP) indicate erosion and sediment control Best Management Practices (BMPs) to be utilized throughout construction activities. The proposed regional detention basin shall be used as a temporary sediment trap throughout construction. It is important to note that the sediment in the basin must be pumped out to its designed depth to provide adequate fish habitat. Appendix A includes erosion and sediment control storage calculations.

2.2 Stormwater Detention Design

Design Standard(s):

- *Lee's Summit, Missouri Stormwater Discharge Control Regulations (Code of Ordinance Chapter 34 Article 3)*
- *APWA Section 5300*
- *LS Section 5600 – Storm Drainage Systems and Facilities (revised July 2020)*

The regional detention basin has been designed to serve all sites south of Meadowview Drive and west of the existing box culvert. This basin will provide detention and water quality with allocations for impervious areas for future development. Table 1 compares the area of each lot, the approximate impervious area, and the total impervious treated by the regional basin for the entire development. The first development will be Wilshire Hills Phase III. The impervious area from this site will be subtracted from the overall total for future development.

Impervious areas have been approximated based on future use of each lot. The time of concentrations and curve numbers reflect these assumptions for future site development. The box culvert is the dividing

line separating the wet regional detention basin. Due to the shallow nature of the culvert, separating the basins is more practical than piping across the culvert to serve the remaining parcels.

Table 1: Future Land Development

	Area (acres)	Impervious (acres)	Curve Number
Wilshire III (Northwest + Bypass)	2.54	1.25	87
Northeast (0.62 ac detention basin included)	5.21	2.66	89
Southeast	2.59	1.81	91
Southwest	1.60	1.12	91
West	3.20	1.65	86
Total	15.14	8.49	

The pre-developed conditions were calculated based on conditions prior to any development, or pre-2006. The site was originally pasture before being cleared and mass graded for future development. Post-developed conditions include future impervious areas for future site development. This 8.49 acres of additional impervious area has been included with the design of this detention basin.

The assumptions for max release rate required all new additional impervious areas to have detention that restricts runoff to the pre project rates for the 50%, 10%, and 1% design storms. These rates come from the APWA Section 5300 and are 0.5, 2.0, and 3.0 cfs per acre in relation to the design storm. The existing onsite sediment trap will be removed and replaced with the new larger basin designed to serve all onsite lots west of the box culvert. It is important to note the large difference between pre vs. post detention that these limits create.

Appendix B includes HydraFlow detention calculations and Appendix D includes the detention drainage area maps. Table 2 shows the required discharge rates based on the area draining to the detention basin. This is then compared to the Designed basin discharge. This calculated data is then added with the offsite pass through and bypass to ensure that all is accounted for within the basin.

Table 2: Basin Discharge Rates

Design Storm	Rate (cfs) Allowable per Acre per APWA	Area Served (acres)	Maximum Site Rate (cfs)	Designed Basin Discharge (cfs)	Offsite Pass Through (cfs)	Onsite Bypass (cfs)	Total Allowed (csf)	Provided (cfs)	Basin Elevation
50% (2-yr)	0.5	15.14	7.57	7.02	3.02	(-) 0.56	11.15	11.15	921.67
20% (10-yr)	2.0	15.14	30.28	16.68	14.88	(-) 1.45	46.61	33.01	923.28
1% (100-yr)	3.0	15.14	45.45	42.66	35.92	(-) 2.74	81.37	81.32	924.88

The 100-year level of rise in the basin is 924.88 and the top of the dam is 924.90, providing 1.10' of freeboard. 924.88 is the maximum water surface elevation. The emergency spillway for the basin is the grated top of the outfall structure in the basin with an elevation of 924.9. The 100-year design storm was routed through the basin, and the level of rise is 925.46, providing 0.54' of freeboard.

A spillway for the basin has been designed for the top of the earthen dam in the unlikely event the outfall structure should become completely blocked. Appendix B includes weir calculations that indicate the 100-year flow through the spillway is fully contained in the spillway and will not overtop the dam.

2.3 Water Quality

Design Standard(s):

- *APWA Section 5608.4*
- *MARC/APWA BMP Manual Chapter 6.*

The water quality required for this site is provided by a 40-hour extended detention of runoff of the 90% mean annual event. This tis a 1.37"/24-hour event. The designed detention basin takes 60 hours to completely release all of the water quality storm after peaking at the 12-hour mark. This meets the qualifications to meet water quality standards and requirements, according to APWA 5608.4 and Chapter 6 of the MARC/APWA BMP Manual.

2.4 Storm Sewer Design

Design Standard(s):

- *Lee's Summit, Missouri Stormwater Discharge Control Regulations (Code of Ordinance Chapter 34 Article 3)*
- *APWA Section 5300*
- *LS Section 5600 – Storm Drainage Systems and Facilities (revised July 2020)*

All storm sewers for the road public improvement project will be public storm sewers. They have been designed to the 25-year storm but can handle the 100-year storm without impeding traffic. Appendix C includes HydraFlow storm sewer calculations. The calculations are based on the Storm Sewer Drainage Area Map in Appendix D.

It is important to note that the future offsite industrial is currently passing through the storm sewers causing an increase in volume in the pipes. The Storm Drainage Area map shows the designed divide between the inlets TMI42 and SOI6A. Currently all of the water is directed towards SOI6A through a swale to reduce water passing over the road. This is causing a much larger volume of water to enter SOI6A than usual though the pipes are sized to handle this increase in flow.

3 CONCLUSION

Erosion and sediment control has been designed per requirements. The site meets storm water detention requirements for developments within the City of Lee's Summit and is designed for future development on the site. The storm sewers have been designed to convey the 25-year design storm. All of the City of Lee's Summit stormwater requirements have been met.

APPENDIX A:
EROSION AND SEDIMENT CONTROL CALCULATIONS

Engineering Surveys & Services
DELIVERING YOUR VISION ™
COLUMBIA (573) 449-2646 | JEFFERSON CITY (573) 636-3303 | SEDALIA (660) 826-8618
www.ess-inc.com ess@ess-inc.com

Project: Wilshire Hills Phase III Date: 6/13/2023

Sheet: 1 of 1

BY ST

EROSION CONTROL CALCULATIONS

Temporary Sediment Trap

11.3 Acres disturbed area to sediment basin

11.3 × 3,600 CF/Ac = 40,680 CF sediment storage required

ELEVATION	CONTOUR AREA (SF)	TOTAL STORAGE (CF)
910	4,286	0
911	5,114	4693
912	6,006	10,2417
913	6,970	16,728
914	12,152	26,169
915	13,638	39,056
916	15,211	53,472

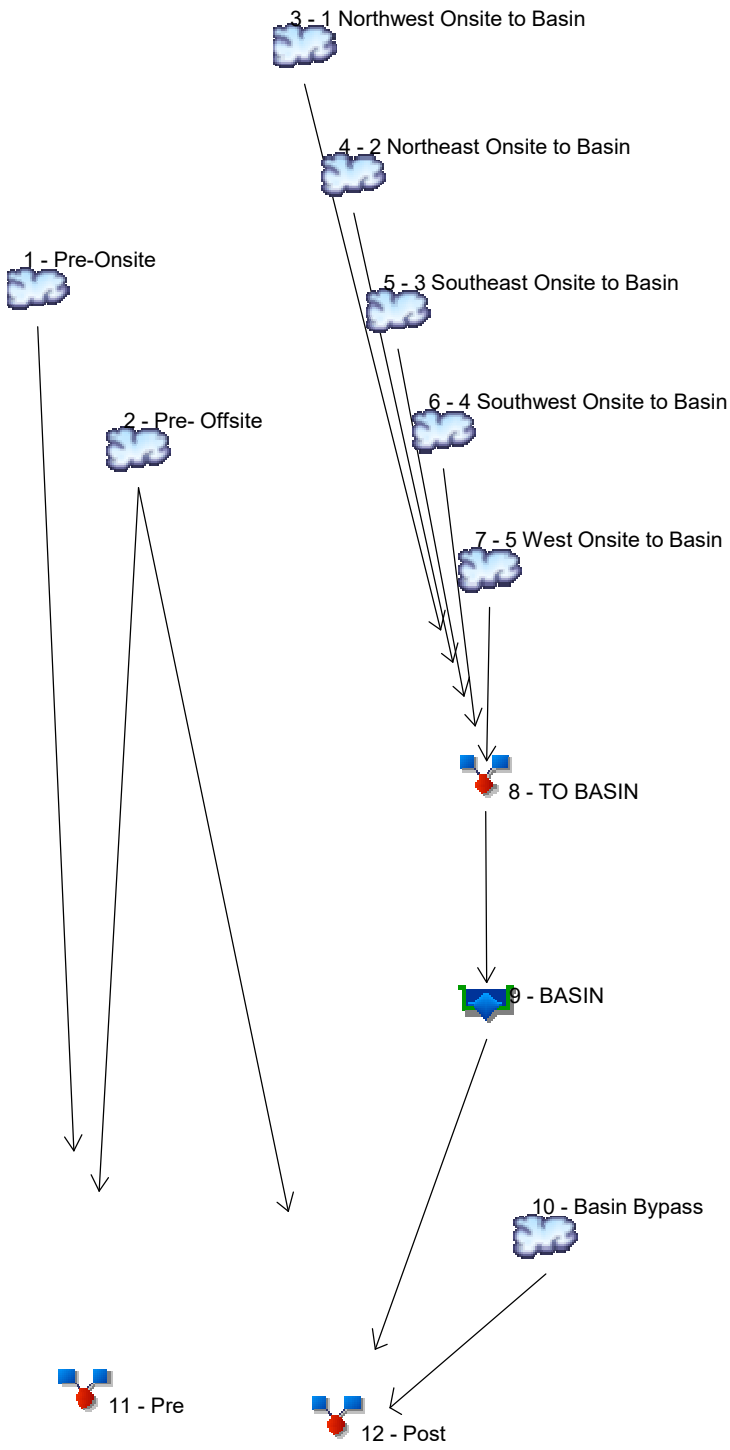
53,472 CF of Sediment storage is provided at an elevation of 916.' This is below the outfall structure so will not require filter fabric to be wrapped.

It is extremely important to note that the depth of this pond is a requirement for housing fish. Once construction has been completed, the sediment accumulation in the pond must be removed back to its original elevation levels.

APPENDIX B:
STORMWATER DETENTION CALCULATIONS

Hydraflow Table of Contents

Watershed Model Schematic



Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	SCS Runoff	------	0.795	18.14	-------	-------	56.95	-------	-------	117.54	Pre-Onsite
2	SCS Runoff	------	0.012	3.023	-------	-------	14.88	-------	-------	35.92	Pre- Offsite
3	SCS Runoff	------	1.239	5.273	-------	-------	11.81	-------	-------	20.88	1 Northwest Onsite to Basin
4	SCS Runoff	------	3.149	11.99	-------	-------	25.83	-------	-------	44.89	2 Northeast Onsite to Basin
5	SCS Runoff	------	1.897	6.426	-------	-------	13.29	-------	-------	22.69	3 Southeast Onsite to Basin
6	SCS Runoff	------	1.278	4.297	-------	-------	8.859	-------	-------	15.10	4 Southwest Onsite to Basin
7	SCS Runoff	------	1.558	7.062	-------	-------	16.17	-------	-------	28.87	5 West Onsite to Basin
8	Combine	3, 4, 5, 6, 7	9.103	34.66	-------	-------	75.08	-------	-------	131.12	TO BASIN
9	Reservoir	8	1.039	7.020	-------	-------	16.68	-------	-------	42.66	BASIN
10	SCS Runoff	------	0.085	0.562	-------	-------	1.449	-------	-------	2.740	Basin Bypass
11	Combine	1, 2,	0.715	19.14	-------	-------	65.94	-------	-------	141.26	Pre
12	Combine	2, 9, 10,	1.047	9.704	-------	-------	29.72	-------	-------	71.32	Post

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	18.14	2	724	53,373	------	------	------	Pre-Onsite
2	SCS Runoff	3.023	2	732	14,805	------	------	------	Pre- Offsite
3	SCS Runoff	5.273	2	722	14,805	------	------	------	1 Northwest Onsite to Basin
4	SCS Runoff	11.99	2	724	37,644	------	------	------	2 Northeast Onsite to Basin
5	SCS Runoff	6.426	2	724	20,351	------	------	------	3 Southeast Onsite to Basin
6	SCS Runoff	4.297	2	722	12,257	------	------	------	4 Southwest Onsite to Basin
7	SCS Runoff	7.062	2	722	19,803	------	------	------	5 West Onsite to Basin
8	Combine	34.66	2	724	104,860	3, 4, 5, 6, 7	------	------	TO BASIN
9	Reservoir	7.020	2	744	104,807	8	921.67	48,894	BASIN
10	SCS Runoff	0.562	2	718	1,128	------	------	------	Basin Bypass
11	Combine	19.14	2	726	69,546	1, 2,	------	------	Pre
12	Combine	9.704	2	736	120,739	2, 9, 10,	------	------	Post

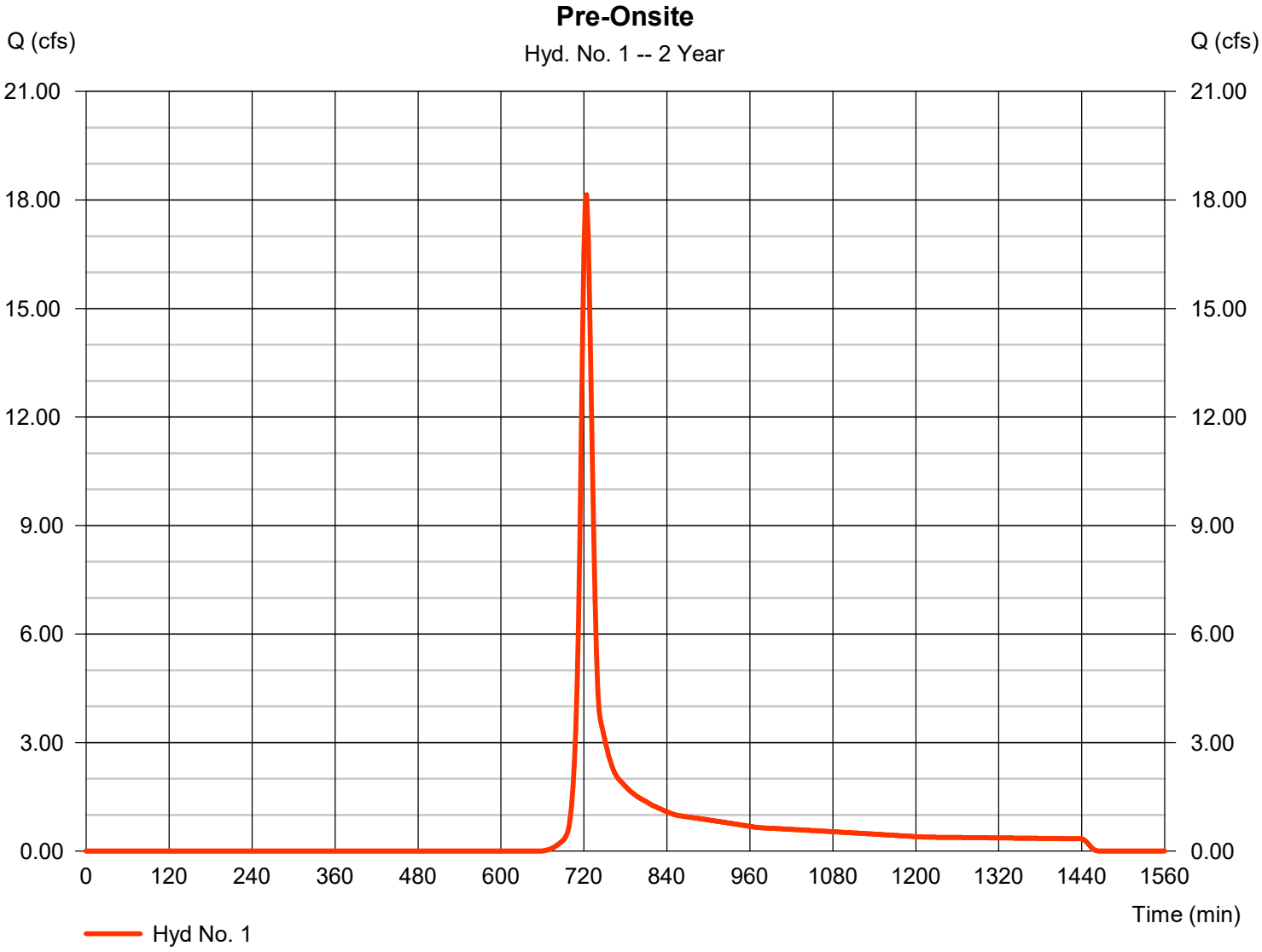
Hydrograph Report

Hyd. No. 1

Pre-Onsite

Hydrograph type	=	SCS Runoff	Peak discharge	=	18.14 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	53,373 cuft
Drainage area	=	15.510 ac	Curve number	=	74*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	15.30 min
Total precip.	=	3.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(15.510 x 74)] / 15.510



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No. 1

Pre-Onsite

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.170		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.10		0.00		0.00		
Land slope (%)	= 5.00		0.00		0.00		
Travel Time (min)	**= 7.63**	**+**	**0.00**	**+**	**0.00**	**=**	**7.63**
Shallow Concentrated Flow							
Flow length (ft)	= 1049.00		0.00		0.00		
Watercourse slope (%)	= 2.00		0.00		0.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=2.28		0.00		0.00		
Travel Time (min)	**= 7.66**	**+**	**0.00**	**+**	**0.00**	**=**	**7.66**
Channel Flow							
X sectional flow area (sqft)	= 0.00		0.00		0.00		
Wetted perimeter (ft)	= 0.00		0.00		0.00		
Channel slope (%)	= 0.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=0.00						
			0.00				
					0.00		
Flow length (ft)	({0})0.0		0.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.00**	**+**	**0.00**	**=**	**0.00**

Total Travel Time, Tc ..... 15.30 min

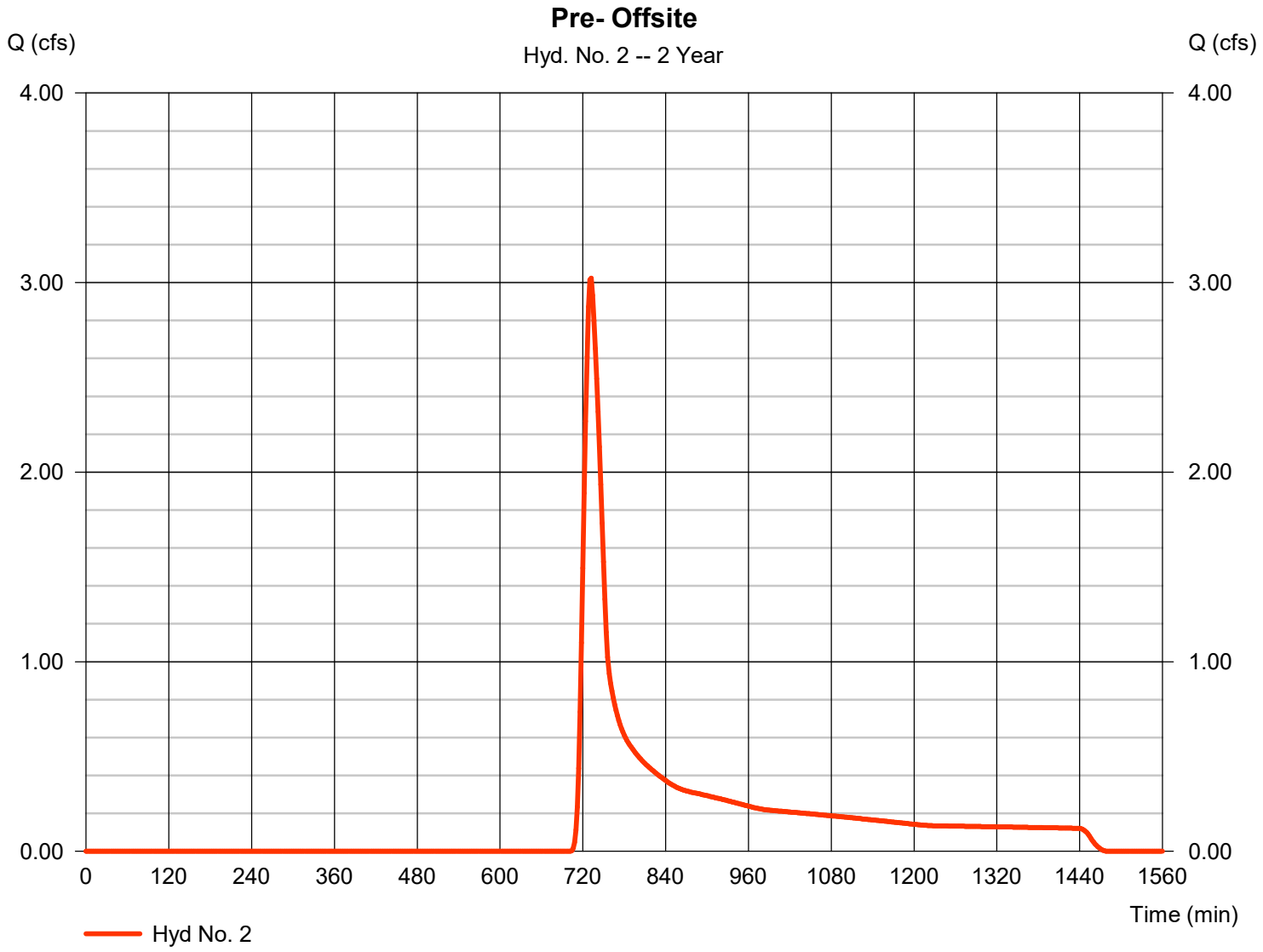
Hydrograph Report

Hyd. No. 2

Pre- Offsite

Hydrograph type	=	SCS Runoff	Peak discharge	=	3.023 cfs
Storm frequency	=	2 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	14,805 cuft
Drainage area	=	7.500 ac	Curve number	=	65*
Basin Slope	=	5.0 %	Hydraulic length	=	100 ft
Tc method	=	TR55	Time of conc. (Tc)	=	25.20 min
Total precip.	=	3.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(7.500 x 65)] / 7.500



TR55 Tc Worksheet

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No. 2

Pre- Offsite

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.170		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.10		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 11.00**	**+**	**0.00**	**+**	**0.00**	**=**	**11.00**
Shallow Concentrated Flow							
Flow length (ft)	= 500.00		120.00		774.00		
Watercourse slope (%)	= 2.00		5.00		1.00		
Surface description	= Unpaved		Unpaved		Unpaved		
Average velocity (ft/s)	=2.28		3.61		1.61		
Travel Time (min)	**= 3.65**	**+**	**0.55**	**+**	**8.00**	**=**	**12.20**
Channel Flow							
X sectional flow area (sqft)	= 2.00		5.00		0.00		
Wetted perimeter (ft)	= 12.00		31.00		0.00		
Channel slope (%)	= 0.50		2.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=2.11						
			4.14				
					0.00		
Flow length (ft)	({0})200.0		96.0		0.0		
Travel Time (min)	**= 1.58**	**+**	**0.39**	**+**	**0.00**	**=**	**1.96**

Total Travel Time, Tc ..... 25.20 min

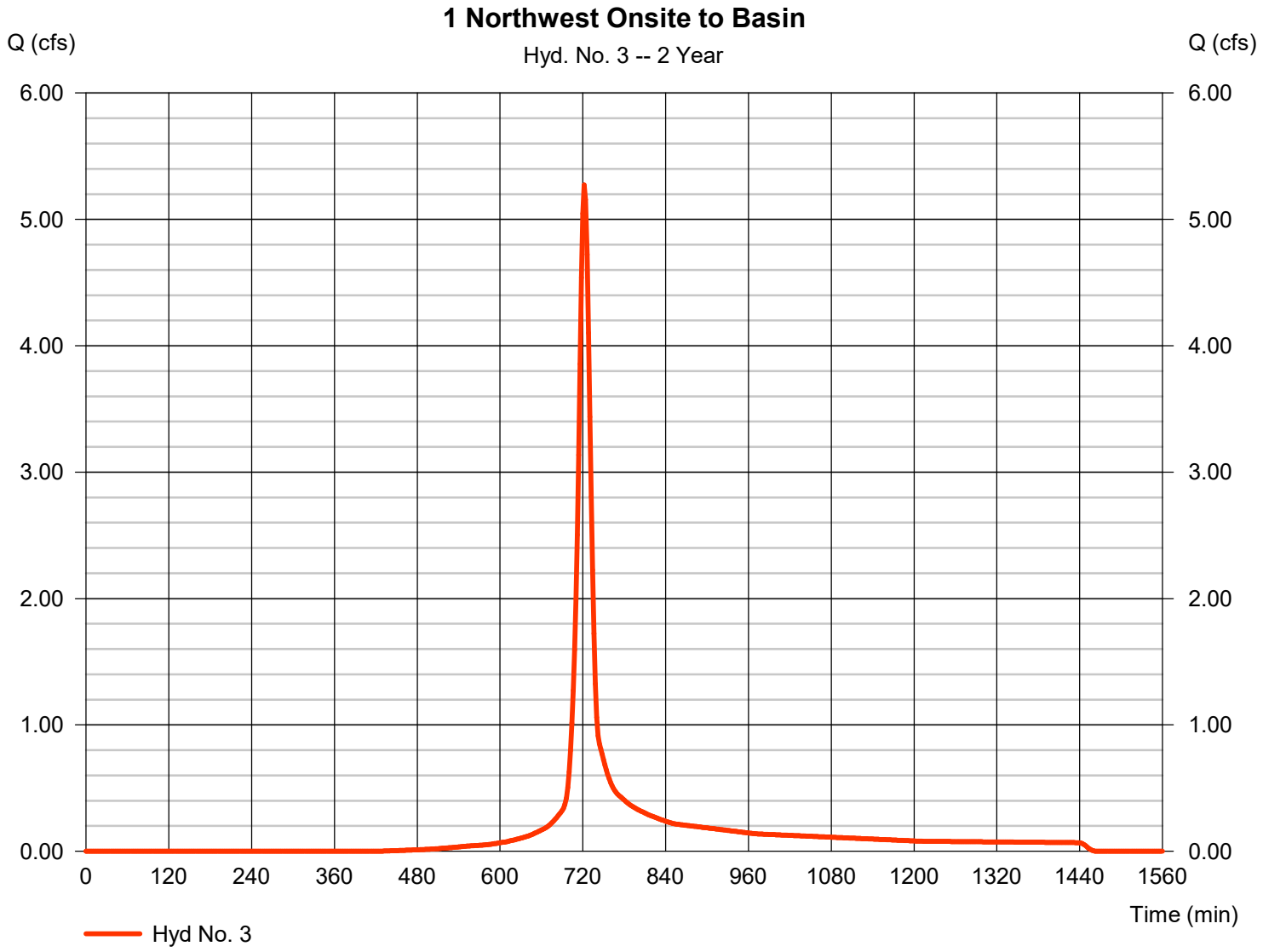
Hydrograph Report

Hyd. No. 3

1 Northwest Onsite to Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	5.273 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	14,805 cuft
Drainage area	=	2.290 ac	Curve number	=	87*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.90 min
Total precip.	=	3.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.180 x 98) + (1.110 x 74)] / 2.290



TR55 Tc Worksheet

Hyd. No. 3

1 Northwest Onsite to Basin

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.10		0.00		0.00		
Land slope (%)	= 5.00		0.00		0.00		
Travel Time (min)	**= 10.05**	**+**	**0.00**	**+**	**0.00**	**=**	**10.05**
Shallow Concentrated Flow							
Flow length (ft)	= 131.00		178.00		0.00		
Watercourse slope (%)	= 3.00		1.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=2.79		1.61		0.00		
Travel Time (min)	**= 0.78**	**+**	**1.84**	**+**	**0.00**	**=**	**2.62**
Channel Flow							
X sectional flow area (sqft)	= 2.00		5.00		0.00		
Wetted perimeter (ft)	= 2.00		31.00		0.00		
Channel slope (%)	= 1.00		2.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=9.93						
			4.14				
					0.00		
Flow length (ft)	({0})516.0		96.0		0.0		
Travel Time (min)	**= 0.87**	**+**	**0.39**	**+**	**0.00**	**=**	**1.25**

Total Travel Time, Tc ..... 13.90 min

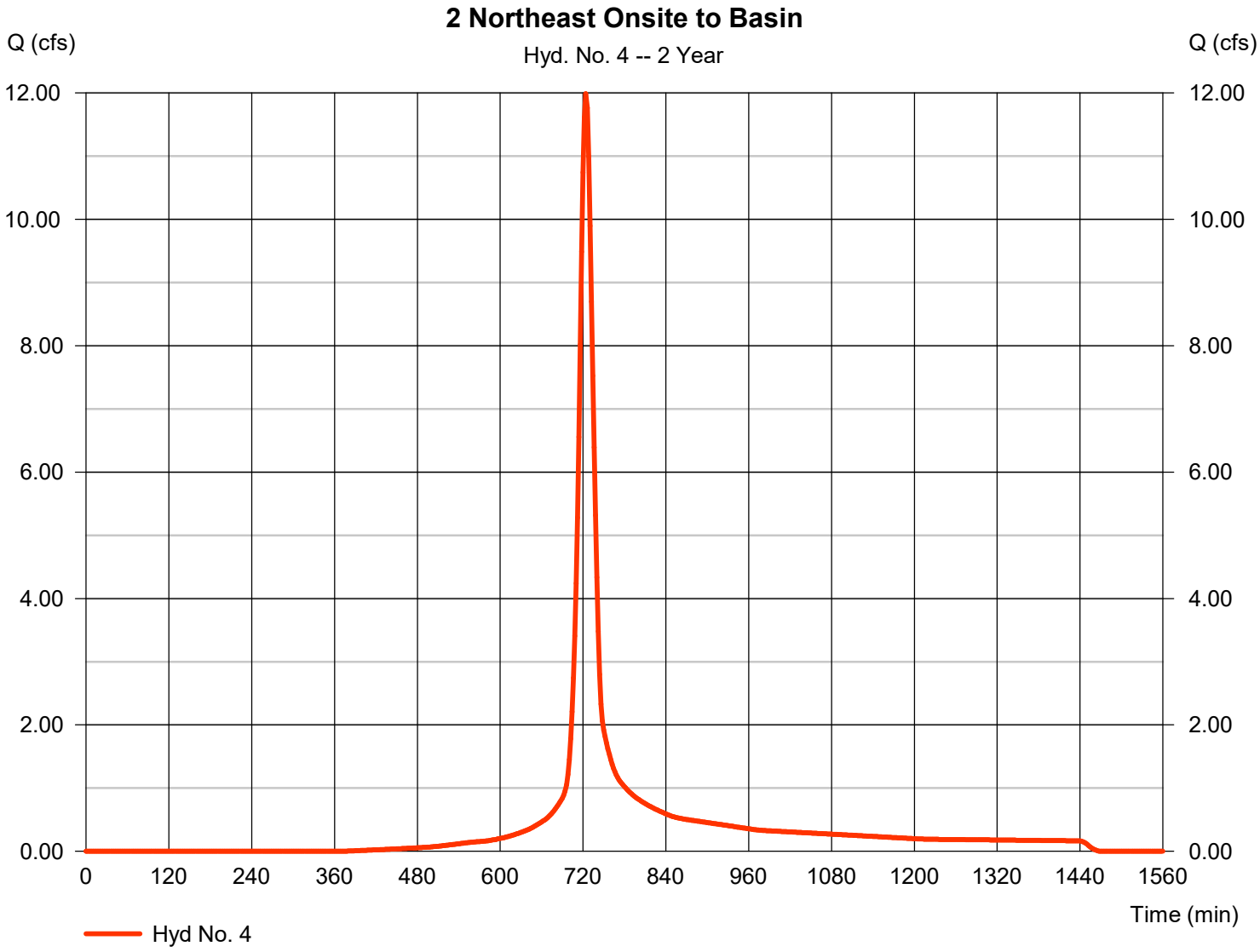
Hydrograph Report

Hyd. No. 4

2 Northeast Onsite to Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.99 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	37,644 cuft
Drainage area	=	5.210 ac	Curve number	=	89*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.90 min
Total precip.	=	3.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.660 x 98) + (1.930 x 74) + (0.620 x 98)] / 5.210



TR55 Tc Worksheet

Hyd. No. 4

2 Northeast Onsite to Basin

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.10		0.00		0.00		
Land slope (%)	= 1.00		0.00		0.00		
Travel Time (min)	**= 19.13**	**+**	**0.00**	**+**	**0.00**	**=**	**19.13**
Shallow Concentrated Flow							
Flow length (ft)	= 0.00		84.00		0.00		
Watercourse slope (%)	= 2.00		6.00		0.00		
Surface description	= Unpaved		Unpaved		Paved		
Average velocity (ft/s)	=2.28		3.95		0.00		
Travel Time (min)	**= 0.00**	**+**	**0.35**	**+**	**0.00**	**=**	**0.35**
Channel Flow							
X sectional flow area (sqft)	= 5.00		0.00		0.00		
Wetted perimeter (ft)	= 31.00		0.00		0.00		
Channel slope (%)	= 2.00		0.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=4.14						
			0.00				
					0.00		
Flow length (ft)	({0})96.0		0.0		0.0		
Travel Time (min)	**= 0.39**	**+**	**0.00**	**+**	**0.00**	**=**	**0.39**

Total Travel Time, Tc ..... 19.90 min

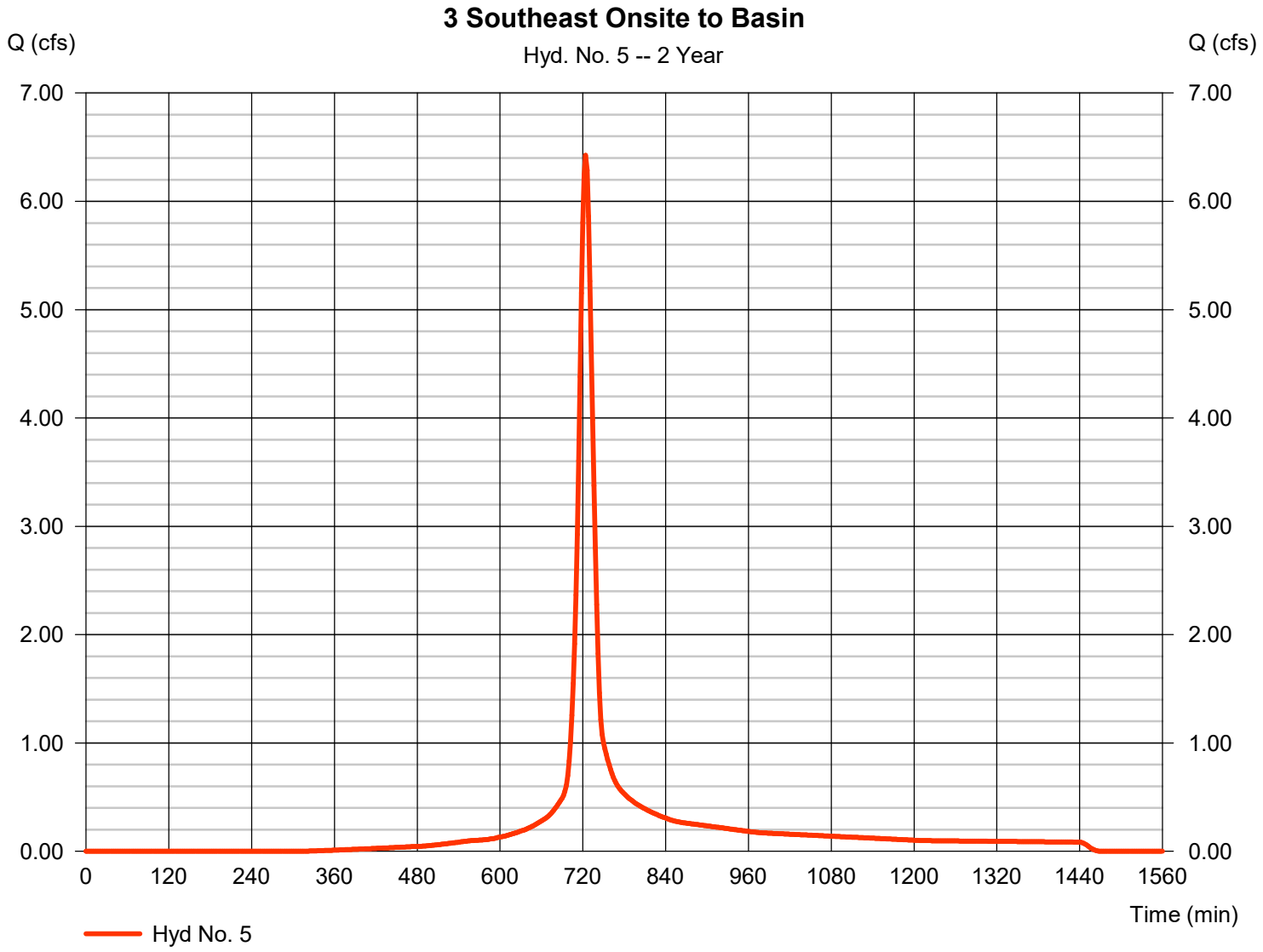
Hydrograph Report

Hyd. No. 5

3 Southeast Onsite to Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	6.426 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	20,351 cuft
Drainage area	=	2.590 ac	Curve number	=	91*
Basin Slope	=	5.0 %	Hydraulic length	=	200 ft
Tc method	=	TR55	Time of conc. (Tc)	=	18.70 min
Total precip.	=	3.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.810 x 98) + (0.780 x 74)] / 2.590



TR55 Tc Worksheet

Hyd. No. 5

3 Southeast Onsite to Basin

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.10		0.00		0.00		
Land slope (%)	= 2.00		0.00		0.00		
Travel Time (min)	**= 14.50**	**+**	**0.00**	**+**	**0.00**	**=**	**14.50**
Shallow Concentrated Flow							
Flow length (ft)	= 639.00		0.00		0.00		
Watercourse slope (%)	= 3.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=2.79		0.00		0.00		
Travel Time (min)	**= 3.81**	**+**	**0.00**	**+**	**0.00**	**=**	**3.81**
Channel Flow							
X sectional flow area (sqft)	= 2.00		5.00		0.00		
Wetted perimeter (ft)	= 2.00		31.00		0.00		
Channel slope (%)	= 1.00		2.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=9.93						
			4.14				
					0.00		
Flow length (ft)	({0})0.0		96.0		0.0		
Travel Time (min)	**= 0.00**	**+**	**0.39**	**+**	**0.00**	**=**	**0.39**

Total Travel Time, Tc ..... 18.70 min

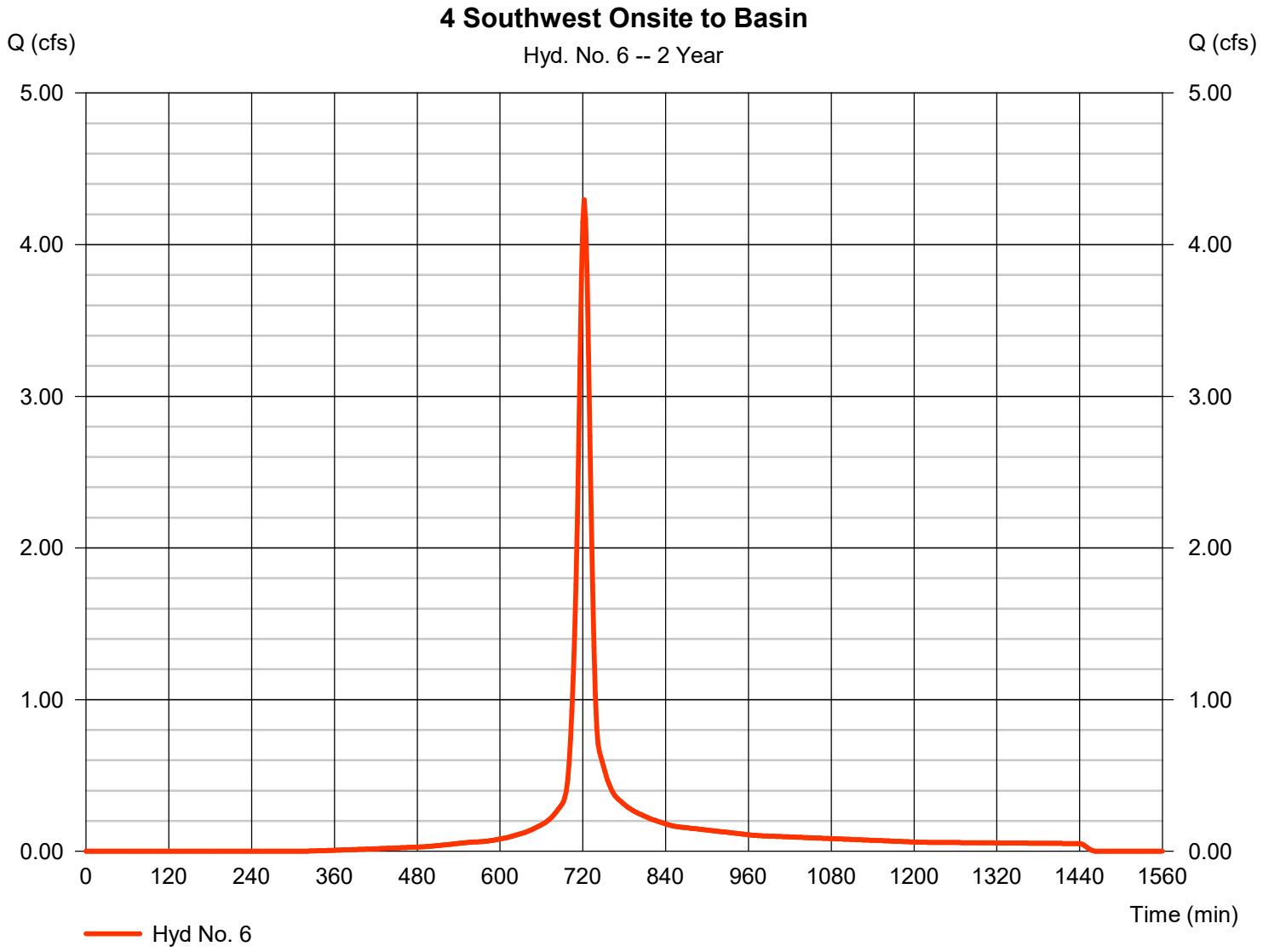
Hydrograph Report

Hyd. No. 6

4 Southwest Onsite to Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	4.297 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	12,257 cuft
Drainage area	=	1.600 ac	Curve number	=	91*
Basin Slope	=	5.0 %	Hydraulic length	=	126 ft
Tc method	=	TR55	Time of conc. (Tc)	=	14.40 min
Total precip.	=	3.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.120 x 98) + (0.480 x 74)] / 1.600



TR55 Tc Worksheet

Hyd. No. 6

4 Southwest Onsite to Basin

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.10		0.00		0.00		
Land slope (%)	= 9.00		0.00		0.00		
Travel Time (min)	**= 7.94**	**+**	**0.00**	**+**	**0.00**	**=**	**7.94**
Shallow Concentrated Flow							
Flow length (ft)	= 676.00		0.00		0.00		
Watercourse slope (%)	= 2.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=2.28		0.00		0.00		
Travel Time (min)	**= 4.94**	**+**	**0.00**	**+**	**0.00**	**=**	**4.94**
Channel Flow							
X sectional flow area (sqft)	= 2.00		5.00		0.00		
Wetted perimeter (ft)	= 2.00		31.00		0.00		
Channel slope (%)	= 1.00		2.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=9.93						
			4.14				
					0.00		
Flow length (ft)	({0})700.0		96.0		0.0		
Travel Time (min)	**= 1.17**	**+**	**0.39**	**+**	**0.00**	**=**	**1.56**

Total Travel Time, Tc ..... 14.40 min

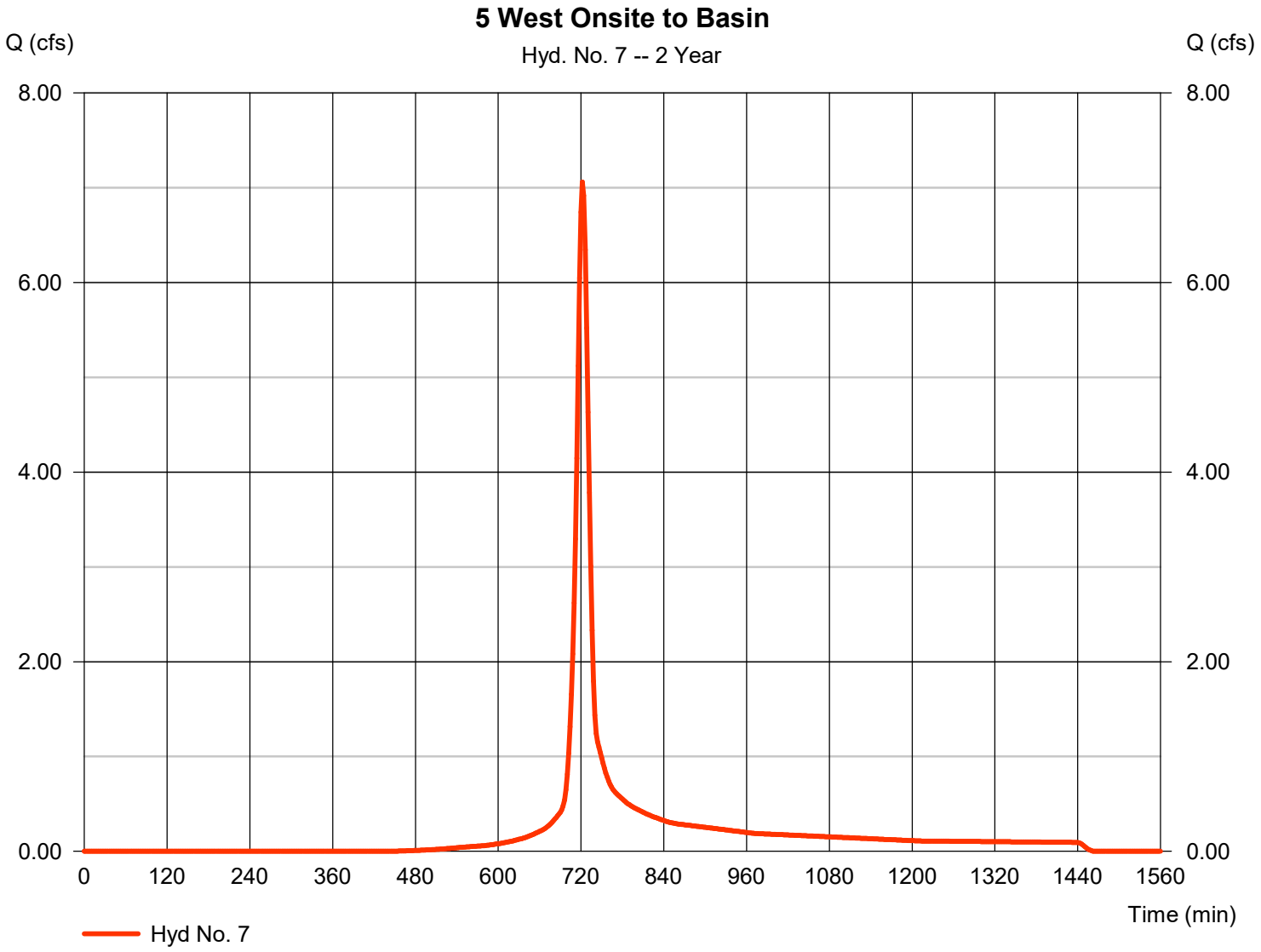
Hydrograph Report

Hyd. No. 7

5 West Onsite to Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	7.062 cfs
Storm frequency	=	2 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	19,803 cuft
Drainage area	=	3.200 ac	Curve number	=	86*
Basin Slope	=	5.0 %	Hydraulic length	=	100 ft
Tc method	=	TR55	Time of conc. (Tc)	=	14.20 min
Total precip.	=	3.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.650 x 98) + (1.550 x 74)] / 3.200



TR55 Tc Worksheet

Hyd. No. 7

5 West Onsite to Basin

Description	A		B		C		Totals
Sheet Flow							
Manning's n-value	= 0.240		0.011		0.011		
Flow length (ft)	= 100.0		0.0		0.0		
Two-year 24-hr precip. (in)	= 3.10		0.00		0.00		
Land slope (%)	= 6.00		0.00		0.00		
Travel Time (min)	**= 9.34**	**+**	**0.00**	**+**	**0.00**	**=**	**9.34**
Shallow Concentrated Flow							
Flow length (ft)	= 398.00		0.00		0.00		
Watercourse slope (%)	= 1.00		0.00		0.00		
Surface description	= Unpaved		Paved		Paved		
Average velocity (ft/s)	=1.61		0.00		0.00		
Travel Time (min)	**= 4.11**	**+**	**0.00**	**+**	**0.00**	**=**	**4.11**
Channel Flow							
X sectional flow area (sqft)	= 2.00		5.00		0.00		
Wetted perimeter (ft)	= 2.00		31.00		0.00		
Channel slope (%)	= 1.00		2.00		0.00		
Manning's n-value	= 0.015		0.015		0.015		
Velocity (ft/s)	=9.93						
			4.14				
					0.00		
Flow length (ft)	({0})200.0		96.0		0.0		
Travel Time (min)	**= 0.34**	**+**	**0.39**	**+**	**0.00**	**=**	**0.72**

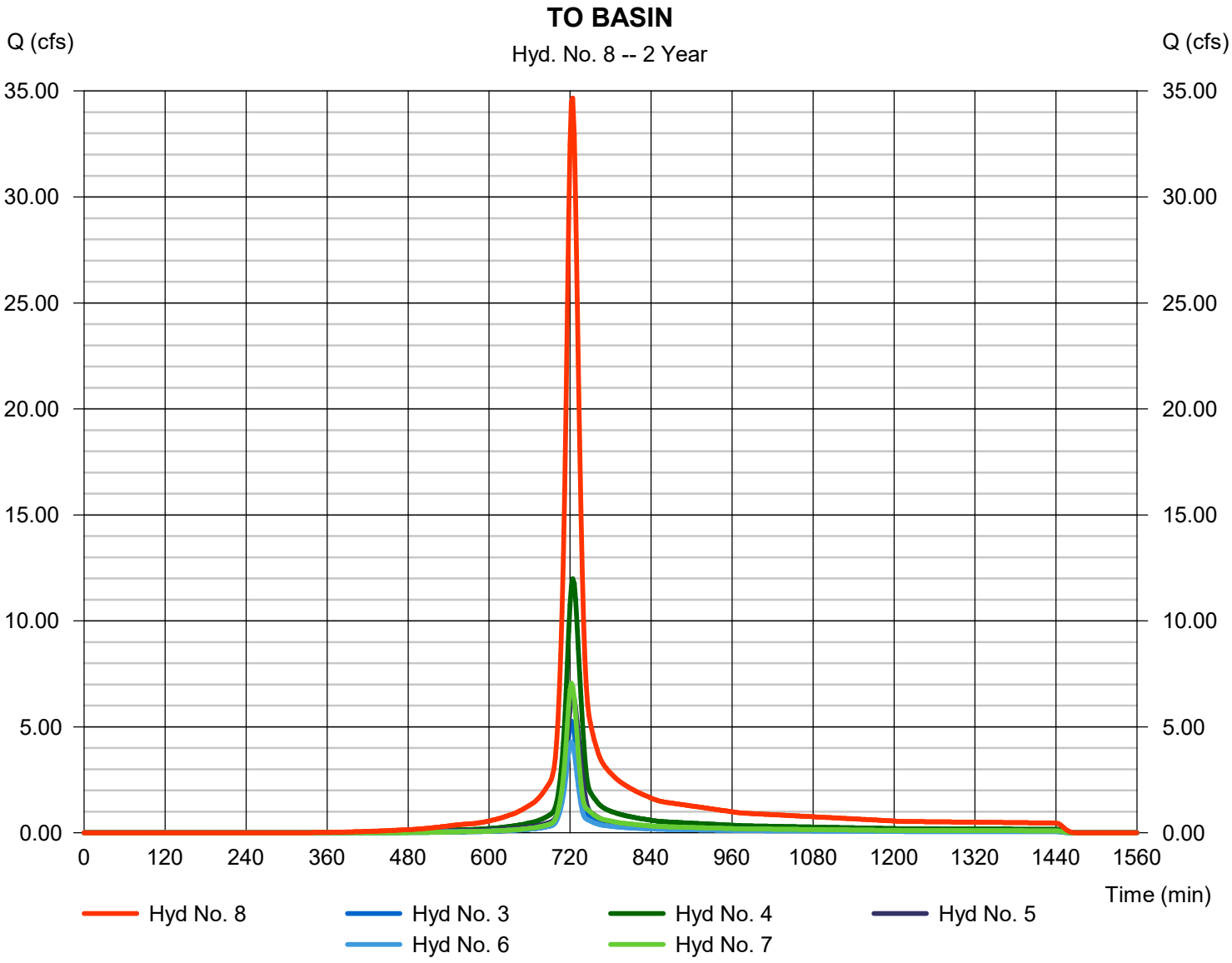
Total Travel Time, Tc ..... 14.20 min

Hydrograph Report

Hyd. No. 8

TO BASIN

Hydrograph type	=	Combine	Peak discharge	=	34.66 cfs
Storm frequency	=	2 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	104,860 cuft
Inflow hyds.	=	3, 4, 5, 6, 7	Contrib. drain. area	=	14.890 ac



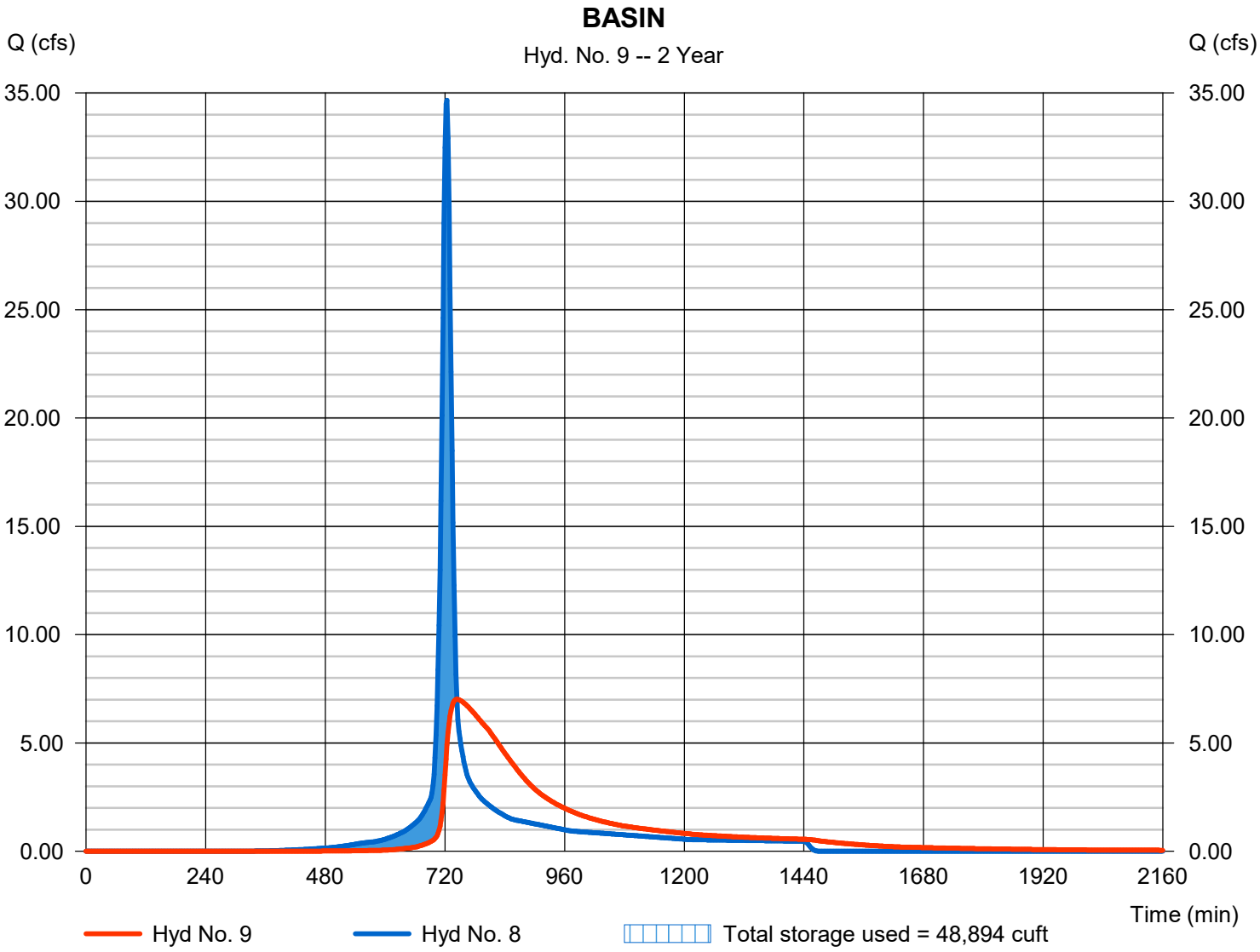
Hydrograph Report

Hyd. No. 9

BASIN

Hydrograph type	=	Reservoir	Peak discharge	=	7.020 cfs
Storm frequency	=	2 yrs	Time to peak	=	744 min
Time interval	=	2 min	Hyd. volume	=	104,807 cuft
Inflow hyd. No.	=	8 - TO BASIN	Max. Elevation	=	921.67 ft
Reservoir name	=	Regional Detention	Max. Storage	=	48,894 cuft

Storage Indication method used.



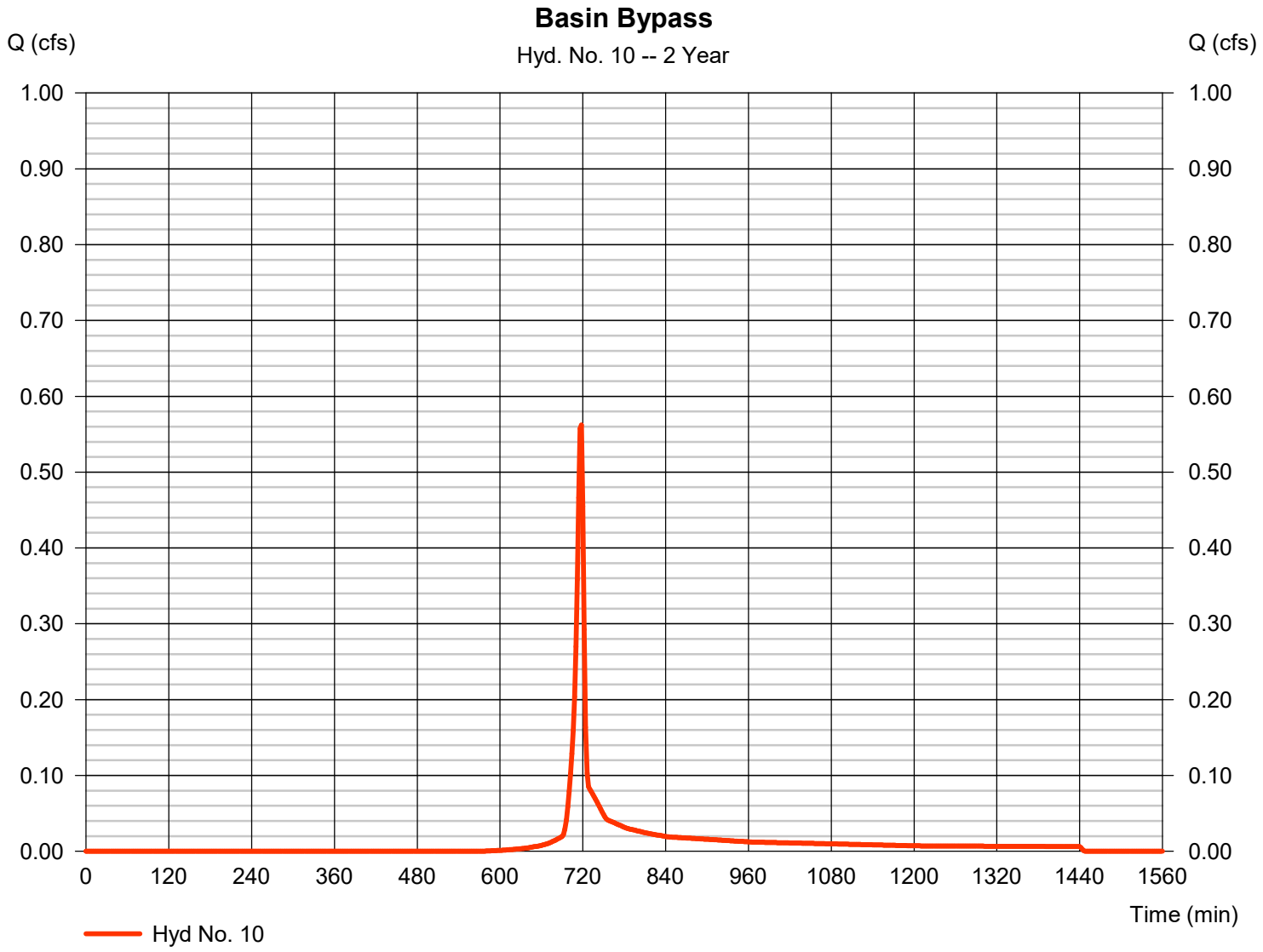
Hydrograph Report

Hyd. No. 10

Basin Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	0.562 cfs
Storm frequency	=	2 yrs	Time to peak	=	718 min
Time interval	=	2 min	Hyd. volume	=	1,128 cuft
Drainage area	=	0.250 ac	Curve number	=	80*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	3.10 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.070 x 98) + (0.180 x 74)] / 0.250

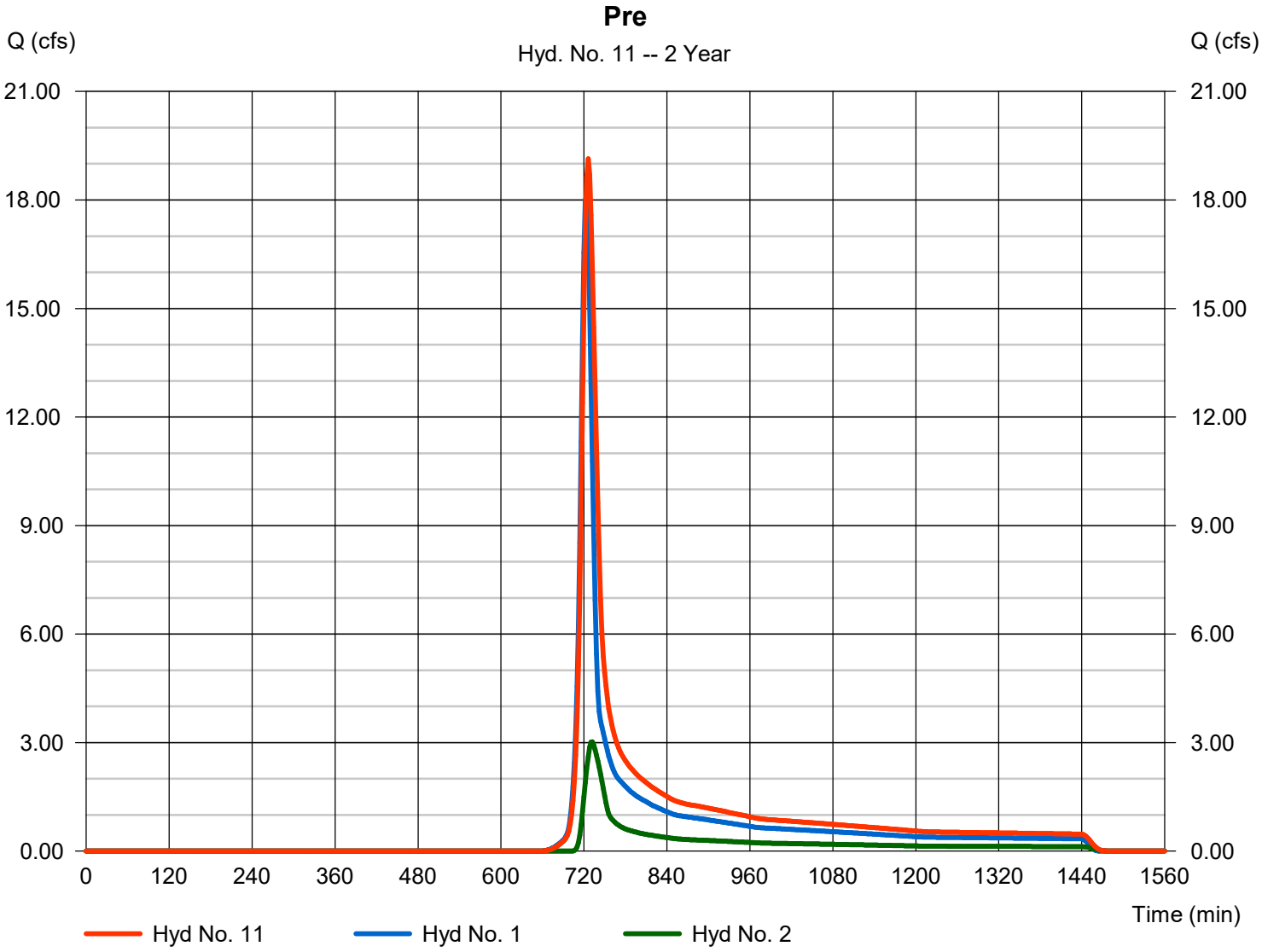


Hydrograph Report

Hyd. No. 11

Pre

Hydrograph type	= Combine	Peak discharge	= 19.14 cfs
Storm frequency	= 2 yrs	Time to peak	= 726 min
Time interval	= 2 min	Hyd. volume	= 69,546 cuft
Inflow hyds.	= 1, 2	Contrib. drain. area	= 23.010 ac

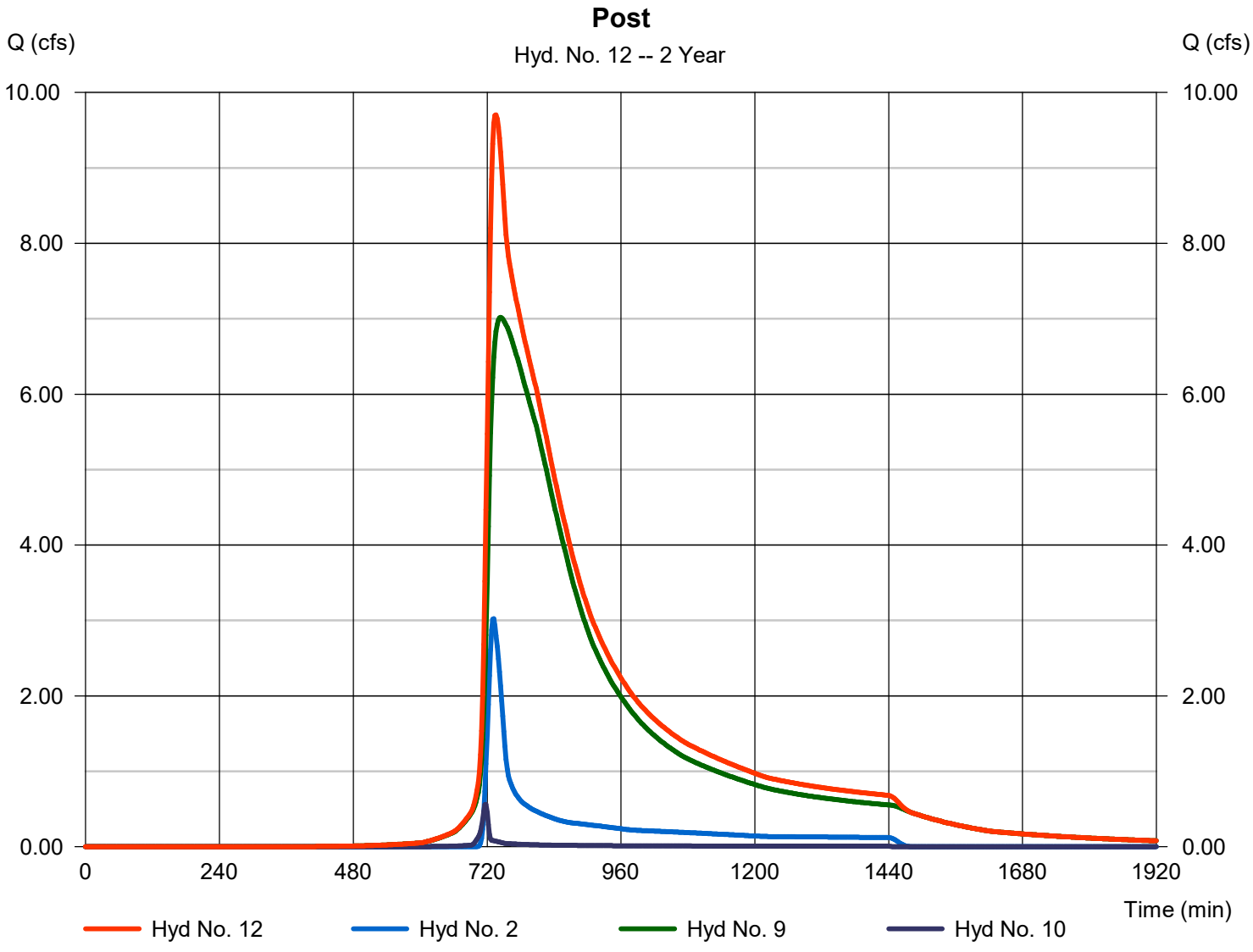


Hydrograph Report

Hyd. No. 12

Post

Hydrograph type	=	Combine	Peak discharge	=	9.704 cfs
Storm frequency	=	2 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	120,739 cuft
Inflow hyds.	=	2, 9, 10	Contrib. drain. area	=	7.750 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	56.95	2	722	159,708	------	------	------	Pre-Onsite
2	SCS Runoff	14.88	2	730	56,664	------	------	------	Pre- Offsite
3	SCS Runoff	11.81	2	722	34,058	------	------	------	1 Northwest Onsite to Basin
4	SCS Runoff	25.83	2	724	83,522	------	------	------	2 Northeast Onsite to Basin
5	SCS Runoff	13.29	2	724	43,573	------	------	------	3 Southeast Onsite to Basin
6	SCS Runoff	8.859	2	722	26,245	------	------	------	4 Southwest Onsite to Basin
7	SCS Runoff	16.17	2	722	46,396	------	------	------	5 West Onsite to Basin
8	Combine	75.08	2	722	233,793	3, 4, 5, 6, 7	------	------	TO BASIN
9	Reservoir	16.68	2	742	233,740	8	923.28	107,383	BASIN
10	SCS Runoff	1.449	2	716	2,965	------	------	------	Basin Bypass
11	Combine	65.94	2	726	220,467	1, 2,	------	------	Pre
12	Combine	29.72	2	732	293,369	2, 9, 10,	------	------	Post

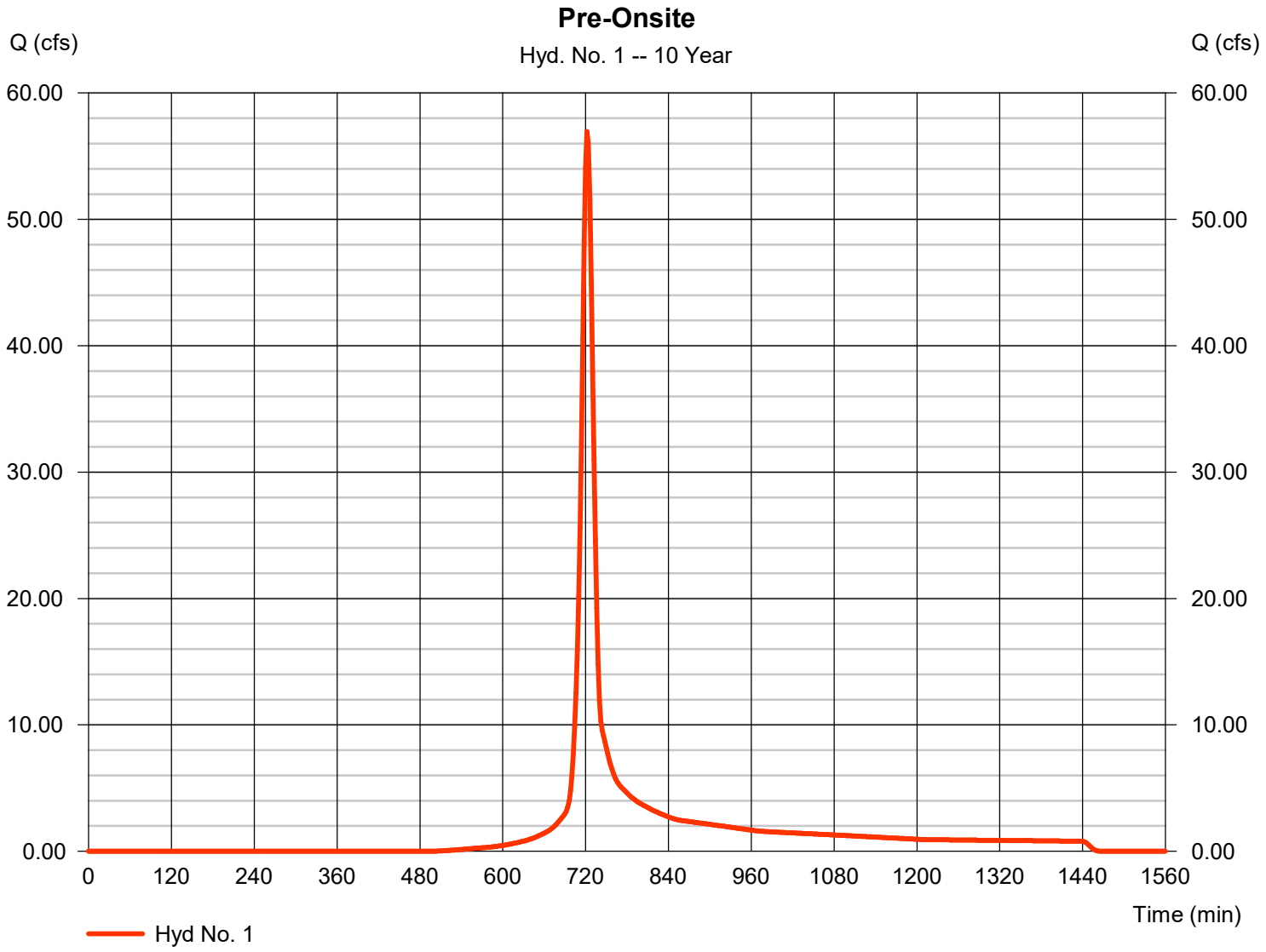
Hydrograph Report

Hyd. No. 1

Pre-Onsite

Hydrograph type	=	SCS Runoff	Peak discharge	=	56.95 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	159,708 cuft
Drainage area	=	15.510 ac	Curve number	=	74*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	15.30 min
Total precip.	=	5.67 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(15.510 x 74)] / 15.510



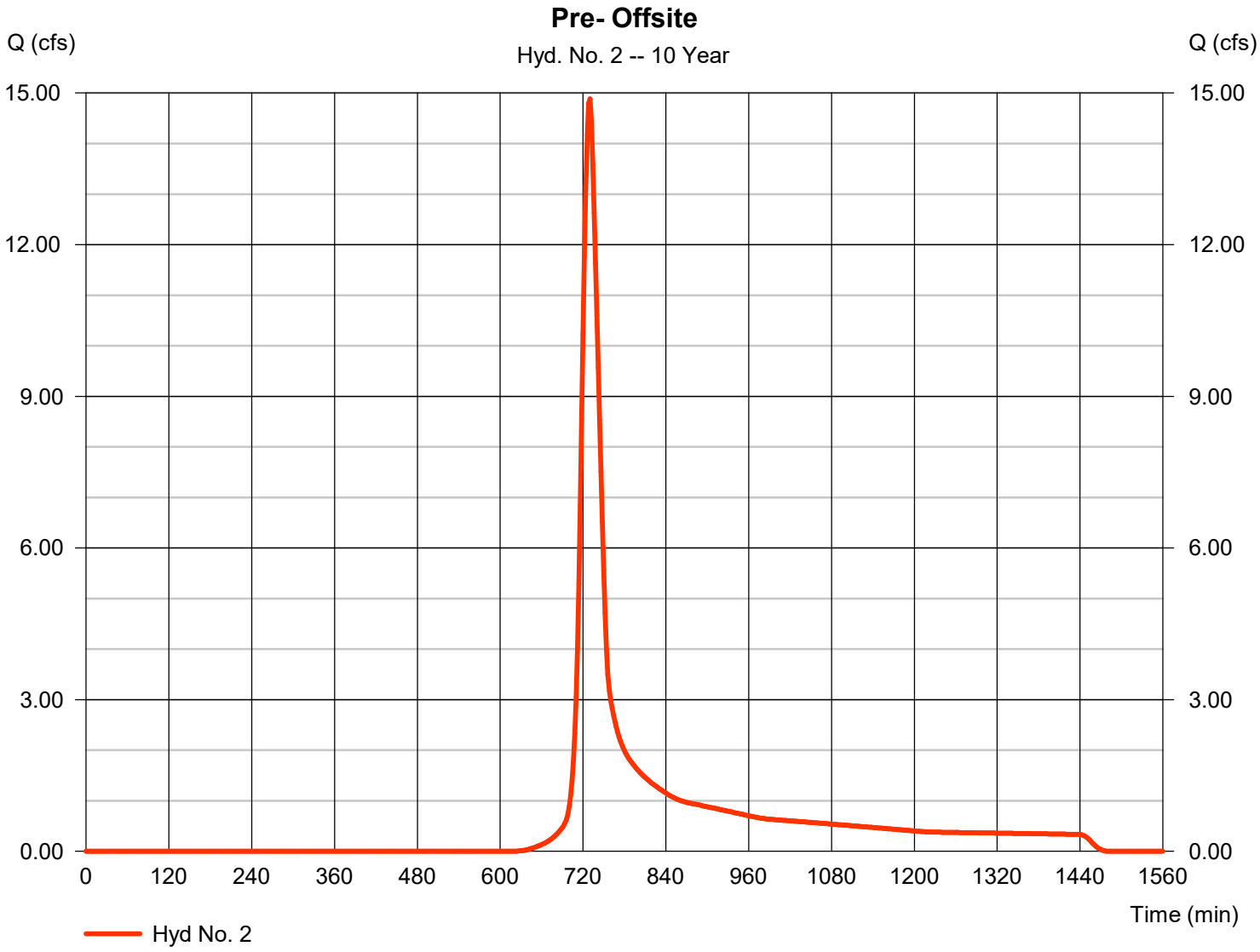
Hydrograph Report

Hyd. No. 2

Pre- Offsite

Hydrograph type	=	SCS Runoff	Peak discharge	=	14.88 cfs
Storm frequency	=	10 yrs	Time to peak	=	730 min
Time interval	=	2 min	Hyd. volume	=	56,664 cuft
Drainage area	=	7.500 ac	Curve number	=	65*
Basin Slope	=	5.0 %	Hydraulic length	=	100 ft
Tc method	=	TR55	Time of conc. (Tc)	=	25.20 min
Total precip.	=	5.67 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(7.500 x 65)] / 7.500



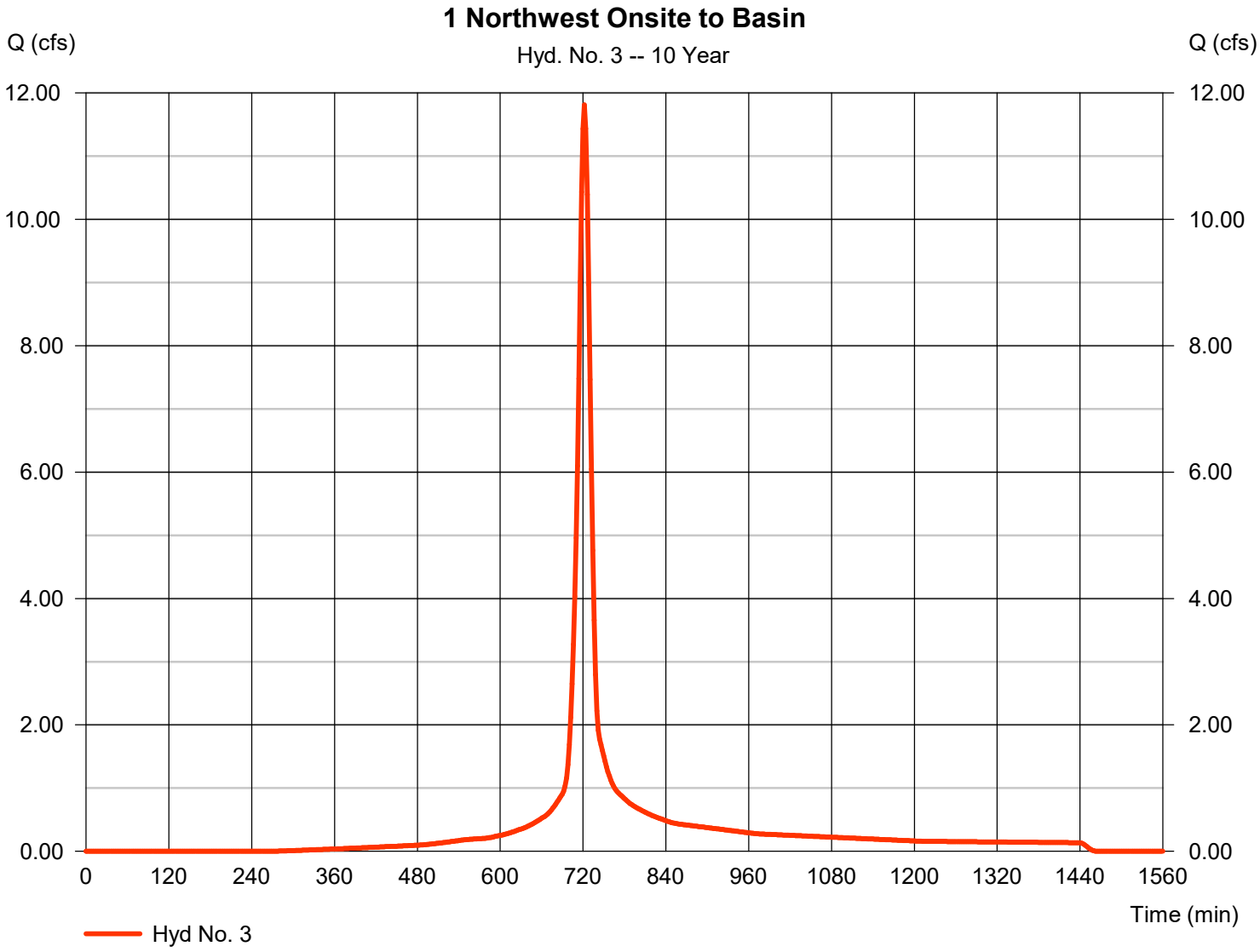
Hydrograph Report

Hyd. No. 3

1 Northwest Onsite to Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	11.81 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	34,058 cuft
Drainage area	=	2.290 ac	Curve number	=	87*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.90 min
Total precip.	=	5.67 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.180 x 98) + (1.110 x 74)] / 2.290



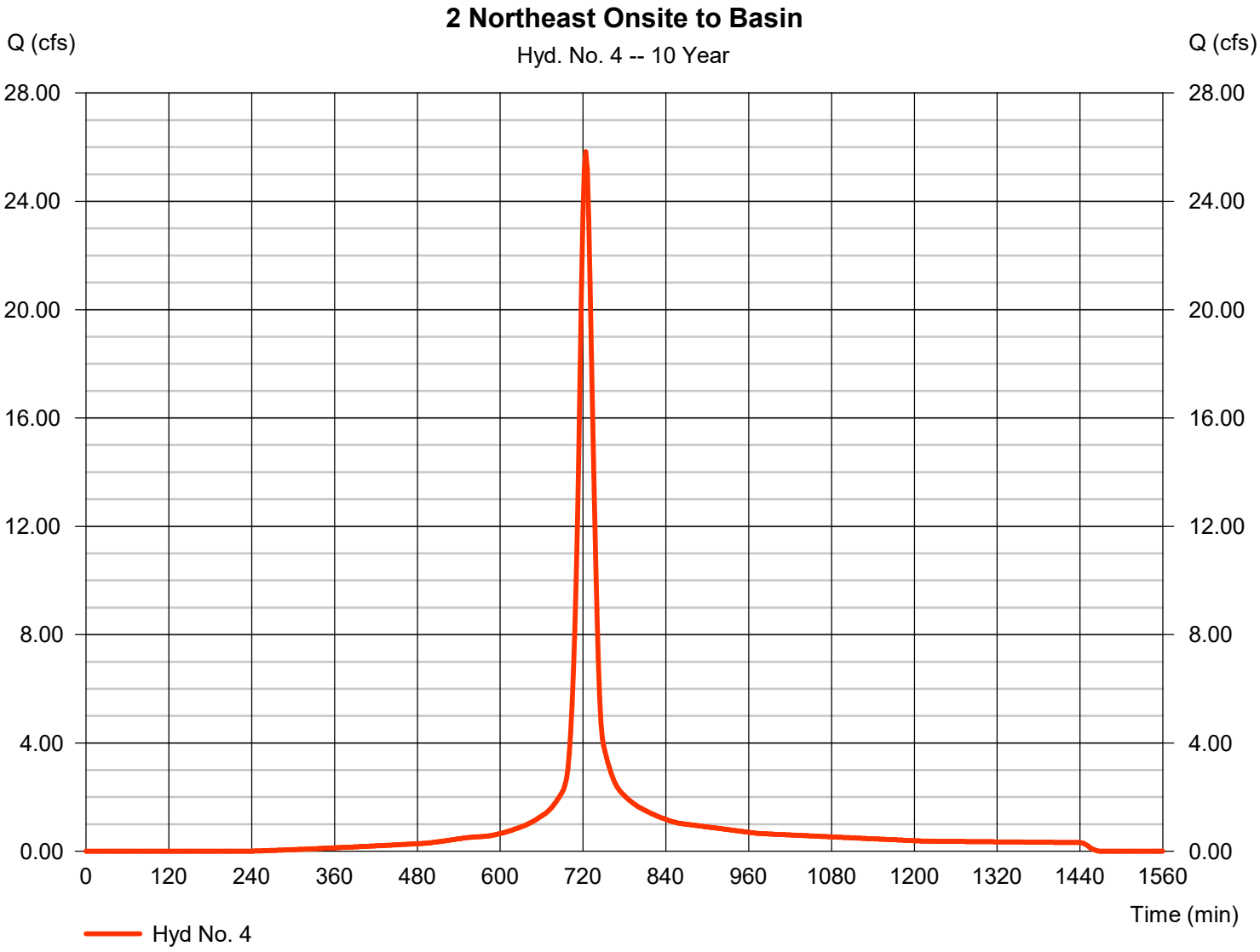
Hydrograph Report

Hyd. No. 4

2 Northeast Onsite to Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	25.83 cfs
Storm frequency	=	10 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	83,522 cuft
Drainage area	=	5.210 ac	Curve number	=	89*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.90 min
Total precip.	=	5.67 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.660 x 98) + (1.930 x 74) + (0.620 x 98)] / 5.210



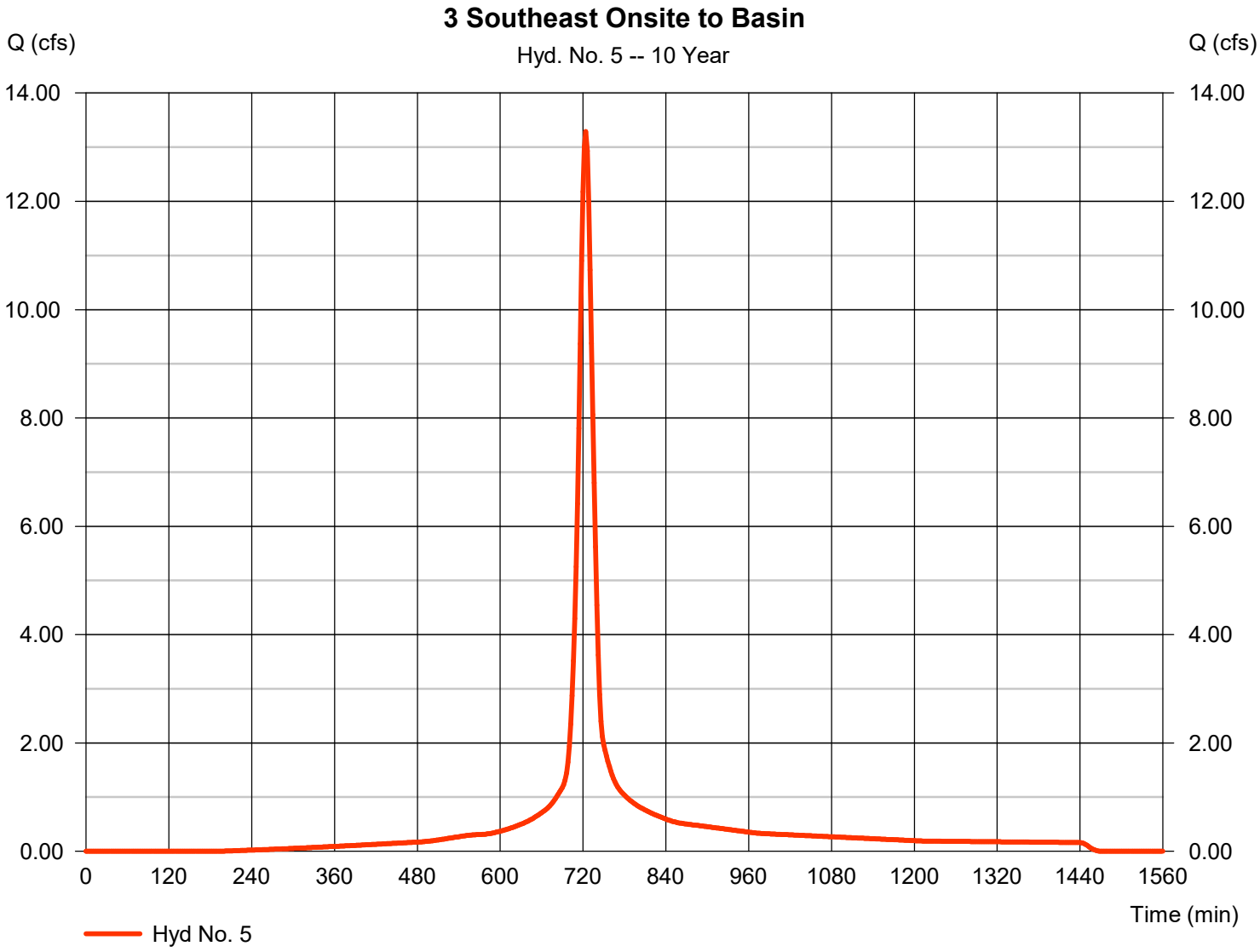
Hydrograph Report

Hyd. No. 5

3 Southeast Onsite to Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	13.29 cfs
Storm frequency	=	10 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	43,573 cuft
Drainage area	=	2.590 ac	Curve number	=	91*
Basin Slope	=	5.0 %	Hydraulic length	=	200 ft
Tc method	=	TR55	Time of conc. (Tc)	=	18.70 min
Total precip.	=	5.67 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.810 x 98) + (0.780 x 74)] / 2.590



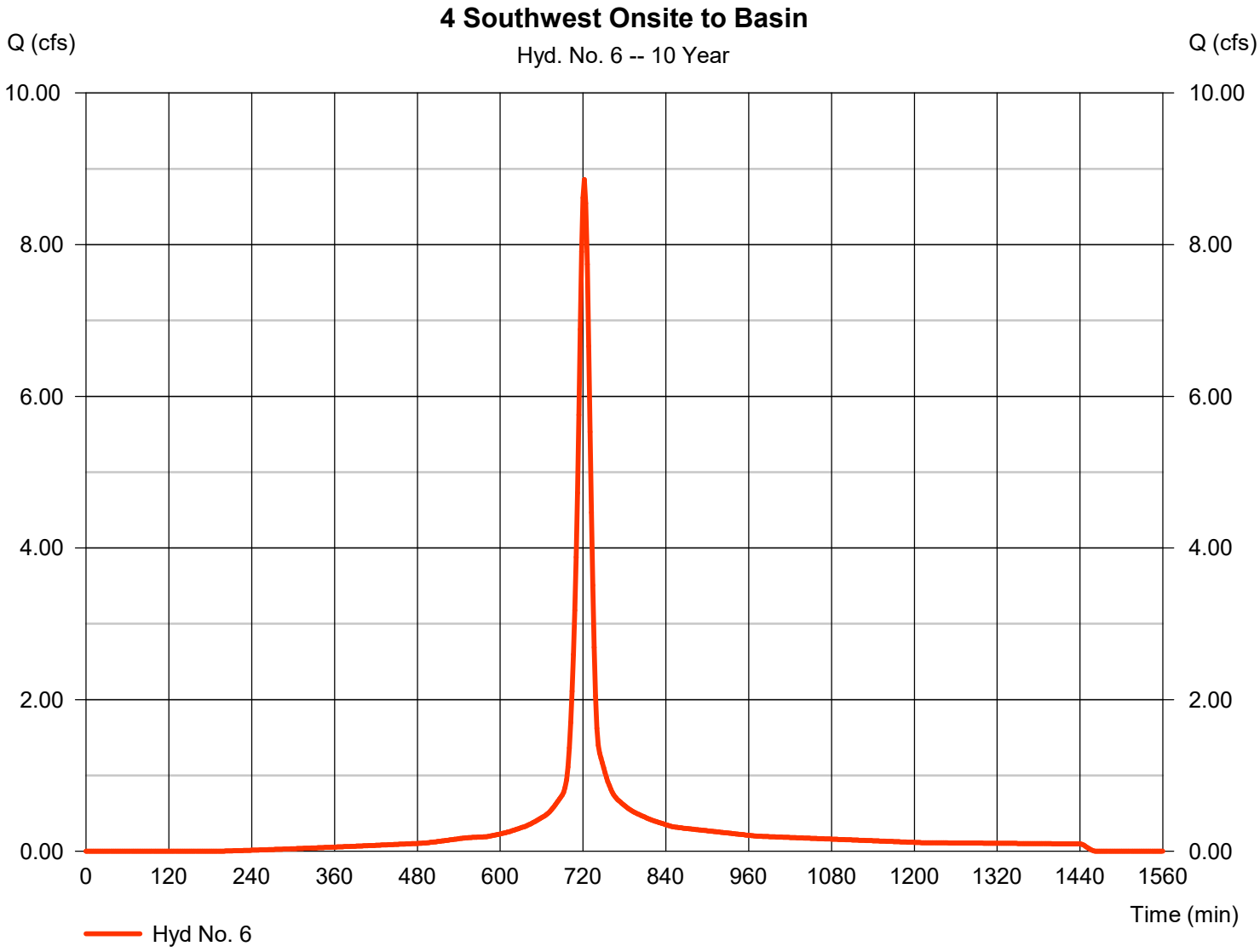
Hydrograph Report

Hyd. No. 6

4 Southwest Onsite to Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	8.859 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	26,245 cuft
Drainage area	=	1.600 ac	Curve number	=	91*
Basin Slope	=	5.0 %	Hydraulic length	=	126 ft
Tc method	=	TR55	Time of conc. (Tc)	=	14.40 min
Total precip.	=	5.67 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.120 x 98) + (0.480 x 74)] / 1.600



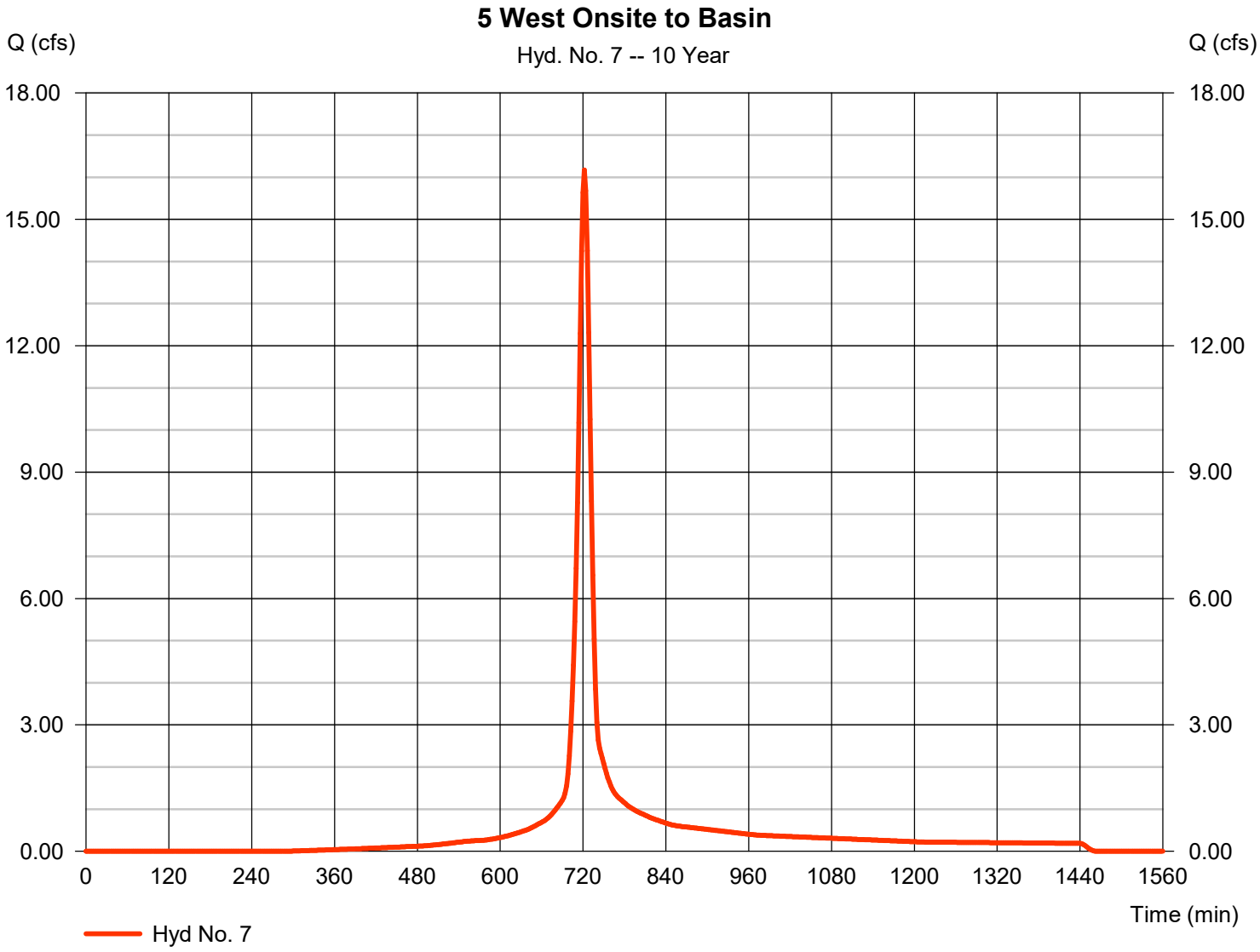
Hydrograph Report

Hyd. No. 7

5 West Onsite to Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	16.17 cfs
Storm frequency	=	10 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	46,396 cuft
Drainage area	=	3.200 ac	Curve number	=	86*
Basin Slope	=	5.0 %	Hydraulic length	=	100 ft
Tc method	=	TR55	Time of conc. (Tc)	=	14.20 min
Total precip.	=	5.67 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.650 x 98) + (1.550 x 74)] / 3.200

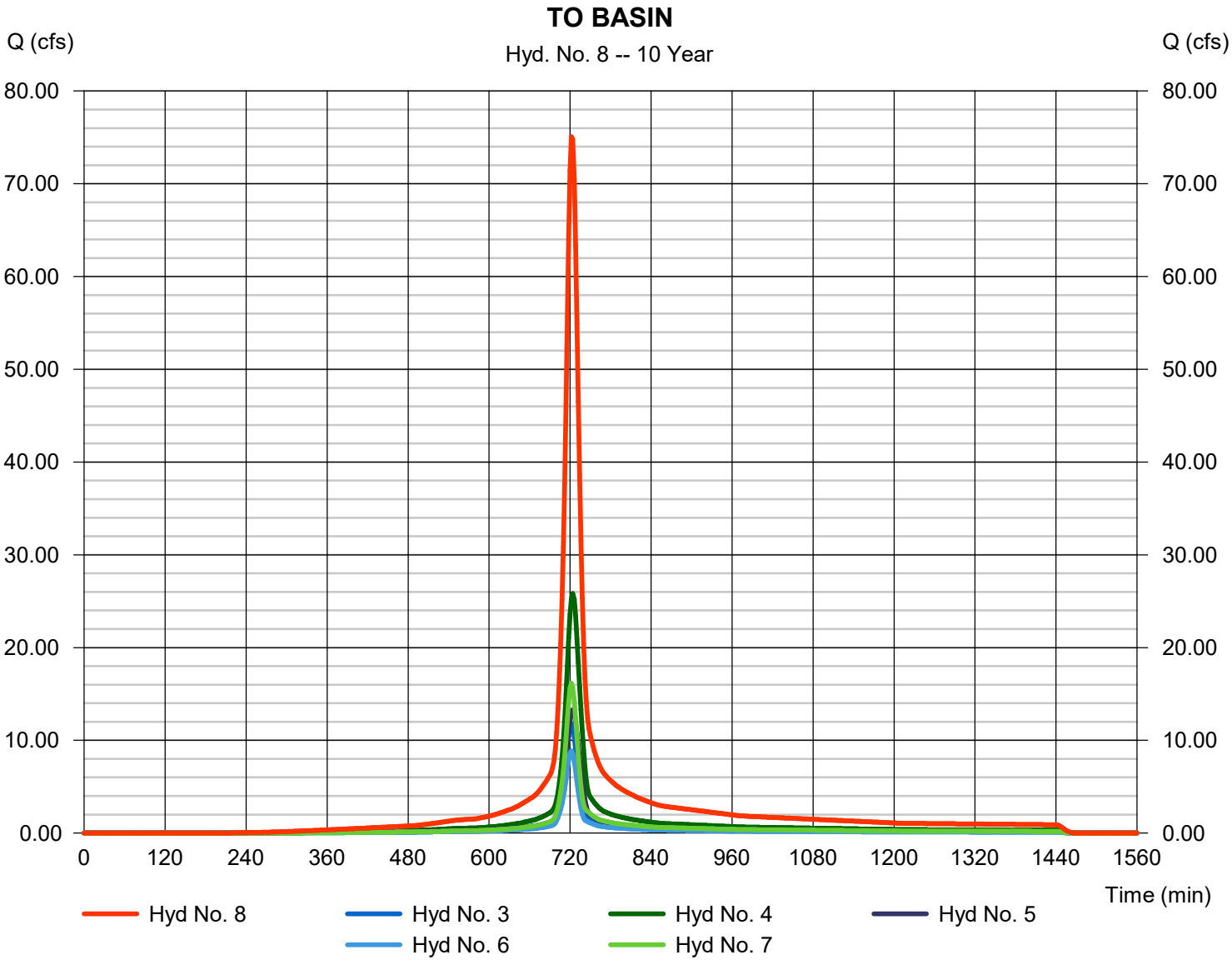


Hydrograph Report

Hyd. No. 8

TO BASIN

Hydrograph type	= Combine	Peak discharge	= 75.08 cfs
Storm frequency	= 10 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 233,793 cuft
Inflow hyds.	= 3, 4, 5, 6, 7	Contrib. drain. area	= 14.890 ac



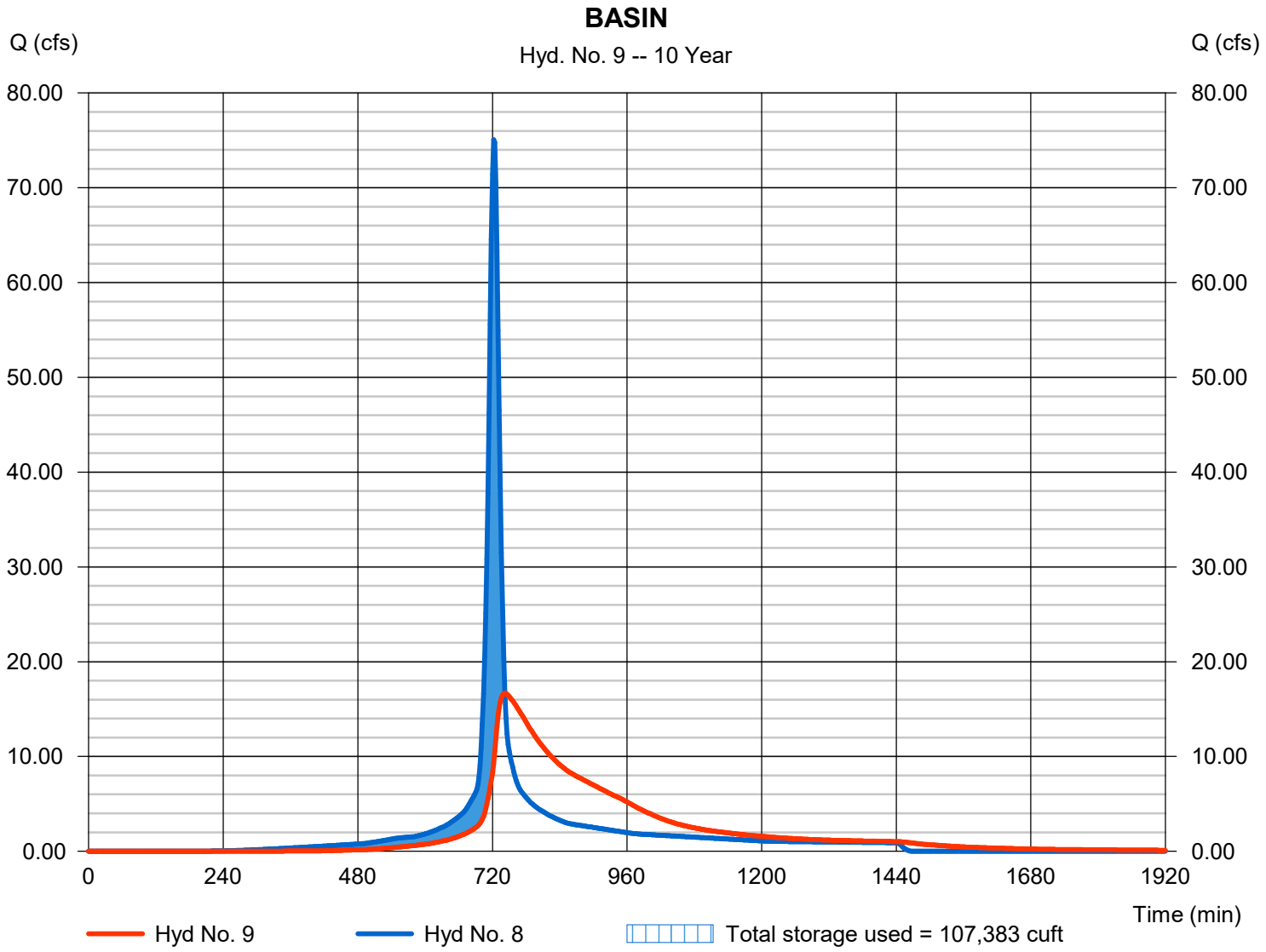
Hydrograph Report

Hyd. No. 9

BASIN

Hydrograph type	=	Reservoir	Peak discharge	=	16.68 cfs
Storm frequency	=	10 yrs	Time to peak	=	742 min
Time interval	=	2 min	Hyd. volume	=	233,740 cuft
Inflow hyd. No.	=	8 - TO BASIN	Max. Elevation	=	923.28 ft
Reservoir name	=	Regional Detention	Max. Storage	=	107,383 cuft

Storage Indication method used.



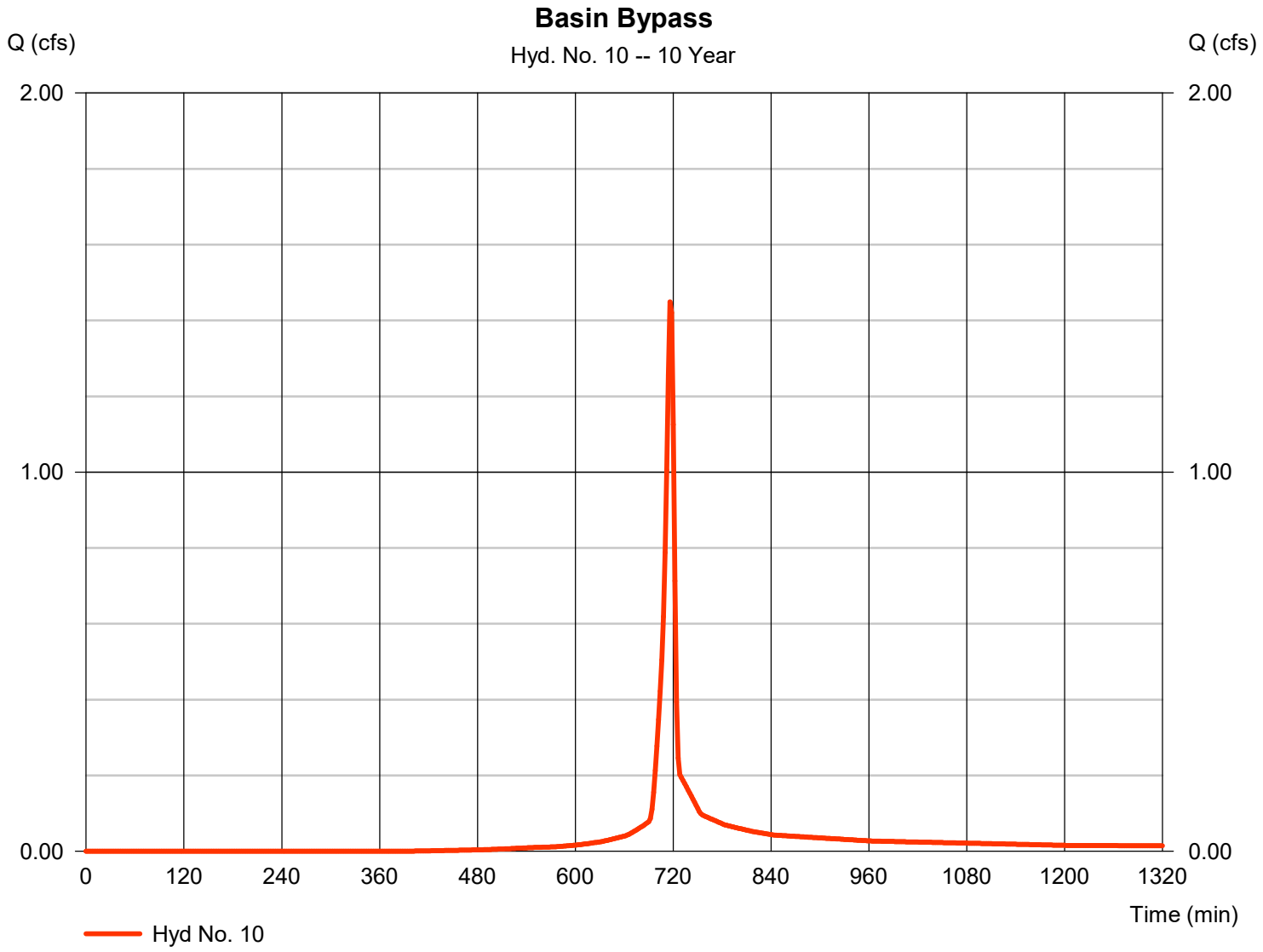
Hydrograph Report

Hyd. No. 10

Basin Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	1.449 cfs
Storm frequency	=	10 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	2,965 cuft
Drainage area	=	0.250 ac	Curve number	=	80*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	5.67 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.070 x 98) + (0.180 x 74)] / 0.250

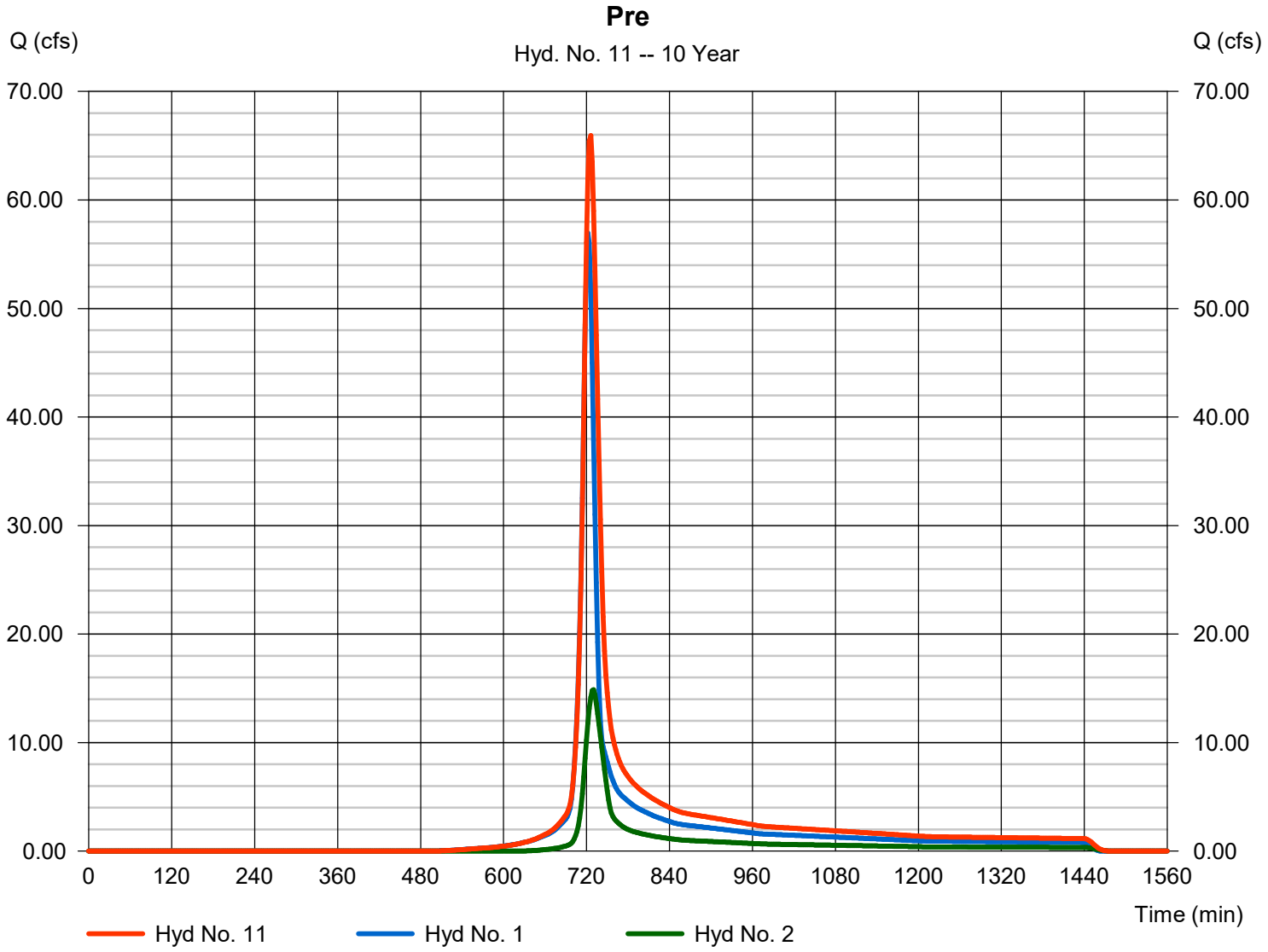


Hydrograph Report

Hyd. No. 11

Pre

Hydrograph type	=	Combine	Peak discharge	=	65.94 cfs
Storm frequency	=	10 yrs	Time to peak	=	726 min
Time interval	=	2 min	Hyd. volume	=	220,467 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	23.010 ac

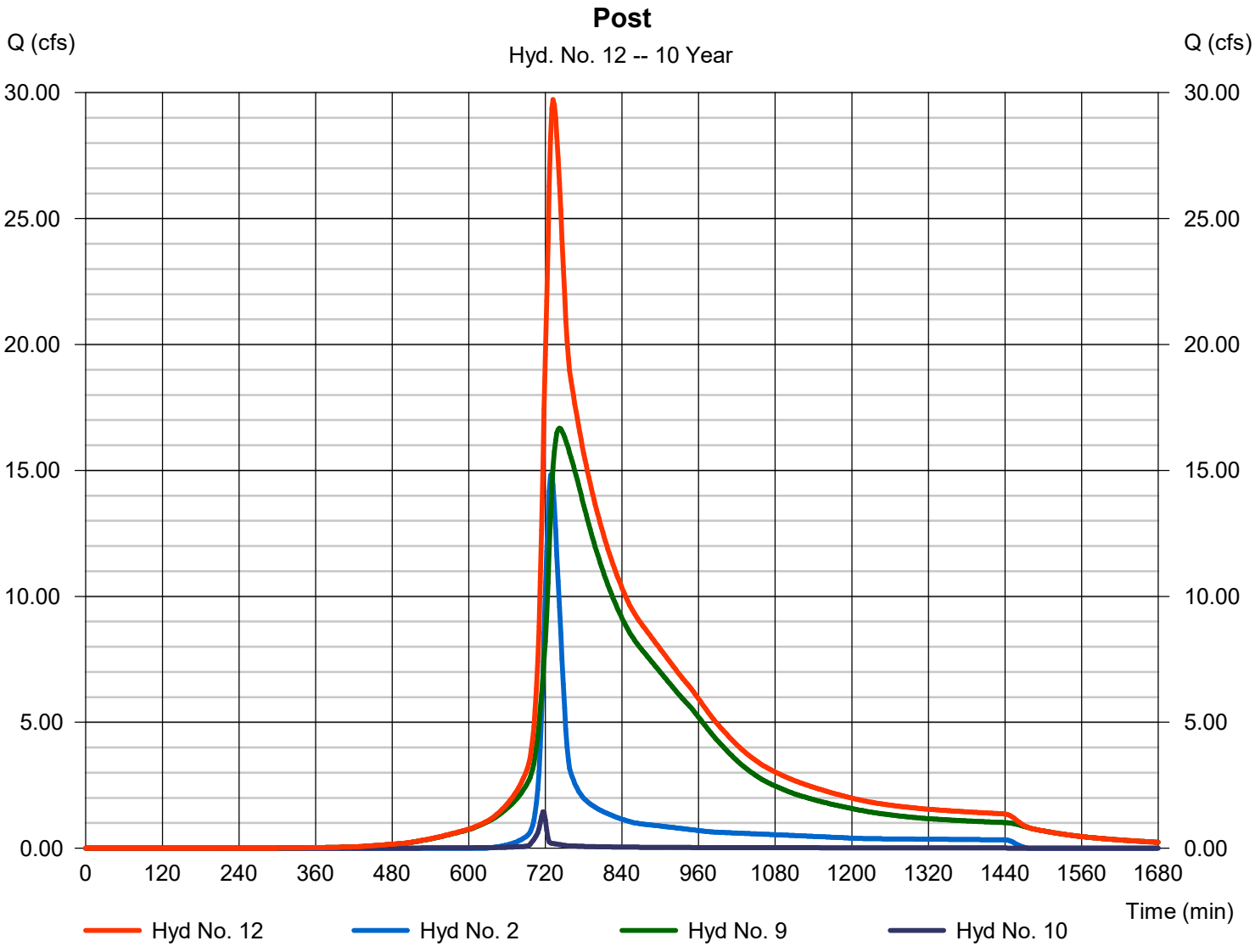


Hydrograph Report

Hyd. No. 12

Post

Hydrograph type	=	Combine	Peak discharge	=	29.72 cfs
Storm frequency	=	10 yrs	Time to peak	=	732 min
Time interval	=	2 min	Hyd. volume	=	293,369 cuft
Inflow hyds.	=	2, 9, 10	Contrib. drain. area	=	7.750 ac



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2023

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	117.54	2	722	332,510	------	------	------	Pre-Onsite
2	SCS Runoff	35.92	2	728	132,043	------	------	------	Pre- Offsite
3	SCS Runoff	20.88	2	722	62,170	------	------	------	1 Northwest Onsite to Basin
4	SCS Runoff	44.89	2	724	149,711	------	------	------	2 Northeast Onsite to Basin
5	SCS Runoff	22.69	2	724	76,724	------	------	------	3 Southeast Onsite to Basin
6	SCS Runoff	15.10	2	722	46,212	------	------	------	4 Southwest Onsite to Basin
7	SCS Runoff	28.87	2	722	85,482	------	------	------	5 West Onsite to Basin
8	Combine	131.12	2	722	420,298	3, 4, 5, 6, 7	------	------	TO BASIN
9	Reservoir	42.66	2	738	420,244	8	924.88	179,502	BASIN
10	SCS Runoff	2.740	2	716	5,790	------	------	------	Basin Bypass
11	Combine	141.26	2	724	473,078	1, 2,	------	------	Pre
12	Combine	71.32	2	736	558,077	2, 9, 10,	------	------	Post

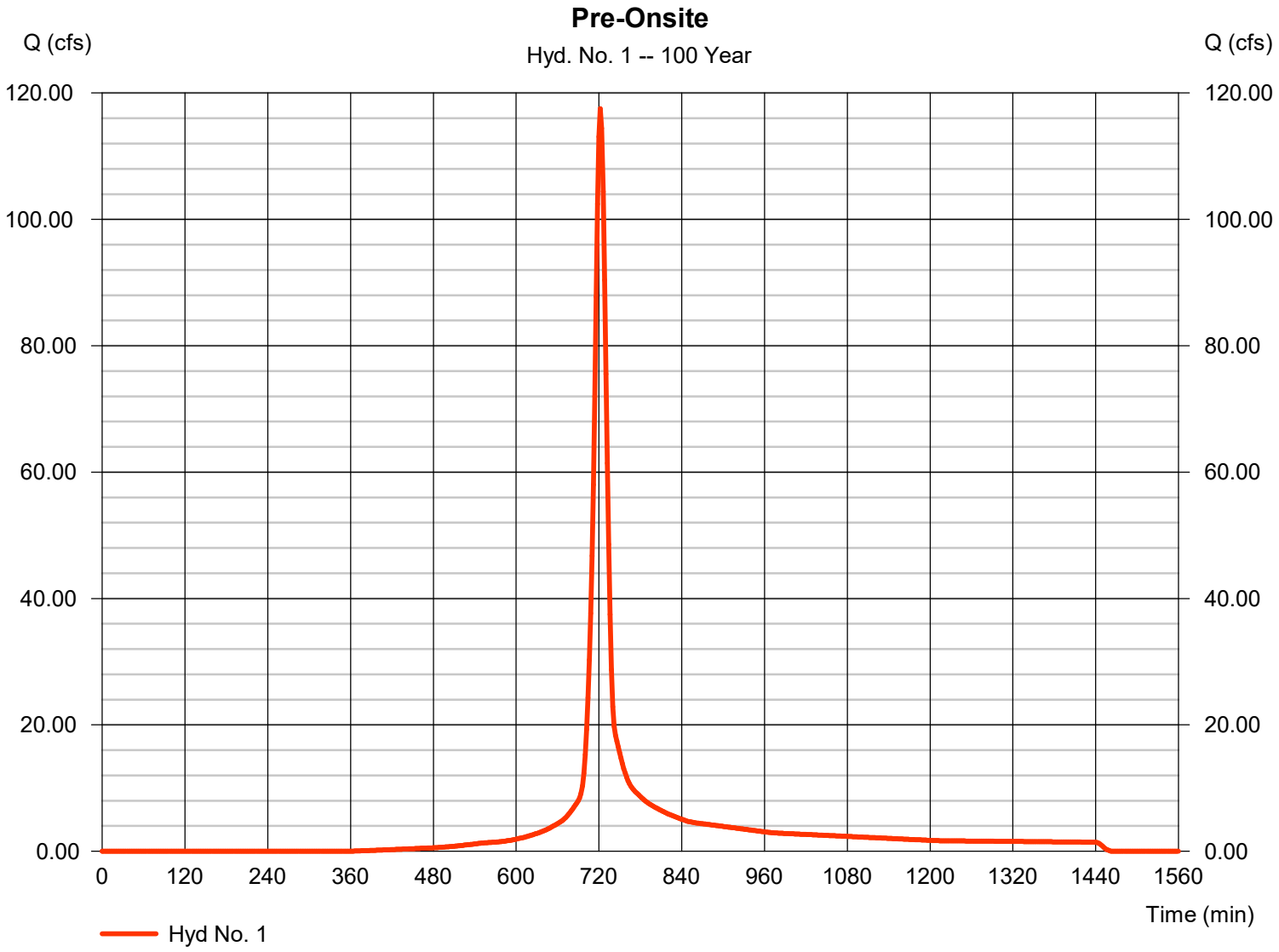
Hydrograph Report

Hyd. No. 1

Pre-Onsite

Hydrograph type	=	SCS Runoff	Peak discharge	=	117.54 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	332,510 cuft
Drainage area	=	15.510 ac	Curve number	=	74*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	15.30 min
Total precip.	=	9.25 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(15.510 x 74)] / 15.510



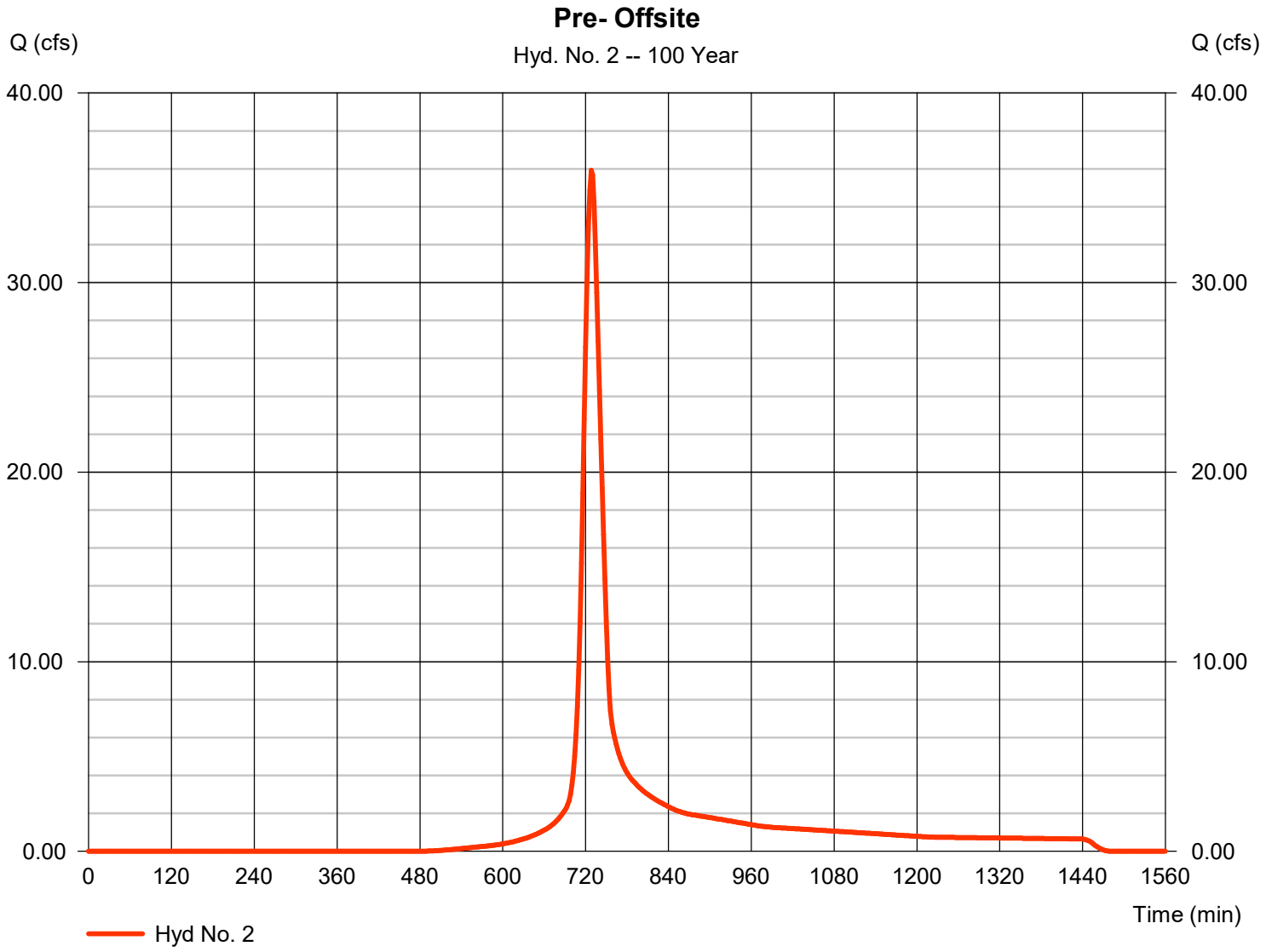
Hydrograph Report

Hyd. No. 2

Pre- Offsite

Hydrograph type	=	SCS Runoff	Peak discharge	=	35.92 cfs
Storm frequency	=	100 yrs	Time to peak	=	728 min
Time interval	=	2 min	Hyd. volume	=	132,043 cuft
Drainage area	=	7.500 ac	Curve number	=	65*
Basin Slope	=	5.0 %	Hydraulic length	=	100 ft
Tc method	=	TR55	Time of conc. (Tc)	=	25.20 min
Total precip.	=	9.25 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(7.500 x 65)] / 7.500



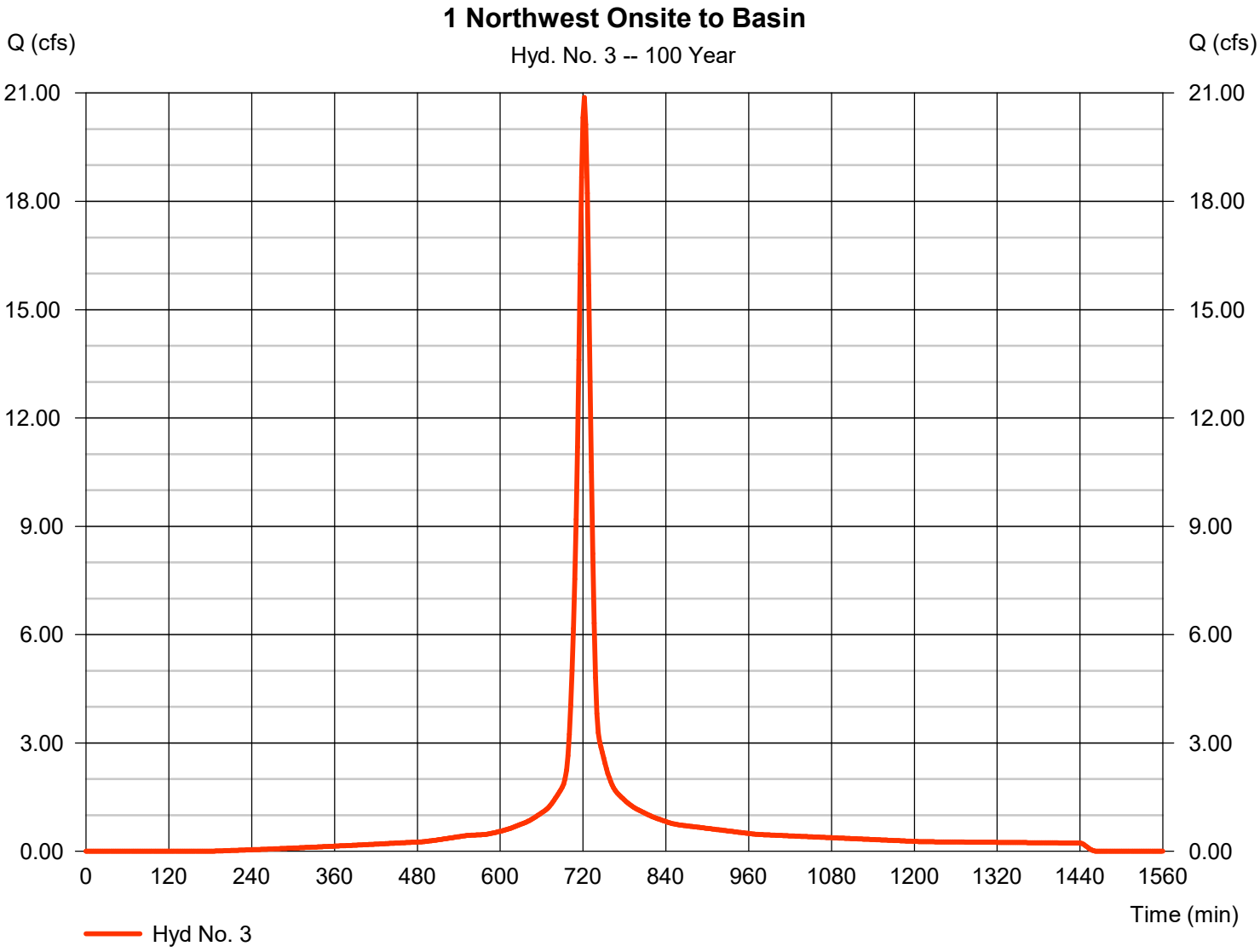
Hydrograph Report

Hyd. No. 3

1 Northwest Onsite to Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	20.88 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	62,170 cuft
Drainage area	=	2.290 ac	Curve number	=	87*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	13.90 min
Total precip.	=	9.25 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.180 x 98) + (1.110 x 74)] / 2.290



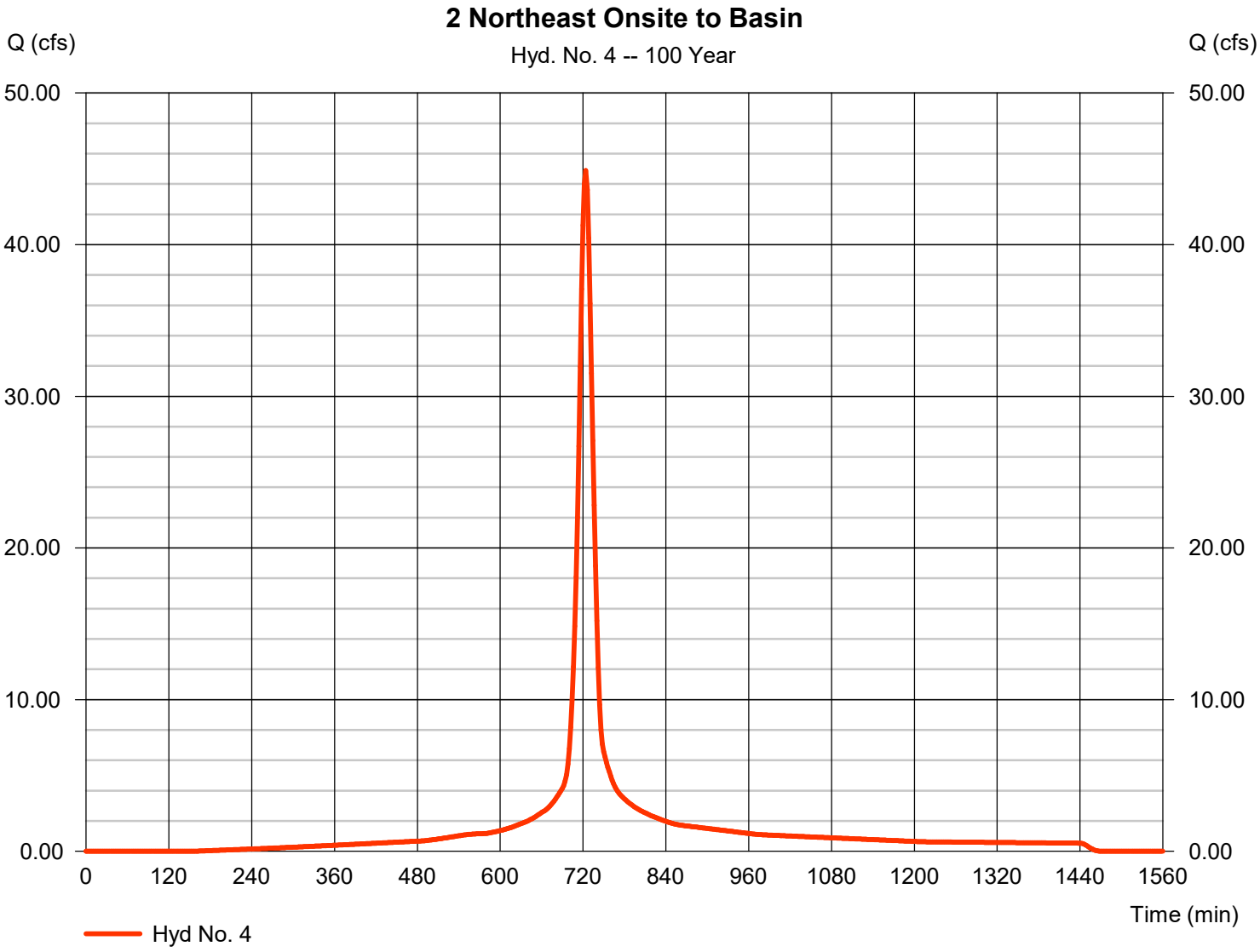
Hydrograph Report

Hyd. No. 4

2 Northeast Onsite to Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	44.89 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	149,711 cuft
Drainage area	=	5.210 ac	Curve number	=	89*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	19.90 min
Total precip.	=	9.25 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(2.660 x 98) + (1.930 x 74) + (0.620 x 98)] / 5.210



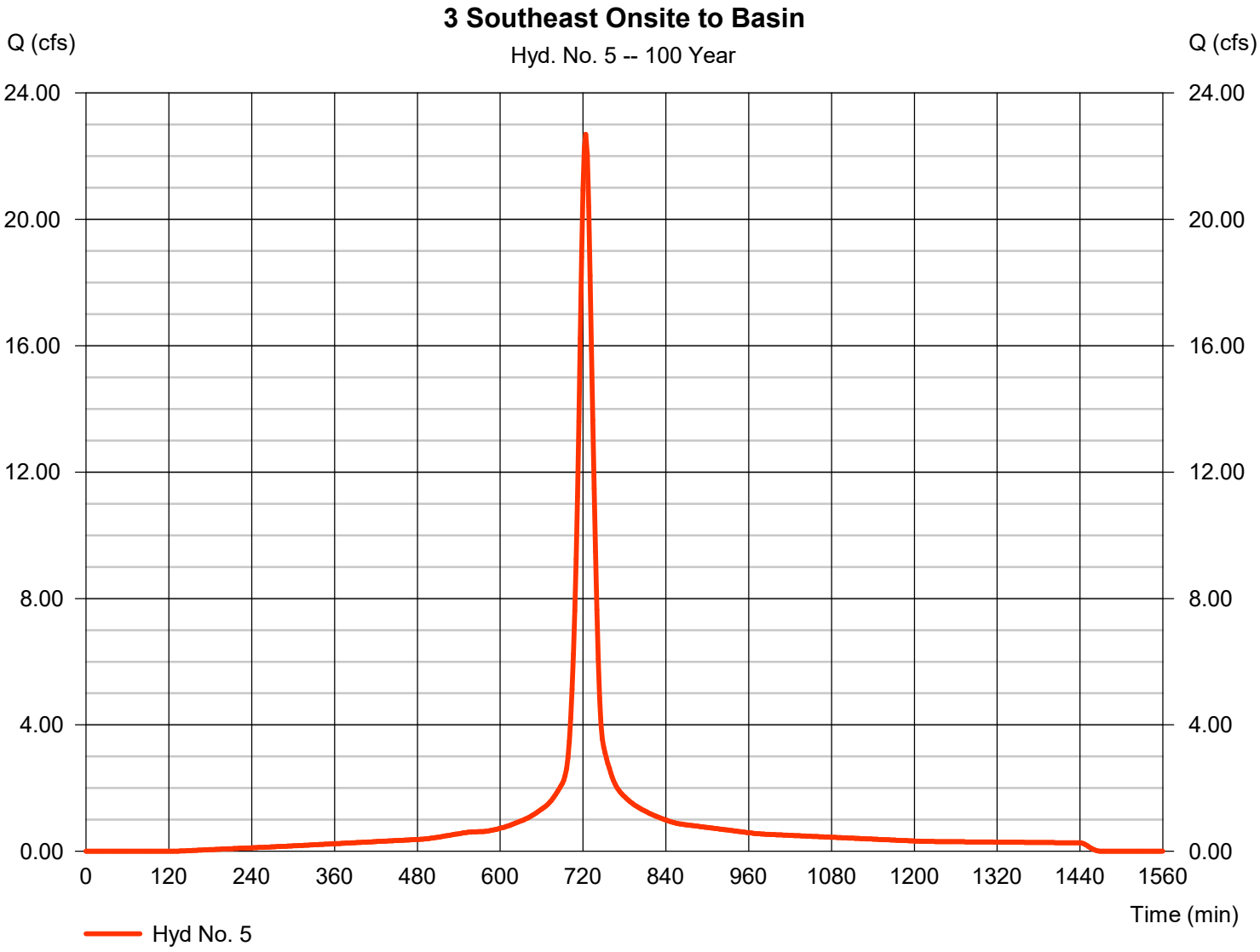
Hydrograph Report

Hyd. No. 5

3 Southeast Onsite to Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	22.69 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	76,724 cuft
Drainage area	=	2.590 ac	Curve number	=	91*
Basin Slope	=	5.0 %	Hydraulic length	=	200 ft
Tc method	=	TR55	Time of conc. (Tc)	=	18.70 min
Total precip.	=	9.25 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.810 x 98) + (0.780 x 74)] / 2.590



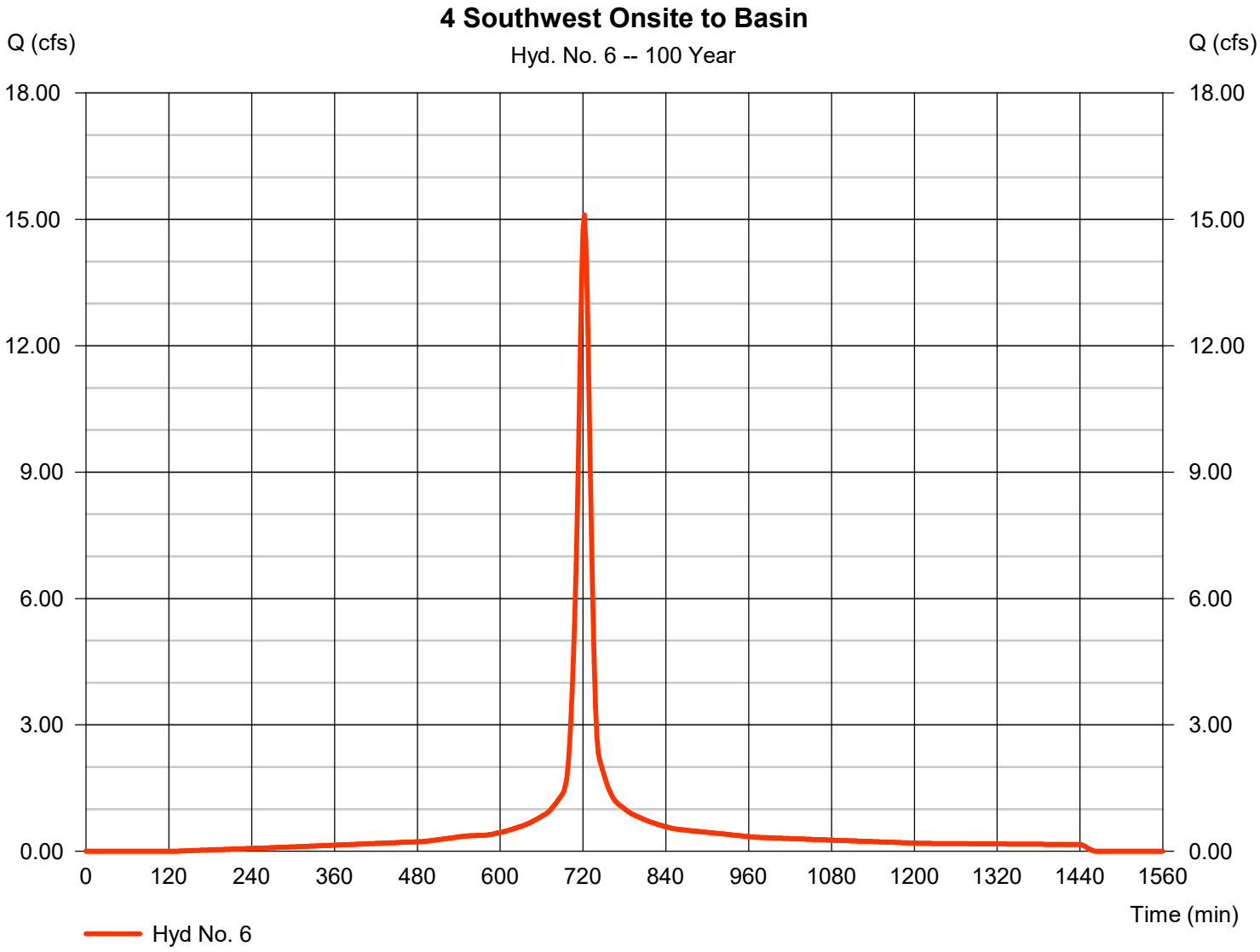
Hydrograph Report

Hyd. No. 6

4 Southwest Onsite to Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	15.10 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	46,212 cuft
Drainage area	=	1.600 ac	Curve number	=	91*
Basin Slope	=	5.0 %	Hydraulic length	=	126 ft
Tc method	=	TR55	Time of conc. (Tc)	=	14.40 min
Total precip.	=	9.25 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.120 x 98) + (0.480 x 74)] / 1.600



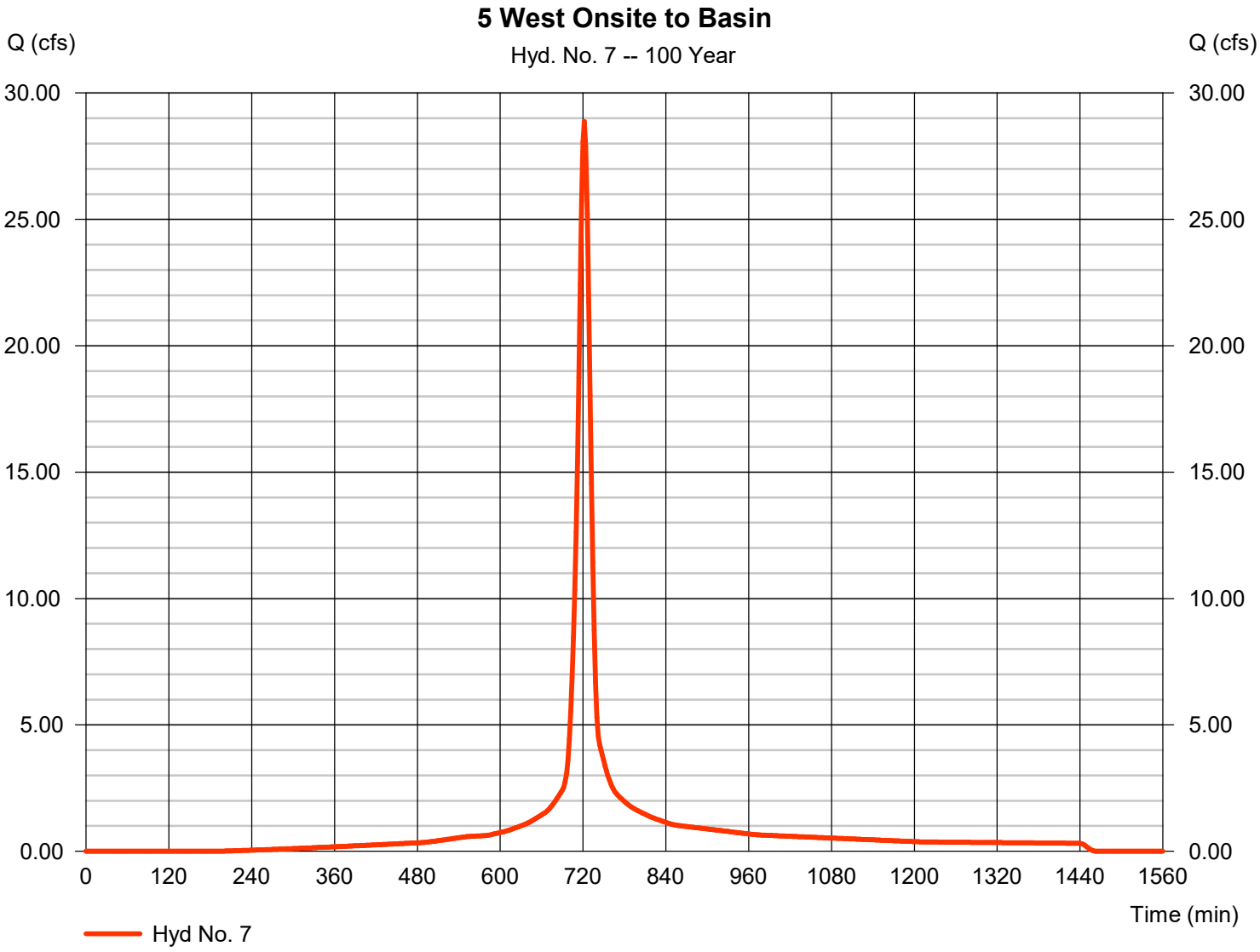
Hydrograph Report

Hyd. No. 7

5 West Onsite to Basin

Hydrograph type	=	SCS Runoff	Peak discharge	=	28.87 cfs
Storm frequency	=	100 yrs	Time to peak	=	722 min
Time interval	=	2 min	Hyd. volume	=	85,482 cuft
Drainage area	=	3.200 ac	Curve number	=	86*
Basin Slope	=	5.0 %	Hydraulic length	=	100 ft
Tc method	=	TR55	Time of conc. (Tc)	=	14.20 min
Total precip.	=	9.25 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(1.650 x 98) + (1.550 x 74)] / 3.200

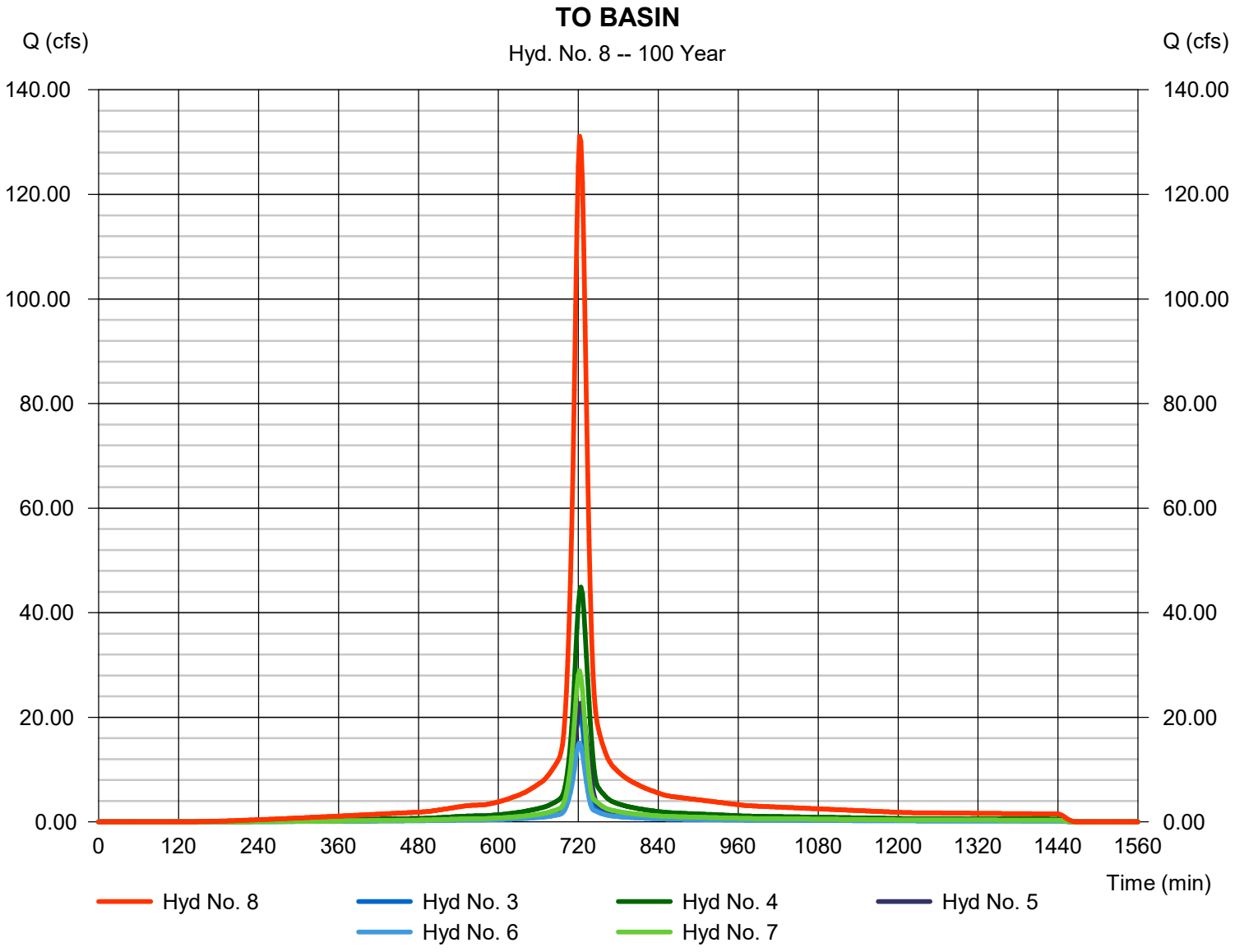


Hydrograph Report

Hyd. No. 8

TO BASIN

Hydrograph type	= Combine	Peak discharge	= 131.12 cfs
Storm frequency	= 100 yrs	Time to peak	= 722 min
Time interval	= 2 min	Hyd. volume	= 420,298 cuft
Inflow hyds.	= 3, 4, 5, 6, 7	Contrib. drain. area	= 14.890 ac



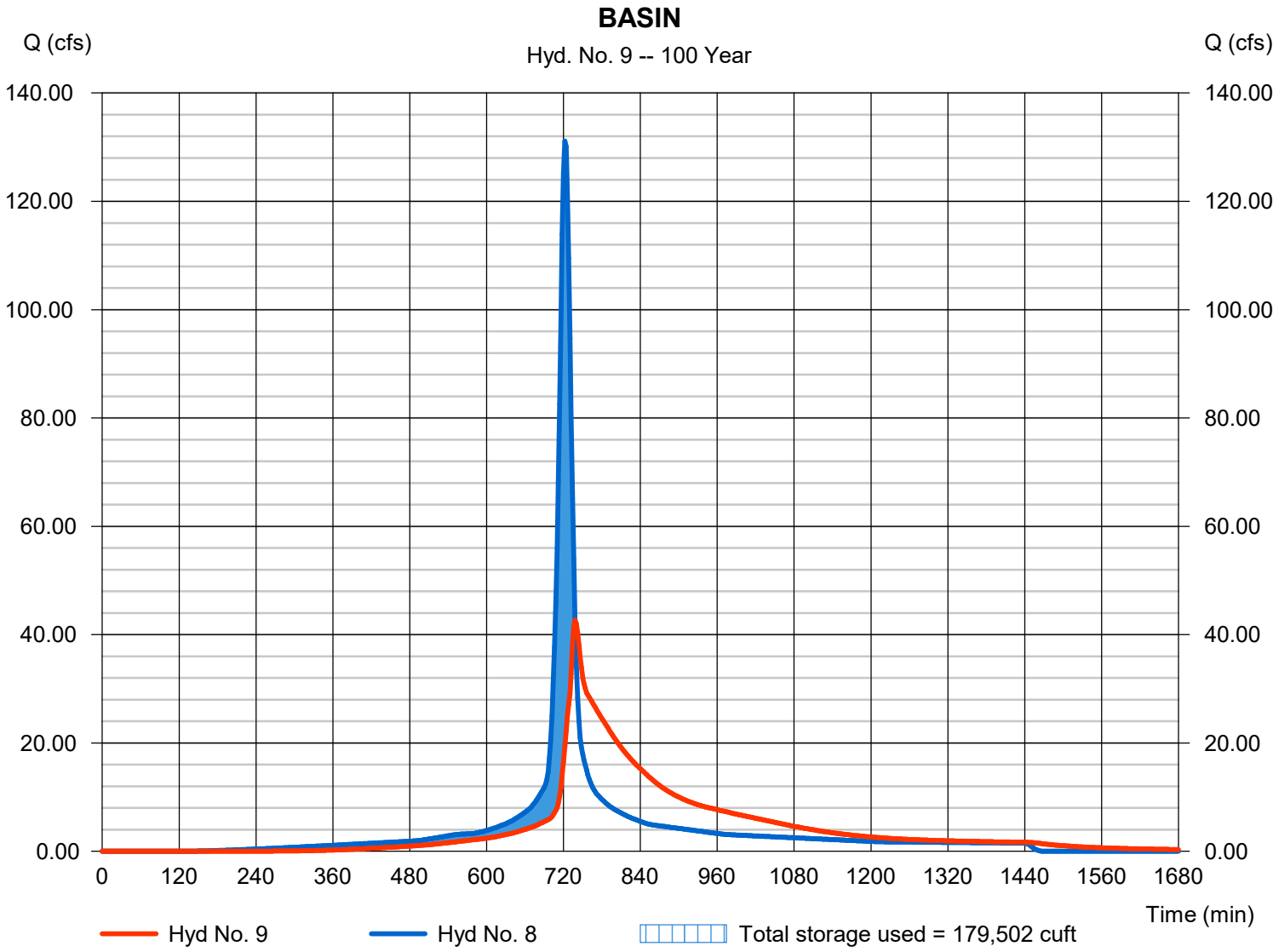
Hydrograph Report

Hyd. No. 9

BASIN

Hydrograph type	=	Reservoir	Peak discharge	=	42.66 cfs
Storm frequency	=	100 yrs	Time to peak	=	738 min
Time interval	=	2 min	Hyd. volume	=	420,244 cuft
Inflow hyd. No.	=	8 - TO BASIN	Max. Elevation	=	924.88 ft
Reservoir name	=	Regional Detention	Max. Storage	=	179,502 cuft

Storage Indication method used.



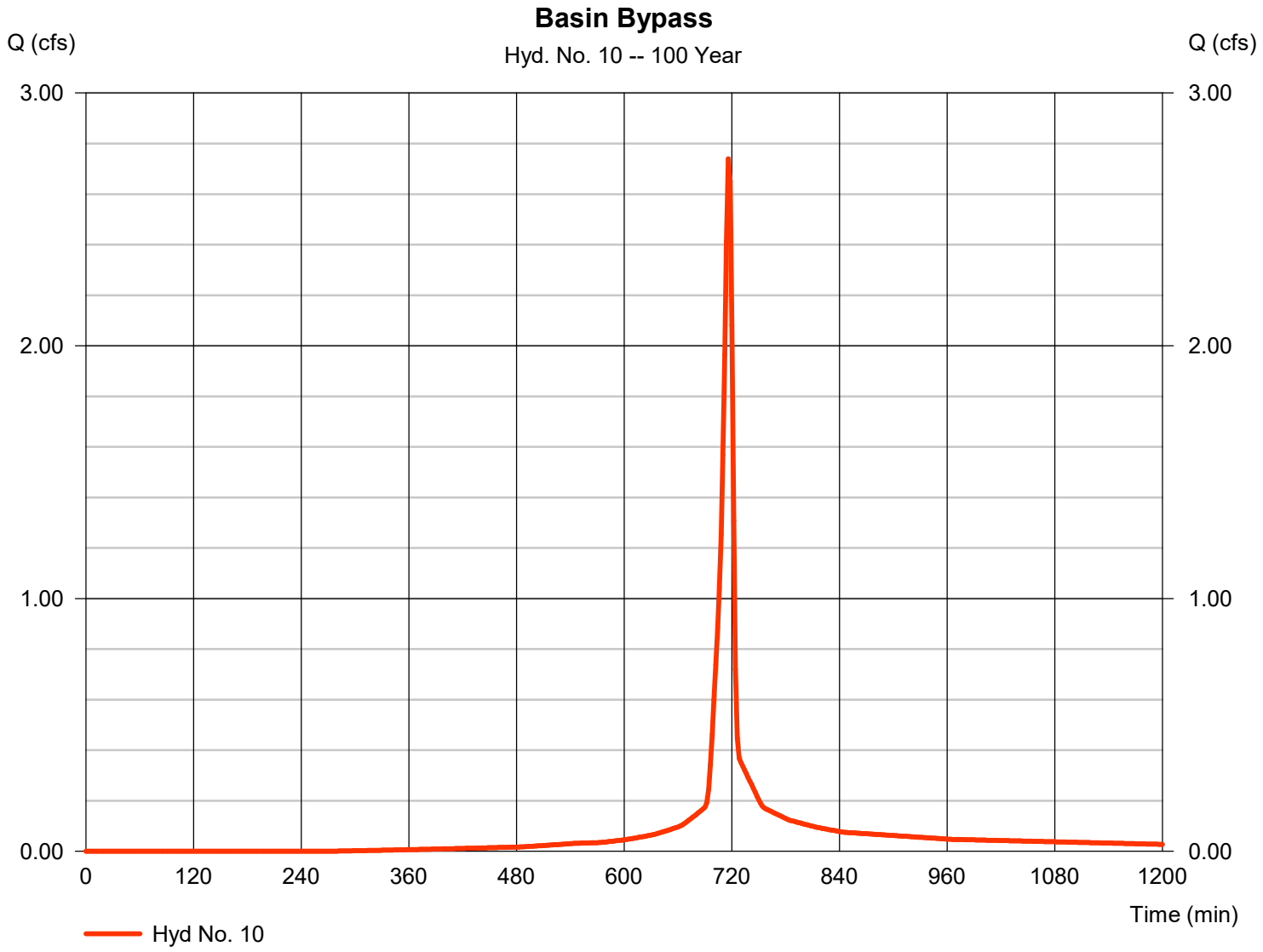
Hydrograph Report

Hyd. No. 10

Basin Bypass

Hydrograph type	=	SCS Runoff	Peak discharge	=	2.740 cfs
Storm frequency	=	100 yrs	Time to peak	=	716 min
Time interval	=	2 min	Hyd. volume	=	5,790 cuft
Drainage area	=	0.250 ac	Curve number	=	80*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	User	Time of conc. (Tc)	=	5.00 min
Total precip.	=	9.25 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(0.070 x 98) + (0.180 x 74)] / 0.250

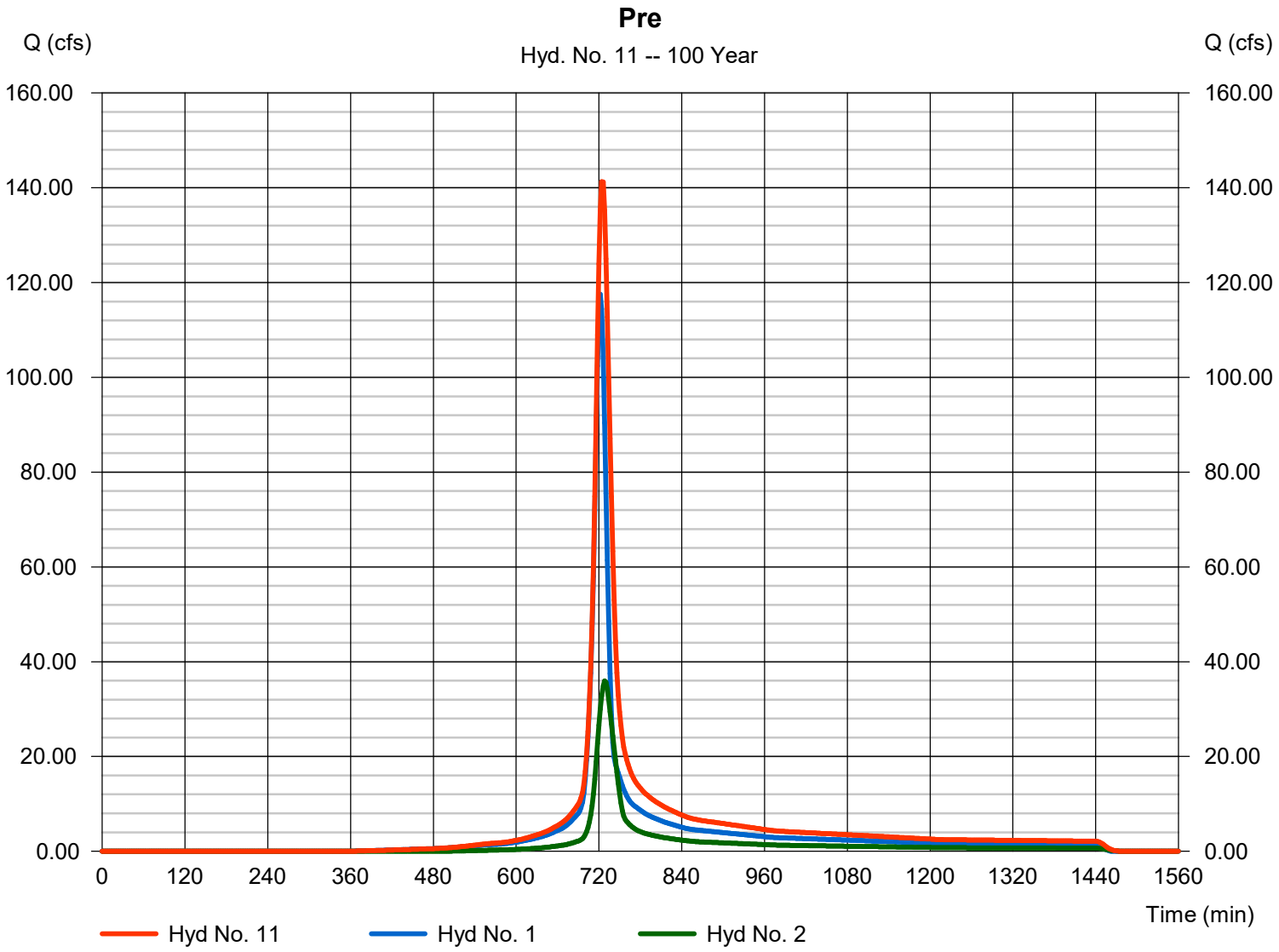


Hydrograph Report

Hyd. No. 11

Pre

Hydrograph type	=	Combine	Peak discharge	=	141.26 cfs
Storm frequency	=	100 yrs	Time to peak	=	724 min
Time interval	=	2 min	Hyd. volume	=	473,078 cuft
Inflow hyds.	=	1, 2	Contrib. drain. area	=	23.010 ac

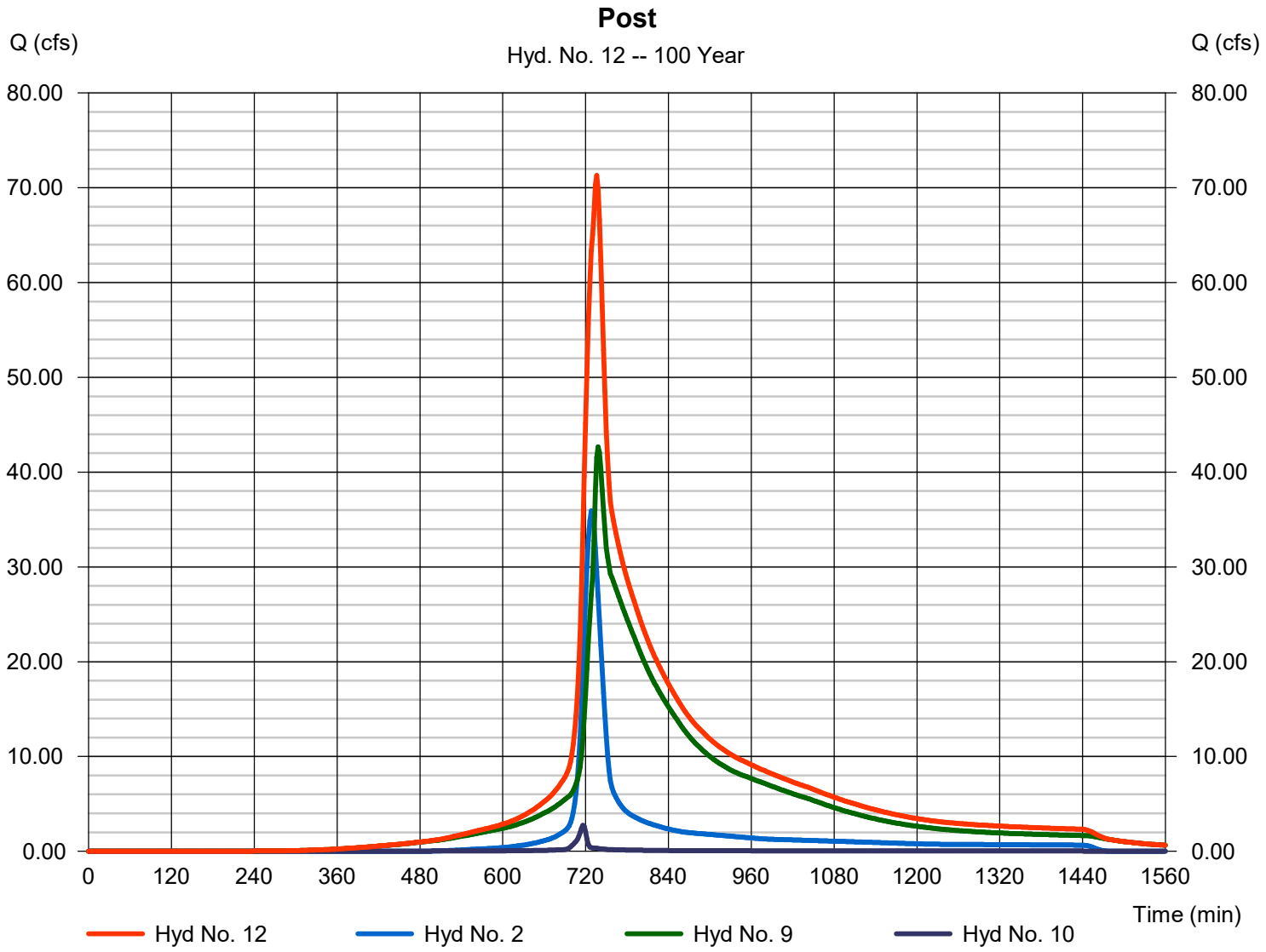


Hydrograph Report

Hyd. No. 12

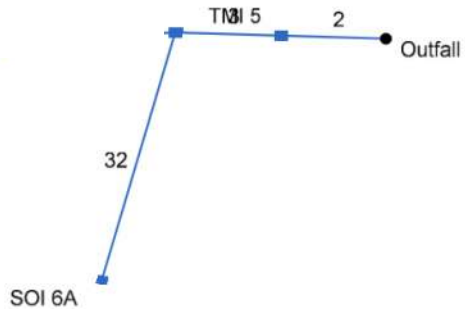
Post

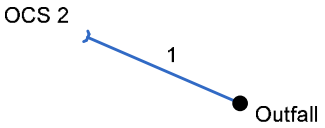
Hydrograph type	=	Combine	Peak discharge	=	71.32 cfs
Storm frequency	=	100 yrs	Time to peak	=	736 min
Time interval	=	2 min	Hyd. volume	=	558,077 cuft
Inflow hyds.	=	2, 9, 10	Contrib. drain. area	=	7.750 ac

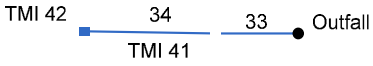


APPENDIX C:
STORM SEWER CALCULATIONS

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan







Project File: STORM SEWERS 6-20-23.stm	Number of lines: 1	Date: 6/21/2023

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line Size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line Slope (%)	HGL Down (ft)	HGL Up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns Line No.	Junction Type
1	EX WALL	22.82	60	Cir	98.333	911.00	920.00	9.153	912.32	921.32	0.47	921.32	End	OpenHeadwall
2	FES 4	41.63	36	Cir	33.145	922.47	922.64	0.513	924.51	924.74	n/a	924.74	End	Curb-Horiz
3	6	40.17	36	Cir	33.000	922.83	923.00	0.515	924.81	925.06	n/a	925.06	2	Curb-Horiz
32	6A	34.04	24	Cir	98.565	923.20	923.69	0.497	925.20*	927.10*	1.83	928.93	3	
33	FES 40	1.60	24	Cir	26.463	928.76	929.03	1.020	929.12	929.47	0.08	929.47	End	Curb-Horiz
34	42	0.88	24	Cir	42.000	929.23	929.65	1.000	929.49	929.97	0.11	929.97	33	Curb-Horiz

Project File: STORM SEWERS 6-20-23.stm | Number of lines: 1 | Run Date: 6/21/2023

NOTES: Return period = 25 Yrs.

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	98.333	0.00	0.00	0.00	0.00	0.00	5.0	5.0	0.0	22.82	853.7	5.51	60	9.15	911.00	920.00	912.32	921.32	0.00	920.00	EX WALL
2	End	33.145	0.40	13.35	0.76	0.30	8.24	5.0	22.5	5.1	41.63	51.75	8.01	36	0.51	922.47	922.64	924.51	924.74	0.00	928.10	FES 4
3	2	33.000	0.91	12.95	0.58	0.53	7.94	5.0	22.4	5.1	40.17	51.86	7.93	36	0.52	922.83	923.00	924.81	925.06	928.10	929.66	6
32	3	98.565	8.38	8.38	0.66	5.53	5.53	14.2	14.2	6.2	34.04	17.28	10.84	24	0.50	923.20	923.69	925.20	927.10	929.66	929.00	6A
33	End	26.463	0.18	0.36	0.59	0.11	0.21	5.0	7.5	7.5	1.60	24.75	3.66	24	1.02	928.76	929.03	929.12	929.47	0.00	934.65	FES 40
34	33	42.000	0.18	0.18	0.59	0.11	0.11	5.0	5.0	8.2	0.88	24.50	3.18	24	1.00	929.23	929.65	929.49	929.97	934.65	934.65	42

Project File: STORM SEWERS 6-20-23.stm | Number of lines: 1 | Run Date: 6/21/2023

NOTES:Intensity = 102.61 / (Inlet time + 16.50) ^ 0.82; Return period =Yrs. 25 ; c = cir e = ellip b = box

Inlet Report

Line No	Inlet ID	Q = CIA (cfs)	Q carry (cfs)	Q capt (cfs)	Q Byp (cfs)	Junc Type	Curb Inlet		Grate Inlet			Gutter							Inlet			Byp Line No
							Ht (in)	L (ft)	Area (sqft)	L (ft)	W (ft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	OCS 2	22.82*	0.00	22.82	0.00	Hdwl	0.0	0.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	0.00	0.00	0.00	0.00	0.0	Off
2	TMI 5	2.51	0.00	2.51	0.00	Curb	6.0	2.93	0.00	0.00	0.00	Sag	1.50	0.020	0.020	0.013	0.43	21.66	0.43	21.66	0.0	Off
3	TMI 6	4.35	0.00	4.35	0.00	Curb	6.0	2.93	0.00	0.00	0.00	Sag	1.50	0.020	0.020	0.013	0.63	31.29	0.63	31.29	0.0	Off
32	SOI 6A	34.04	0.00	34.04	0.00	DrCrb	4.0	1.00	0.00	0.00	0.00	Sag	0.00	0.000	0.000	0.013	361.34	inf.00	361.34	inf.00	0.0	Off
33	TMI 41	0.88	0.00	0.88	0.00	Curb	4.0	1.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.25	9.49	0.25	9.49	0.0	Off
34	TMI 42	0.88	0.00	0.88	0.00	Curb	6.0	4.00	0.00	0.00	0.00	Sag	2.00	0.050	0.020	0.013	0.20	6.79	0.20	6.79	0.0	Off

Project File: STORM SEWERS 6-20-23.stm | Number of lines: 1 | Run Date: 6/21/2023

NOTES: Inlet N-Values = 0.016; Intensity = 102.61 / (Inlet time + 16.50) ^ 0.82; Return period = 25 Yrs. ; * Indicates Known Q added. All curb inlets are Horiz throat.

Storm Sewer Inlet Time Tabulation

Line No.	Line ID	Tc Method	Sheet Flow					Shallow Concentrated Flow					Channel Flow							Total Travel Time (min)
			n-Value	flow Length (ft)	2-yr 24h P (in)	Land Slope (%)	Travel Time (min)	flow Length (ft)	Water Slope (%)	Surf Descr	Ave Vel (ft/s)	Travel Time (min)	X-sec Area (sqft)	Wetted Perim (ft)	Chan Slope (%)	n-Value	Vel	flow Length (ft)	Travel Time (min)	
1	EX WALL	User																		5.00
2	FES 4	User																		5.00
3	6	User																		5.00
32	6A	User																		14.20
33	FES 40	User																		5.00
34	42	User																		5.00

Project File: STORM SEWERS 6-20-23.stm | Min. Tc used for intensity calculations = 5 min | Number of lines: 1 | Date: 6/21/2023

Hydraulic Grade Line Computations

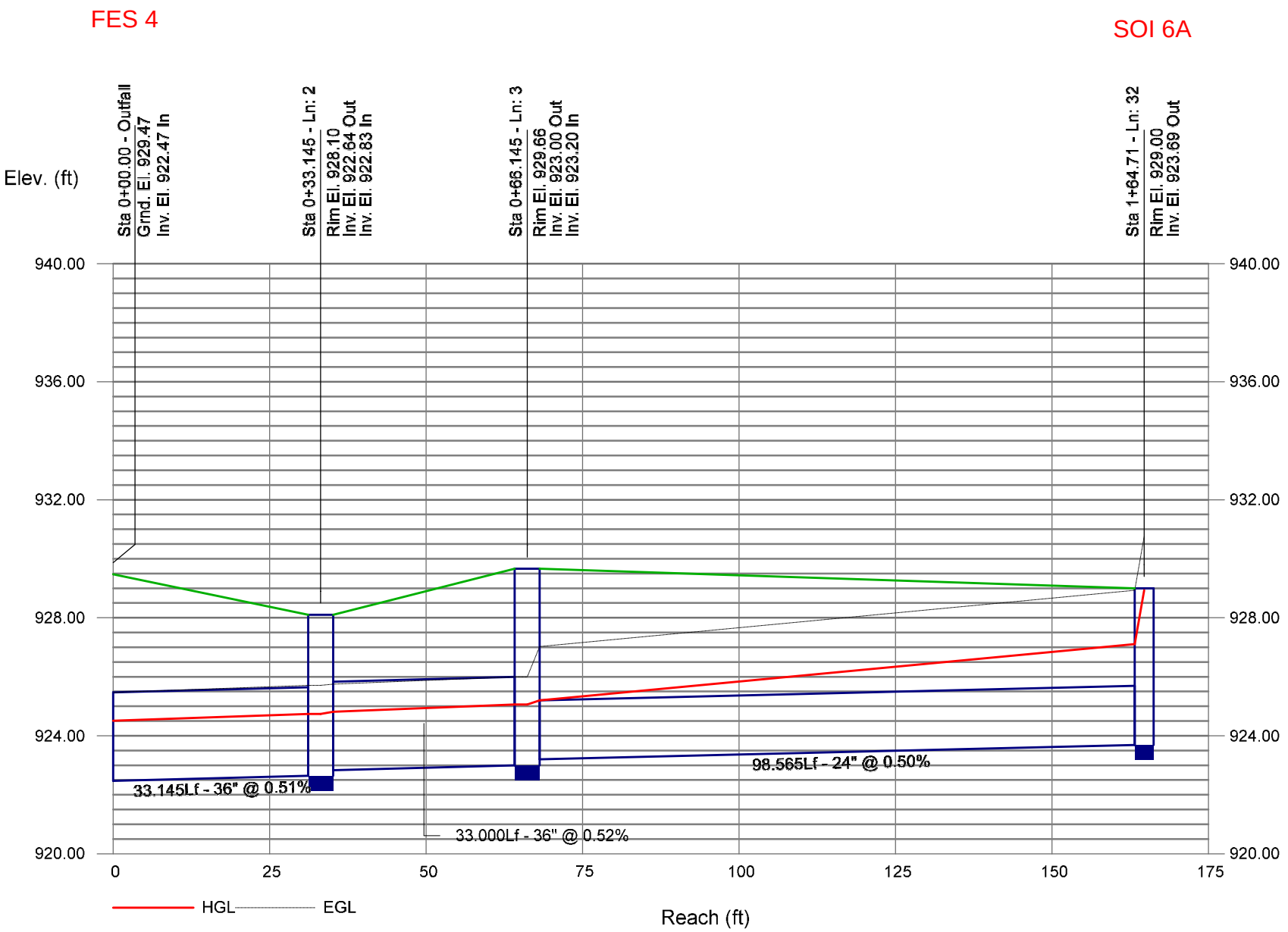
Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf		Invert elev	HGL elev	Depth	Area	Vel	Vel head	EGL elev	Sf	Ave Sf	Enrgy loss		
	(in)	(cfs)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft/s)	(ft)	(ft)	(%)	(%)	(ft)	(K)	(ft)
1	60	22.82	911.00	912.32	1.32	4.14	5.51	0.47	912.79	0.000	98.333	920.00	921.32	1.32**	4.14	5.51	0.47	921.79	0.000	0.000	n/a	1.00	0.47
2	36	41.63	922.47	924.51	2.04*	5.11	8.14	0.97	925.47	0.000	33.145	922.64	924.74	2.10**	5.28	7.88	0.97	925.70	0.000	0.000	n/a	0.50	n/a
3	36	40.17	922.83	924.81	1.98*	4.96	8.10	0.93	925.75	0.000	33.000	923.00	925.06	2.06**	5.18	7.75	0.93	926.00	0.000	0.000	n/a	1.48	n/a
32	24	34.04	923.20	925.20	2.00*	3.14	10.84	1.83	927.03	1.931	98.565	923.69	927.10	2.00	3.14	10.84	1.83	928.93	1.930	1.930	1.903	1.00	1.83
33	24	1.60	928.76	929.12	0.36	0.38	4.16	0.15	929.27	0.000	26.463	929.03	929.47	0.44**	0.51	3.15	0.15	929.62	0.000	0.000	n/a	0.50	0.08
34	24	0.88	929.23	929.49	0.26*	0.24	3.67	0.11	929.60	0.000	42.000	929.65	929.97	0.32**	0.33	2.68	0.11	930.08	0.000	0.000	n/a	1.00	0.11

Project File: STORM SEWERS 6-20-23.stm | Number of lines: 1 | Run Date: 6/21/2023

Notes: ; ** Critical depth. ; c = cir e = ellip b = box

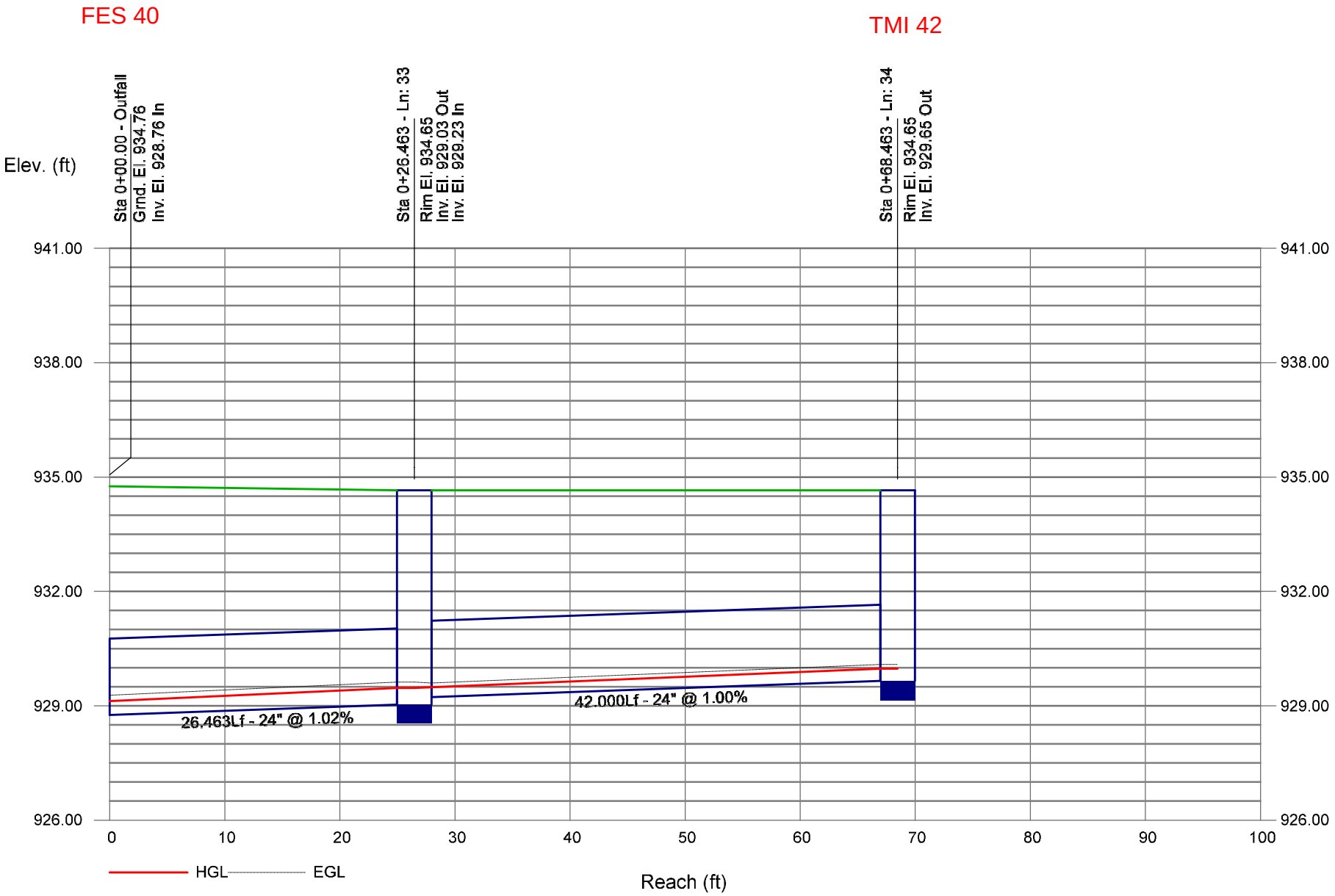
Storm Sewer Profile

Proj. file: STORM SEWERS 6-20-23.stm



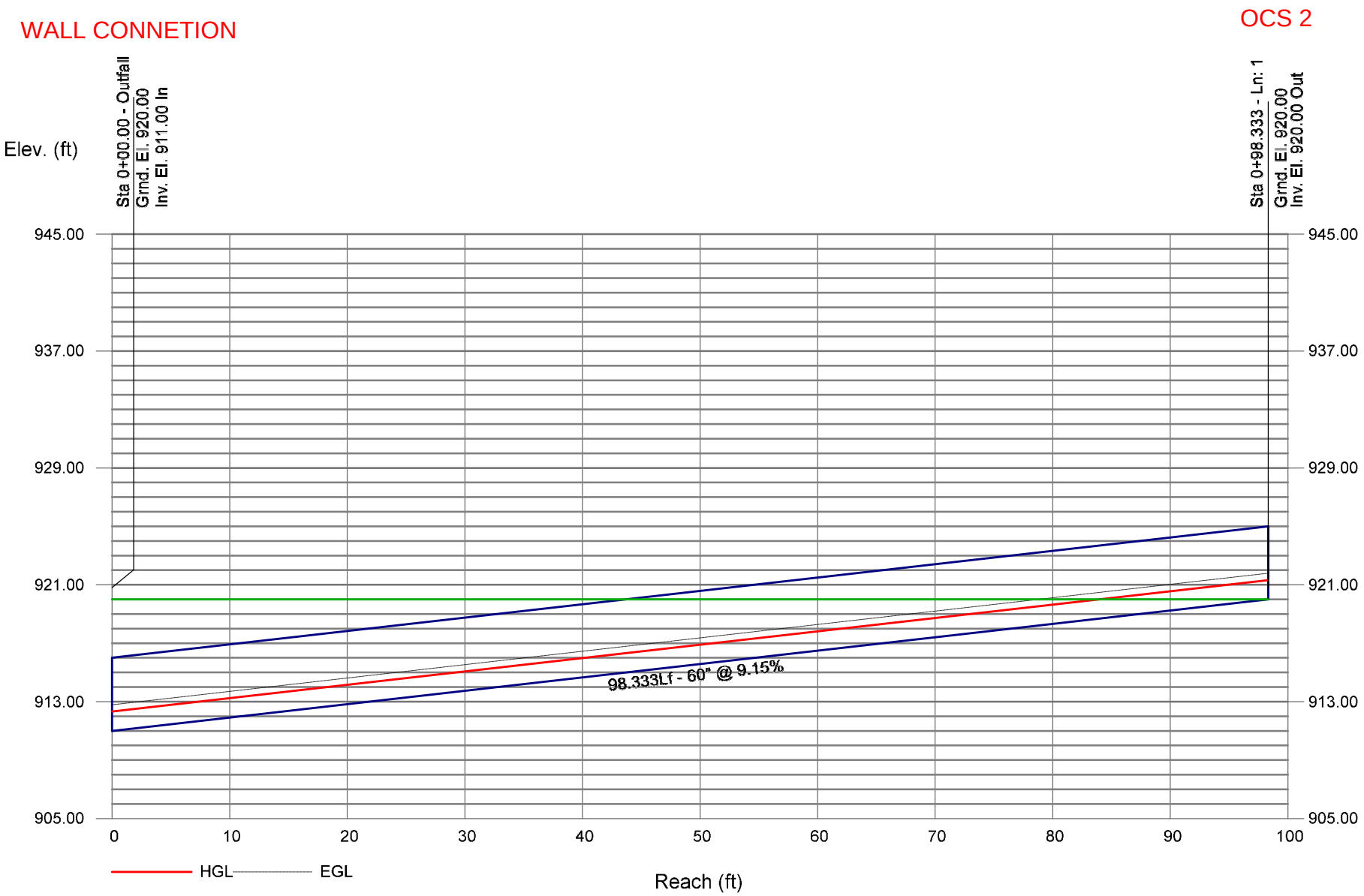
Storm Sewer Profile

Proj. file: STORM SEWERS 6-20-23.stm

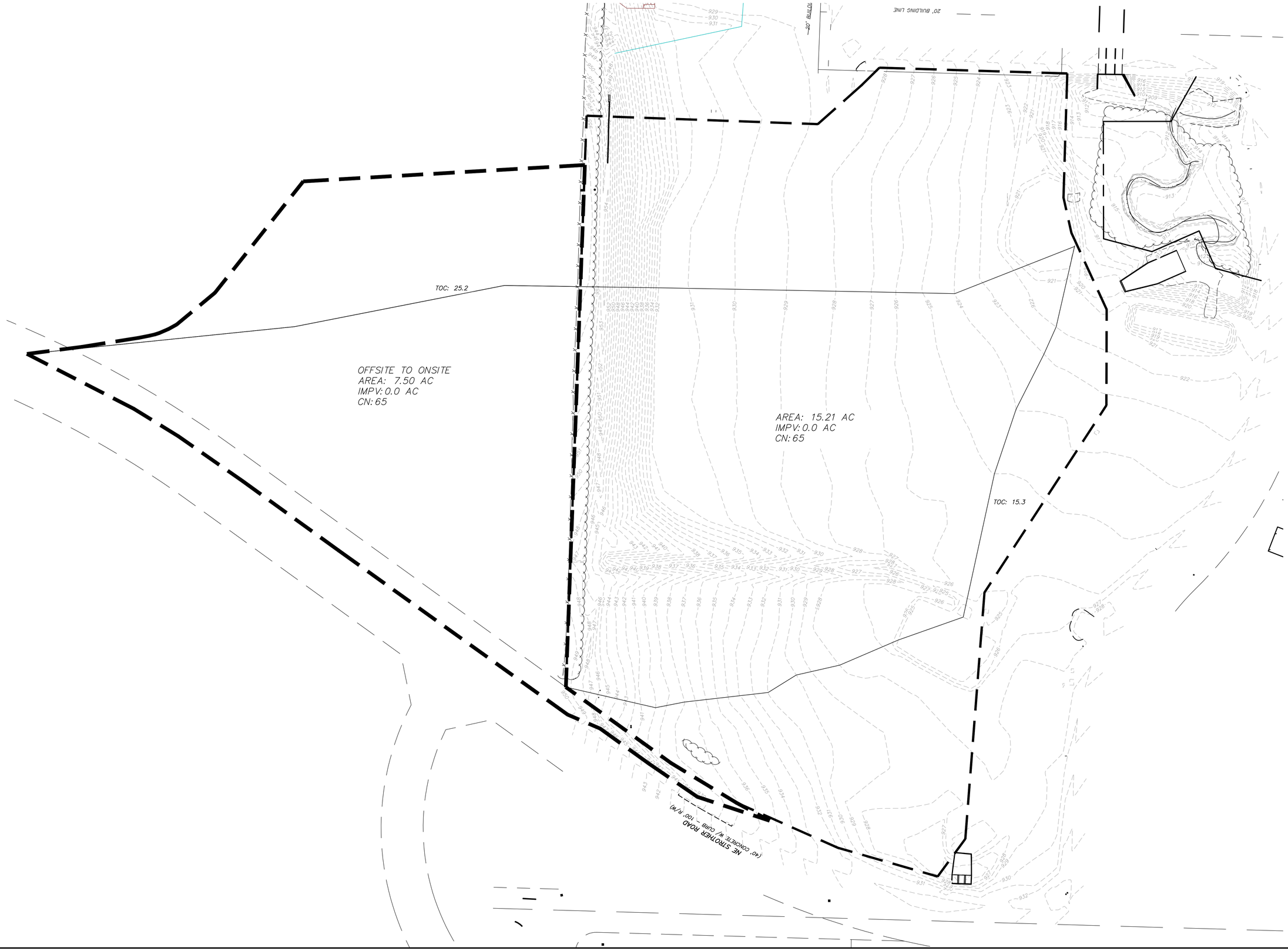


Storm Sewer Profile

Proj. file: STORM SEWERS 6-20-23.stm



APPENDIX D:
DRAINAGE AREA MAP(S)



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N

0 1"
SCALE: 1" = 60'

WILSHIRE HILLS PHASE III
STREET ADDRESS
LEE'S SUMMIT JACKSON COUNTY, MO

THIS MEDIA SHOULD NOT BE CONSIDERED A CERTIFIED DOCUMENT

PRELIMINARY

NOT FOR CONSTRUCTION, BIDDING, RECORDING, OR PERMIT REVIEW PURPOSES

MATTHEW A. KRIETE
PROFESSIONAL ENGINEER
PE-2007002811

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Date
JUNE 22, 2023

Revised

Design: ST Drawn: ST

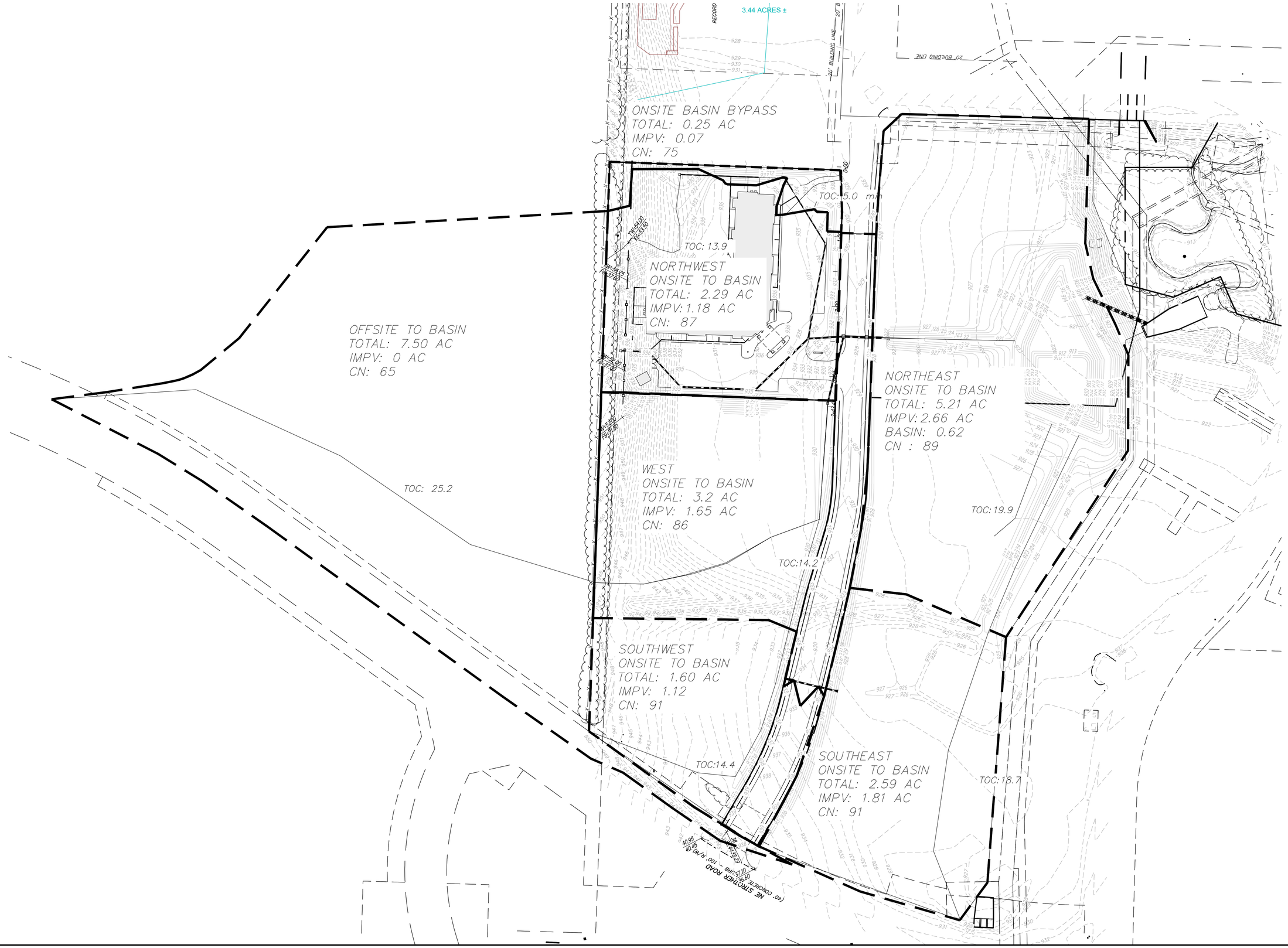
PRE-DRAINAGE AREA MAP

Sheet
C12.01

ES&S PROJECT NO. 15925

CONSTRUCTION DOCUMENTS

P:\GENERAL PROJECTS\15925E-JES-WILSHIRE-HILLS-3-ENG\CAD\15925 DAM (6-14-2023).DWG 6/22/2023



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Date
JUNE 22, 2023

Revised

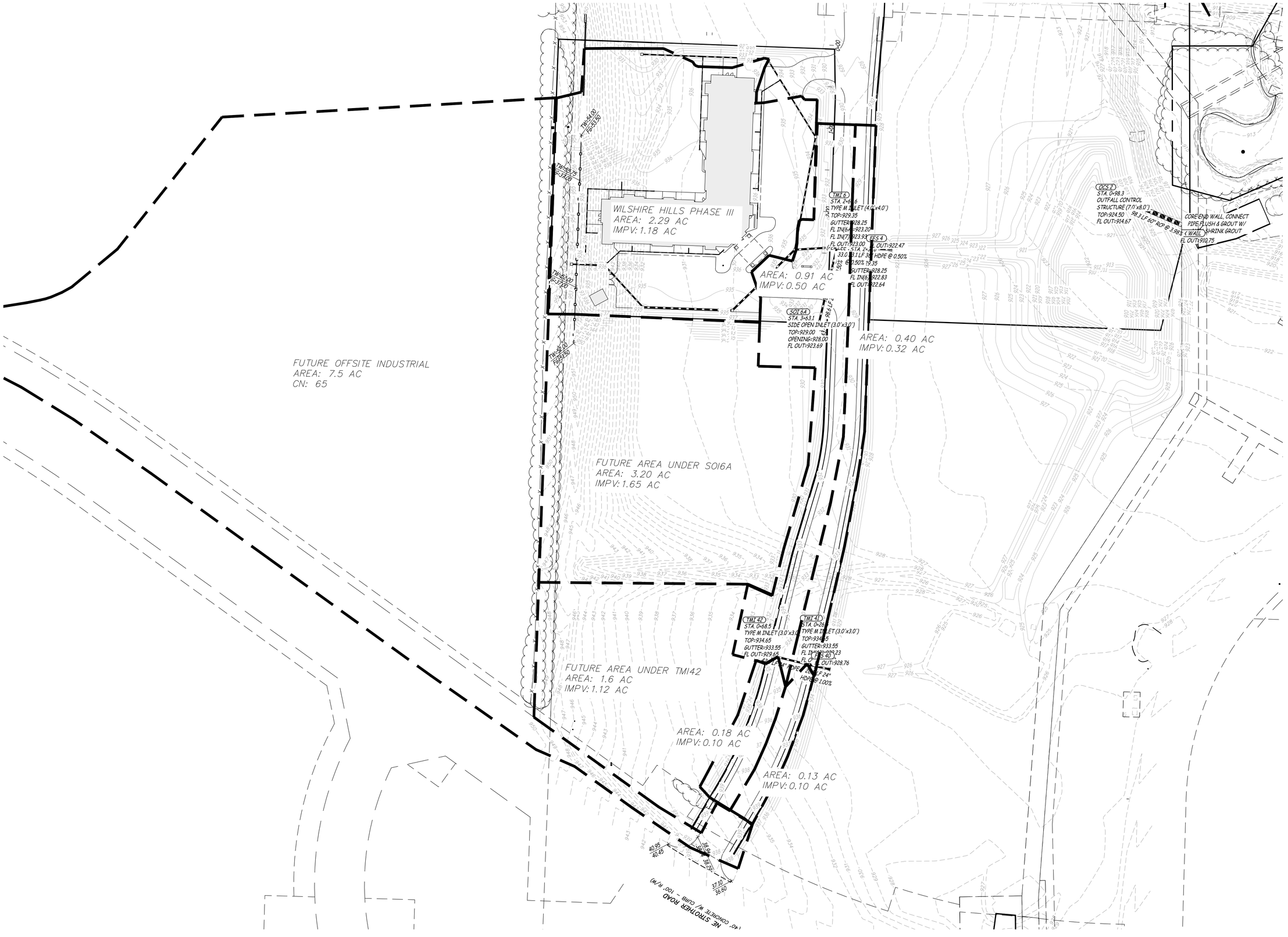
Design: ST Drawn: ST

POST-DRAINAGE AREA MAP

Sheet
C12.02

ES&S PROJECT NO. 15925

P:\GENERAL PROJECTS\15925E-JES-WILSHIRE-HILLS-3-ENG\CAD\15925 DAM (6-14-2023).DWG 6/22/2023



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0 1"

SCALE: 1" = 50'

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MATTHEW A. KRIETE
PROFESSIONAL ENGINEER
PE-2007002811

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Date

JUNE 22, 2023

Revised

Design: ST Drawn: ST

PUBLIC STORM DRAINAGE

Sheet

C12.03

ES&S PROJECT NO. 15925

CONSTRUCTION DOCUMENTS

P:\GENERAL PROJECTS\15925E--JES-WILSHIRE--HILLS--3--ENG\CAD\15925 DAM (6-14-2023).DWG 6/22/2023

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SECTION 004000
AGREEMENT

PART 1 GENERAL

1.01 FORM OF AGREEMENT

A. Capital Advance Construction Contract/Cost Plus - MHDC Form 92442-CA (Attached).

PART 2 - PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

CONSTRUCTION CONTRACT / COST PLUS
(MHDC Form 92442-CA)

THIS CONSTRUCTION CONTRACT / COST PLUS CONTRACT ("CONTRACT") made the _____, between _____, a Missouri _____, whose address is _____ _____, Missouri _____ ("Contractor"), and _____, a Missouri _____, whose address is _____, _____, Missouri _____ ("Owner").

WHEREAS, Mortgagor has applied to MHDC for a mortgage loan for the purpose of erecting a housing development to be located in _____, _____ **County**, Missouri, and identified as MHDC Development No. _____-_____ and commonly called _____ ("Development").

WITNESSETH, that Contractor and Owner, for the consideration hereinafter set out, agree as follows:

Article 1 -- Scope of Contract

A. The Contract between the parties is set forth in the Contract Documents, which consist of this Contract, the drawings dated _____ and the specifications dated _____ ("collectively Drawings and Specifications'), which includes the current edition of AIA Document A201, General Conditions of the Contract for Construction and the MHDC approved Supplementary Conditions ("Supplementary Conditions"), if any. The provisions of this instrument and the said Supplementary Conditions, take precedence over all inconsistent provisions in the said AIA General Conditions. This Contract constitutes the entire agreement between the parties, and any previously existing contract concerning the work contemplated by the Contract Documents is hereby revoked.

B. The Contractor shall furnish all of the materials and perform all of the work (within the property lines) shown on, and in accordance with, the Drawings and Specifications as shown on **Exhibit "A"** attached hereto.

C. The Drawings, numbered as shown on **Exhibit "A"** attached, and the Specifications have been prepared by _____ ("Design Architect").

The architect administering the Contract is _____ ("Architect").

D. A master set of said Drawings and Specifications, identified by the parties hereto and by the Design Architect, the Architect, and the Contractor's Surety or Guarantor have been placed on file with **MISSOURI HOUSING DEVELOPMENT COMMISSION** ("MHDC"), and shall govern in all matters that arise with respect to such Drawings and Specifications.

E. Changes in the Drawings and Specifications, any terms of the Contract Documents, orders for extra work, changes by altering or adding to the work, or which will change the design concept, may be effected only with the prior written approval of the Owner and MHDC under such conditions as the MHDC may establish.

F. Notwithstanding any other provisions contained in the Contract Documents, the following is applicable to all construction contracts not competitively bid in accordance with MHDC's rules and regulations:

(i) The Contractor acknowledges that this Contract has resulted from sole-source negotiation rather than from competitive bid.

(ii) The Contractor has conducted a full and independent inspection of the site and acknowledges that it has taken steps reasonably necessary to ascertain the nature and location of the work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost. The Contractor also acknowledges that it has satisfied itself as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work (such as test borings) done by or on behalf of the Contractor, as well as from the Drawings and Specifications made a part of this Contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the work or for proceeding to successfully perform the work without additional expense to the Owner, or MHDC.

(iii) The Contractor warrants to the Owner and MHDC that the work, when completed, will comply fully with all MHDC's requirements, Drawings and Specifications and construction requirements imposed or enforced by any governmental agencies and in existence on the date of execution of this agreement.

(iv) The Contractor further agrees that it will not assert any claim against the MHDC because of changes in the Drawings and Specifications arising out of errors, omissions or deficiencies in the Drawings and Specifications.

Article 2 -- Time

A. The work to be performed under this Contract shall be commenced within Ten (10) days as evidenced by a Notice to Proceed from the Owner and shall be completed by _____. Completion will be determined at the time in which all Development construction is completed as evidenced by the fully executed final certificate of substantial completion (AIA Document G704) has been received and approved by MHDC. This final certificate of substantial completion shall be the trigger for the start of the Development warranty period. The time by which the work shall be completed may be extended in accordance with the terms of the said AIA General Conditions only

with the prior written approval of the Owner and MHDC, such approval shall not be unreasonably withheld.

B. The Contractor shall correct any defects due to faulty materials or workmanship which appear within one year from the date of substantial completion.

C. If the work is not substantially completed in accordance with the Drawings and Specifications, including any authorized changes, by the date specified above, or by such date to which the contract time may be extended, the contract sum stated in Article 3A below shall be reduced by $0.00 as liquidated damages, for each day of delay until the date of substantial completion.

D. The date of substantial completion shall be the date the Architect establishes that the Development is substantially completed as established by the AIA General Conditions provided that the date is subsequently endorsed by the Owner and MHDC or their designated representative(s).

E. By not more than 60 days after the date of substantial completion, the Contractor shall furnish final certificates of occupancy, if applicable and unconditional lien releases from all subcontractors and suppliers or provide adequate security bonding over any such claims as determined by the Owner. If the Contractor fails to fulfill its obligations hereunder, the Contractor agrees to pay liquidated damages of $0.00 per day for each day until it has fulfilled such obligations. Owner may deduct liquidated damages in this subparagraph E and in subparagraph C from the final payment owed to the Contractor.

Article 3 -- Contract Sum and Payments

A. (1) Subject to the provisions hereinafter set out, the Owner shall pay to the Contractor for the performance of this Contract the following items in cash:

(a) The actual cost of construction as defined in Article 9 below; plus

(b) A fee of **$**_____.

(c) Subject to the terms and conditions of this Contract the total cash payable pursuant to this paragraph shall not exceed **$**_____.

(d) In addition to any cash fee provided for in paragraph (1) Owner shall pay to the Contractor, the following: **NONE**

(2) If, upon completion, the Contractor shall have received cash payments in excess of (a) the actual cost of construction, plus (b) the cash fee specified in paragraph (1), plus the additional amount to be paid under the provisions of paragraph 1(d), all such excess shall be refunded to the Owner.

B. Each month after the commencement of work hereunder, the Contractor shall make a

monthly request on Form AIA G702 and G703 (or equivalent form approved by MHDC) for payment by the Owner for work done during the preceding month. Each request for payment shall be filed at least Seven (7) days before the date payment is desired. Subject to the approval of the MHDC, the Contractor shall be entitled to payment thereon in an amount equal to (1) the total value of classes of the work acceptably completed; plus (2) the value of materials and equipment incorporated in the work; less (3) 10 percent holdback **(or acceptable substitute security as required by RSMo. § 436.306-309)** and less prior payments. The "values" of (1) and (2) shall be computed in accordance with the amounts assigned to classes of work in the "Contractor's and/or Mortgagor's Cost Breakdown," attached hereto as **Exhibit "B"**. The Contractor agrees that no materials or equipment required by the Specifications will be purchased under a conditional sale contract or with the use of any security agreement or other vendor's title or lien retention instrument. All payments under this Contract shall be disbursed pursuant to a Disbursing Agreement by and among the Owner, Contractor, Title Insurance Company, Architect(s) and MHDC.

C. The balance due the Contractor hereunder shall be payable upon the expiration of Thirty (30) days after the work hereunder is fully completed, provided the following have occurred:

(1) All work hereunder requiring inspection by municipal or other governmental authorities having jurisdiction has been inspected and approved by such authorities and by the rating or inspection organization, bureau, association or office having jurisdiction; and

(2) All certificates of occupancy, or other approvals, with respect to all units of the Development have been issued by State of local governmental authorities having jurisdiction; and

(3) Architect has inspected the work and issues final Certificate of Payment as set forth in the AIA General Conditions; and

(4) Contractor has submitted his cost certifications to MHDC as required by MHDC under Article 9; and

(5) MHDC has allowed all costs as submitted in Contractor's Cost Certification.

D. With its final application for payment by the Owner, the Contractor shall disclose, on a form prescribed by the MHDC, all unpaid obligations contracted in connection with the work performed under this Contract.

The Contractor agrees that within Fifteen (15) days following receipt of final payment, it will pay such obligations in cash and furnish satisfactory evidence of such payment to the Owner.

Article 4 -- Receipts and Releases of Liens

The Owner and MHDC may require the Contractor to attach to each request for payment its acknowledgement of payment and waiver or release of lien and all subcontractors' and

materialmen's acknowledgements of payment and waiver or release of lien for work done and materials, equipment and fixtures furnished through the date covered by the previous payment. Concurrently with the final payment, the Owner and MHDC shall require the Contractor and subcontractor to execute a waiver or release of lien for all work performed and materials furnished hereunder.

Article 5 -- Requirements of Contractor

A. The Contractor shall furnish, at its own expense, all building and other permits, licenses, tools, equipment and temporary structures necessary for the construction of the Development. The Contractor shall give all required notices and shall comply with all applicable codes, laws, ordinances, rules and regulations, and with the current regulations of the National Board of Fire Underwriters, wherever applicable. The Contractor further shall comply with the provisions of the Occupational Safety and Health Act of 1970. The Contractor shall immediately notify the MHDC of the delivery of all permits, licenses, certificates of inspection, certificates of occupancy, and any other such certificates and instruments required by law, regardless of to whom issued, and shall cause them to be displayed to the MHDC upon his request. Contractor shall also be responsible to comply with the provisions of those laws commonly known as CERCLA, RCRA, Clear Air Act, Clean Water Act and all other federal, state and local laws, ordinances, codes, rules and regulations pertaining to the protection of the environmental and of persons.

B. If the Contractor observes that the Drawings and Specifications are at variance with any applicable codes, laws, ordinances, rules or regulations, or protective covenants, it shall promptly notify the Architect(s) in writing, and any necessary changes shall be made as provided in this Contract for changes in the Drawings and Specifications. If the Contractor performs any work knowing it to be contrary to such codes, laws, ordinances, rules or regulations, or protective covenants, without giving such notice to the Architect(s), it shall bear all costs arising therefrom.

C. Upon completion of construction, the Contractor shall cooperate with the Owner in providing a survey showing the location on the site of all improvements constructed thereon, and showing the location of all water, sewer, gas and electric lines and mains, and of all existing utility easements. Such survey shall be prepared by a licensed surveyor who shall certify that the work is installed and erected entirely upon the land covered by the _____ _____deed of trust and security agreement on the Development and within any building restriction lines on said land, and does not overhang or otherwise encroach upon any easement or right-of-way of others. The Owner shall furnish copies of such survey required hereunder to MHDC.

D. The Contractor shall assume full responsibility for the maintenance of all landscaping which may be required by the Drawings and Specifications until such time as both parties to this Contract shall receive written notice from the Architect(s) that such landscaping has been finally completed. The Owner hereby agrees to make available to the Contractor, for such purpose, without cost to the latter, such facilities as water, hose and sprinkler.

E. The Contractor shall provide Owner with two (2) copies of the Development maintenance manual.

F. _____If prevailing wage rates are applicable to this Development, the Contractor acknowledges that MHDC will monitor the Contractor's compliance with the prevailing wage requirements on a **monthly** basis. The Contractor must insert the wage provisions as determined by the Secretary of Labor for this Development in the construction contract so as to cover all laborers and mechanics employed in the development of the Development. In addition, the Contractor must post a notice at the job site that all laborers and mechanics are to be paid the prevailing wages in accordance with the prevailing wage determination applicable to the Development. The prevailing wage determination must also be posted at the job site. These postings must be placed so that all affected persons have clear access to the information. As part of the monitoring process, MHDC will make on-site inspections and conduct spot interviews of laborers and mechanics to verify that prevailing wages are being paid. In addition, the Contractor must submit weekly payroll forms to MHDC on a monthly basis. The payrolls will be on HUD forms WH-347 and WH-348. These forms must evidence payment of the prevailing wages. In addition, the contractor is responsible for obtaining these forms from their subcontractors and ensuring that the subcontractors comply with all prevailing requirements.

G. The contracting parties acknowledge and agree to be bound by the MHDC Workforce Eligibility Policy. If there is a violation of the MHDC Workforce Eligibility Policy the contracting parties may be sanctioned by MHDC. The imposition of sanctions will include, but is not limited to, the disqualification of the contracting parties from participation in future MHDC projects. MHDC may also elect to escrow funds which may be utilized in the event Undocumented Workers are determined to be working the project.

The contracting parties agree that in order to adhere to the MHDC Workforce Eligibility Policy each party to this agreement shall comply with the following:

- The contracting parties agree to provide MHDC with all bids collected which were solicited prior to entering into this contract. The contracting parties also agree to provide MHDC with all future bids which may be obtained by the contracting parties with respect to the scope of work contemplated herein;

- The contracting parties agree that prior to any individual performing any work on the project that individual must have properly completed the Form I-9 process with their employer [see Federal Form I-9 (Rev. 06/05/07) N];

- The contracting parties agree to use the Department of Homeland Security's E-Verify program for all employees working on the project except individual employees for which use of E-Verify is not possible due to the employee's existing employment status prior to the contracting party's registration and use of E-Verify. E-Verify is an Internet-based system operated by the Department of Homeland Security in partnership with the Social Security Administration that allows participating employers to electronically verify the employment

eligibility of their newly hired employees. The contracting parties agree to certify in writing that they are using and will continue to use the E-verify system.

- The contracting parties agree that a Form I-9 shall be kept on site for each individual who works on the project. The contracting parties also agree to provide E-Verify print-outs affirming the status of each of the individuals working on the project and attach the E-Verify printout to the corresponding Form I-9 which is stored on the project site (it is an acceptable practice to redact the social security number from the Form I-9 and E-Verify printout which is made available to MHDC for review);

- The contracting parties will cause a list of all individuals employed in the construction of this project to be retained on site;

- The contracting parties agree that a daily sign-in sheet for all individuals working on the project shall be maintained on site;

- The contracting parties will retain and provide MHDC monthly certified payroll records (every month during the construction of the project) for all employees and independent contractors working on the project;

- The contracting parties agree to allow MHDC to review the following documents during any MHDC on site Workforce Eligibility Policy inspections:

  - Form I-9s
  - E-Verify Print-out with corresponding I-9
  - Comprehensive list of individuals who have worked on the project
  - The daily sign in sheet for individuals who are working on the project
  - Copies of all contracts executed in conjunction with the development

-MHDC shall be permitted to access the site to conduct random Workforce Eligibility Policy compliance reviews;

-The contracting parties agree that all contracts and subcontracts, and down the line contracts and subcontracts entered into as a part of this Development shall include this section verbatim; and,

-A copy of this entire agreement shall be made available to MHDC prior to beginning the scope of work contemplated herein.

All Capitalized terms in this section have the same meaning as defined in the MHDC Workforce Eligibility Policy.

H. If applicable, the Contractor and Owner shall ensure compliance with the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701(u)

(hereinafter "Section 3").

(1) The purpose of Section 3 is to ensure that employment and other economic opportunities generated by HUD assistance or HUD-assisted Developments covered by Section 3, shall, to the greatest extent feasible, be directed to low- and very low-income persons, particularly persons who are recipients of HUD assistance for housing.

(2) The parties to this contract agree to comply with HUD's regulations in 24 CFR Part 135, which implement Section 3. As evidenced by their execution of this contract, the parties to this contract certify that they are under no contractual or other impediment that would prevent them from complying with the part 135 regulations.

(3) The contractor agrees to send to each labor organization or representative of workers with which the contractor has a collective bargaining agreement or other understanding, if any, a notice advising the labor organization or workers' representative of the contractor's commitments under this Section 3 clause, and will post copies of the notice in conspicuous places at the work site where both employees and applicants for training and employment positions can see the notice. The notice shall describe the Section 3 preference, shall set forth minimum number and job titles subject to hire, availability of apprenticeship and training positions, the qualifications for each; and the name and location of the person(s) taking applications for each of the positions; and the anticipated date the work shall begin.

(4) The contractor agrees to include this Section 3 clause in every subcontract subject to compliance with regulations in 24 CFR Part 135, and agrees to take appropriate action, as provided in an applicable provision of the subcontract or in this Section 3 clause, upon a finding that the subcontractor is in violation of the regulations in 24 CFR Part 135. The contractor will not subcontract with any subcontractor where the contractor has notice or knowledge that the subcontractor has been found in violation of the regulations in 24 CFR Part 135.

(5) The contractor will certify that any vacant employment positions, including training positions, that are filled (1) after the contractor is selected by before the contract is executed, and (2) with persons other than those to whom the regulations of 24 CFR part 135 require employment opportunities to be directed, were not filled to circumvent the contractor's obligations under 24 CFR part 135.

(6) Noncompliance with HUD's regulations in 24 CFR part 135 may result in sanctions, termination of this contract for default, and debarment or suspension from future HUD assisted contracts.

Article 6 -- Assurance of Completion

The Contractor shall furnish to the Owner assurance of completion of the work in the form of:

100% Performance - Payment Bond (Dual Obligee) (MHDC Forms 2452 and 2452-A), in the amount of $_____; or,

A Completion Assurance Agreement (MHDC Form 2450) in favor of MHDC in the amount of $_____ (an unconditional, irrevocable, nondocumentary letter of credit in favor of MHDC, in the form approved by MHDC, or cash) to be held and disbursed in accordance with the MHDC Completion Assurance Agreement.

In the event the Contractor furnishes a Performance/Payment Bond as assurance of completion, the Contractor shall furnish to the Owner, latent defects insurance in the form of:

A Completion Assurance Agreement (Latent Defects) in favor of the MHDC in the amount of $_____ (either cash or an unconditional, irrevocable, nondocumentary letter of credit in favor of MHDC, in a form approved by MHDC) to be held and disbursed by MHDC, as necessary.

Such assurance of completion shall run to the Owner and the MHDC as obligees and shall contain a provision whereby the surety agrees that any claim or right of action that either the Owner or the MHDC might have thereunder may be assigned to the MHDC.

Article 7 -- Right of Entry and Interpretation

A. The MHDC and its agents or assigns and the MHDC's agents shall, at all times during construction, have the right of entry and free access to the Development and the right to inspect all work done and materials, equipment and fixtures furnished, installed or stored in and about the Development. For such purposes, the Contractor shall furnish such enclosed working space as the MHDC or Agents may require and find acceptable as to location, size, accommodations and furnishings.

B. The MHDC shall also have the right to interpret the Contract Documents and to determine compliance therewith.

Article 8 -- Assignments, Subcontracts and Termination

A. This Contract shall not be assigned by either party without the prior written consent of the other party, and the MHDC, except that the Owner may assign the Contract, or any rights hereunder, to the MHDC.

B. The Contractor shall not subcontract all of the work to be performed hereunder without the prior written consent of the Owner and the MHDC.

C. Upon request by the Owner, or the MHDC, the Contractor shall disclose the names of all persons with whom it has contracted or will contract with respect to work to be done and materials

and equipment to be furnished hereunder. MHDC shall always be provided the monthly subcontractor list and copies of all subcontracts must be available for MHDC review.

D. The Contractor understands the work under this Contract is to be financed by a capital advance to be secured by a _____ _____deed of trust and security agreement and that the terms of said loan are set forth in a Capital Advance Agreement between the Owner and MHDC.

The Contractor further understands that said Capital Advance Agreement provides, among other things, that (i) costs of construction as defined therein will be advanced only to the extent that such charges have accrued thereunder; and (ii) in the event of a failure of the Owner to perform its obligations to the MHDC thereunder, the MHDC may, as attorney-in-fact for the Owner, undertake the completion of the Development in accordance with this Contract; and, in the event the MHDC elects not to undertake such completion, the Contractor's obligations under this Contract shall terminate.

Article 9 -- Certification of Actual Cost

A. The "actual cost of construction" as used in Article 3 above, **which is due Sixty (60) days after the date of substantial completion,** shall include all items of cost and expense incurred by the Contractor in the performance of this Contract, including costs and expenses of labor, materials for construction, equipment and fixtures, field engineering, sales taxes, workmen's compensation insurance, social security, public liability insurance, job overhead expenses, and all other expenses directly connected with construction, and including general overhead expenses, but excluding kickbacks, rebate and discounts received in connection with the construction of the Development; and excluding any return on or cost of the Contractor's working capital, such return on or cost of working capital being a part of or to be paid from the Contractor's fee or profit.

B. The Contractor shall keep accurate records of account of the said actual cost of construction, and shall, upon demand, make such records and invoices, receipts, subcontracts and other information pertaining to the construction of the Development available for inspection by the Owner and MHDC.

C. With its final application for payment, the Contractor shall furnish to the Owner a completed "Contractor's Certificate of Actual Cost," which shall be accompanied and supported by an independent public accountant's certificate as to actual cost (in form acceptable to MHDC).

D. In the event MHDC determines there is an identity of interest between the Owner or Contractor and any such subcontractor, equipment lessor or supplier, the Contractor shall include a provision in all subcontracts, equipment leases and purchase orders requiring the subcontractor, equipment lessor supplier to certify its costs incurred in connection with the Development.

Article 10 -- Insurance

Contractor shall provide to Owner and MHDC at all times during the existence of the Contract Documents and the performance of the work contemplated thereby, Worker's Compensation and Employer's Liability Insurance, Public Liability Insurance and Vehicle Liability Insurance in the form and at least in the amount(s) required by MHDC Form 92329

Article 11 -- Miscellaneous

A. Contractor agrees to furnish Owner and MHDC signed subcontracts from all subcontractor(s) who are to furnish or perform work, labor, services, or materials upon, to or for the work contemplated by the Contract Documents in support of the estimated costs contained on **Exhibit "B"**.

B. Upon issuance of the Certificate of Substantial Completion of the Development by the Architect(s), , the Owner, Architect, and Contractor shall review and prepare a list of items to be completed and corrected ("Punchlist"). Should there be any item(s), on the Punchlist, the Owner and MHDC shall establish an estimated cost to complete each item and Owner will escrow from the amount due Contractor an amount equal to one and one-half (1-1/2) times the estimated cost necessary to complete said work. **All items on the punch list, if any, shall be completed within Two (2) weeks after the date of substantial completion.**

The amount of funds escrowed shall be paid within Thirty (30) days after the MHDC's representative has inspected said work and finds the work acceptable under the Contract Documents and the provisions of Article 3(C) fully performed.

C. The estimated costs to complete all items referred to in Article 2 paragraph B above shall not exceed the costs set forth in the Contractor's and/or Mortgagor's Cost Breakdown (Form FIN-115), attached as **Exhibit "B"**, except as may be adjusted by approved Change Orders **as defined in the MHDC Capital Advance Agreement.**

D. After the final Certificate of occupancy and prior to the Cost Certification, the Owner will establish a date signifying the start of the Contractors 1 year warranty period for all parts, assembly and labor under which the entire development will be a part of. This will include all resident / commercial spaces regardless of their particular occupancy date.

IN WITNESS WHEREOF, the parties hereto have executed this Contract in Two (2) counterparts, each of which shall be deemed an original, in the day and year first above mentioned.

(SEAL)
ATTEST/WITNESS:

OWNER:

_____, a Missouri _____

By: _____, its _____

_____

By: _____

(SEAL)
ATTEST/WITNESS:

CONTRACTOR:

_____, a Missouri _____

_____

By: _____
_____, _____

NOTICE TO OWNER. FAILURE OF THIS CONTRACTOR TO PAY THOSE PERSONS SUPPLYING MATERIAL OR SERVICES TO COMPLETE THIS CONTRACT CAN RESULT IN THE FILING OF A MECHANIC'S LIEN ON THE PROPERTY WHICH IS THE SUBJECT OF THE CONTRACT PURSUANT TO CHAPTER 429, RSMo. TO AVOID THIS RESULT, YOU MAY ASK THIS CONTRACTOR FOR "LIEN WAIVERS" FROM ALL PERSONS SUPPLYING MATERIAL OR SERVICES FOR THE WORK DESCRIBED IN THIS CONTRACT. FAILURE TO SECURE LIEN WAIVERS MAY RESULT IN YOUR PAYING FOR LABOR AND MATERIAL TWICE.

MHDC 92442-CA

SECTION 005000
CONDITIONS OF THE CONTRACT

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The work included under these Specifications consists of furnishing all items, materials, operations, or methods listed, mentioned, indicated, or scheduled on the Drawings and/or in these Specifications, including all labor, materials, equipment transportation temporary facilities, services, and incidentals necessary and required for construction completion of the project named in title page in accordance with Contract Documents.

1.02 FORM OF SPECIFICATIONS

A. Conditions of the Contract, Supplementary General Conditions, and Division 1 apply to every Division of these Specifications.

B. These Specifications are of abbreviated form and contain incomplete sentences. Omissions of words or phrases such as “the Contractor shall”, “shall be”, “as noted on the Drawings”, “according to the Drawings”, “a”, “the”, and “all” are intentional. Omitted words and phrases shall be supplied by inference in the same manner as they are when a “note” occurs on the Drawings.

C. All Specification instructions are directed to the Contractor, and inclusion of any work by mention, note, or itemization, however brief, implies Contractor shall provide same unless specifically directed otherwise.

D. In specifying an item by manufacturer’s name and/or catalog number, unless specifically stated otherwise, such item shall be provided with all standard devices and accessories indicated in latest edition of manufacture’s catalog or brochure published at date of Invitation to Bid: furnished such item complete with component parts necessary for obviously intended use and installation, whether or not description or catalog number contains all supplemental information and/or numbers of such components.

1.03 UNIFORM FEDERAL ACCESSIBILITY STANDARDS

A. General Contractor shall complete all work in accordance with latest printed edition of the Fair Housing Act Guidelines, Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act and/or the Uniform Federal Accessibility Standards as applicable. Where work is required to comply with the standards and conflict exist with the architectural plans and/or specifications, notify Architect immediately of such conflict and request written clarification prior to proceeding with the work.

1.04 AIA GENERAL CONDITIONS

A. AIA Document A201, “General Conditions of the Contract for Construction”, 2017 Edition, 14 Articles, hereinafter referred to as “AIA General Conditions”, is hereby made a part of this Specification. Contractor shall consult this Document and become intimately familiar with it content.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 SUPPLEMENTS AND AMENDMENTS TO THE AIA GENERAL CONDITIONS

A. The AIA General Conditions are hereinafter supplemented and/or amended. All supplementary provisions shall be considered as added thereto. Where any Article is amended, deleted or superseded hereby, unaltered provisions of such. Article shall remain in effect.

3.02 GENERAL PROVISIONS

A. Supplement Subparagraph 1.2.1 as follows:

1. Drawings, Specifications and Other Contract Documents are not intended as “Shop Drawings” or extensively detailed documents; they are intended to indicate general design concept of Project in sufficient detail that all work required is reasonable inferable there from and Contractor shall provide all work thus indicated or reasonably inferred as

necessary to produce intended results of complete, structurally sound, aesthetically desirable, durable, properly performing work of quality. Should conflict occur between Drawings and Specifications, Contractor shall obtain written decision of same from Architect prior to submitting Bid, Signing Agreement or proceeding with the work.

B. Supplement Subparagraph 1.4,1 Interpretation, as follows:
   1. When a word, “approval”, “approved”, “proper”, “satisfactory”, “equal”, and “as directed”, is used, it implies such reference as to the Architect’s approval or direction.
   2. “Approve”, “approval”, or “approved” means the Architect will observe or review items or construction referred to him for such approval and that his review represents his opinion that such item or construction is acceptable for the circumstances and conditions of the project, based on his observations and/or information made available to him by Contractor. However, such review shall not represent that Architect checked item or construction in detail, nor that he thereby waives original requirements or assumes any responsibility for its correctness or performance.
   3. “Equal”, “equivalent”, means the item or construction possesses similar physical size and characteristics, similar performance qualities and characteristics and fulfills utilitarian functions required by Contract Documents without any decrease in quality, appearance or durability, responsibility for “equal” or “equivalent” item of construction fulfill the Architect’s intent of Contract Documents (expressed or implied) rests with the Contractor.
   4. “Extent” means general checklist or outline of work included: not constructed as all inclusive nor limiting and not relieving Contractor from providing all similar or related work elsewhere indicated or inferable in Contract Documents.
   5. “Indicated” means as indicated on Contract Documents.
   6. “Provide” means furnish and install.

3.03 ARTICLE 2 OWNER

A. Delete Subparagraph 2.2.5 and insert: The successful Contractor awarded the contract shall purchase Drawings and Project Manuals as needed for the execution of the work.

3.04 ARTICLE 3 CONTRACTOR

A. Supplement Subparagraph 3.7.1 as follows:
   1. Contractor shall give notice to public or private utility companies and others required to make installations, in ample time for them to complete such installations and not delay the project, whether such installations are under contract or reasonable inferable necessary for completion of project. Contractor is responsible for staking or surveying as may be required to complete the installation of utilities either on or off site by any Utility Companies or by private contract.

B. Supplement Subparagraph 3.12.5 as follows:
   1. By submitting Shop Drawings and samples, Contractor thereby represents he has approved them (whether they bear his approval stamp or not) and he has determined and verified all field measurements, quantities, field construction criteria, materials, catalog numbers, and similar data, or will do so, and he has checked and coordinated Shop Drawings and sample with requirements of work and Contract Documents and with work of all other trades and Contractors on project.

C. Supplement Subparagraph 3.12.8 as follows:
   1. When material or equipment is specified by manufacturer’s name or names, the intent is to establish quality required. Materials other than those specified will be considered after Contract has been executed provided they are submitted in writing by successful bidder with sufficient data to establish that their quality for the use intended is equivalent to the quality of materials specified.
   2. By making request for substitution, the Contractor represents that he has personally investigated the substitute product and determined that it is equal or superior to that specified, that he will provide the same warranty as for that specified, that he waives all claims for any additional cost related to the substitution, and that eh will coordinate the installation of any accepted substitution making changes as may be required such that the work shall be complete in all respects.

3. Requests for substitutions shall be submitted in sufficient time to allow for proper consideration and so as to cause no delay in the work. All materials and equipment shall be applied, installed, connected, cleaned and placed in operation in accordance with manufacturer's directions.
4. When material or equipment is required to be installed by manufacture's approved applicator, it shall be the contractor's responsibility to insure such approval.

3.05 ARTICLE 4 ADMINISTRATION OF THE CONTRACT

A. Insert after first sentence in Subparagraph 4.1.1: The term Architect means Architect or his authorized representative (including his Consulting Engineer). The term Architect/Engineer means Architect and/or his Consulting Engineer.

3.06 ARTICLE 8 TIME

A. Add the following Subparagraph 8.1.5: As between the Owner and the Contractor: as to all acts or failures to act occurring prior to the relevant Date of Substantial Completion, any applicable statue of limitations shall commence to run and any alleged coarse of action shall be deemed to have accrued in any and all events not later than such Date of Substantial Completion; as to all acts or failures to act occurring subsequent to the relevant Date of Substantial Completion, any applicable statue of limitation shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of issuance of final Certificate of Payment.

3.07 ARTICLE 11 INSURANCE AND BONDS

A. Supplement Paragraph 11.1 Contractor's Insurance and bonds, add the following: 11.1.4 Certificates of Insurance: General Contractor shall, before commencing work under this Contract, submit duplicate copies to Architect and Owner showing evidence that all Certificates of Insurance are in effect, covering Contractor and owner as their interests may appear, and that these minimum insurance coverage will not be canceled or changed until 30 days after written notice is given to Owner and Architect. Coverage are as follows:
   1. Workmen's Compensation: Statutory for applicable states, except provide $100,000.00 minimum coverage.
   2. Comprehensive General Liability including Contractor's Liability: Contingent Liability; Contractual Liability, Completed Operations and Products Liability all on occurrences with Bodily Injury Coverage and broad from Property Damage. Remove XCU exclusion relating to Explosion, Collapse and Underground Property Damage. Completed Operations Liability shall be kept in force for at least 2 years after date of final completion. Provide $500,000.00 minimum coverage.
   3. Comprehensive Automobile Liability including nonowner or hired care coverage as well as owned vehicles. Provide $500,000.00 minimum coverage.
   4. Employer's Liability: Provide $100,000.00 minimum coverage.
   5. Builder's Risk Insurance: Contractor will effect and maintain, Fire Insurance with extended coverage and vandalism and malicious mischief insurance upon the entire structure on which the work to be performed under this Contract is to be done to the extent of 100% of the insurable value thereof. Contractor will be responsible for any and all deductibles.
   6. In addition to the above minimum coverage, Contractor shall provide $1,000,000.00 umbrella coverage.

B. Add Paragraph 11.4 Performance Bond and Payment Bond as follows:
   1. Performance Bond and Labor and Materials Payment Bonds shall be furnished to the Owner, by General Contractor, in an amount equal to 100% of the contract sum as security for the faithful performance of the contract and the payment of all persons performing labor and furnishing materials in connection with the contract.
   2. Surety: Bonds furnished shall be written by a Surety approved by the U.S. Treasury Department and licensed to do business in the State where project is to be constructed. No work shall be commenced until bonds are in force. Power of Attorney for the Surety Company Agent must accompany each bond issued, and must be certified to include the date of the bonds.
   3. Bid Proposal: Contractor shall include cost of bonds in contract price.

END OF SECTION

SECTION 005436
BUILDING INFORMATION MODELING EXHIBIT

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The work included under these Specifications consists of furnishing all operations, or methods listed, mentioned, indicated or scheduled on the Drawings and/or in these Specifications concerning the preparation of electronic drawings by Architect and/or Architect's Consultants for the Project. This information is being made available to the Contractor, sub-contractor and material suppliers to set forth the basis of design.

B. This Section establishes the terms and protocols governing the reliance upon, and the ownership, development, uses, transmission and sharing of Building Information Models (BIM) and other Digital Data for the Project.

1.02 DEFINITIONS

A. Building Information Model or Model: A BIM or Model is a digital representation of the Project or a subset of the Project. A Model is a collection of one or more Model Portions, each of which is an assemblage of Model Elements.

B. Model Portion: A model Portion, or Portion, is a subset of a Model. The parties may designate a Model Portion by discipline, trade, area, location, phase, or other mutually agreeable distinction.

C. Model Element: A Model Element is a digital representation of a component, system, object, or assembly within a Model.

D. Model Version: A Model Version, is a specific edition of a Model or Model Portion that is sufficiently identifiable as unique and unchanged as of the time it is saved by its Author or the Architect

E. Confidential Digital Data: Unless otherwise stated, Confidential Digital Data is Digital Data containing confidential or business proprietary information that the transmitting party designates as "confidential". For purposes of this Project – all information transmitted by Architect and Architect's Consultants shall be treated as confidential.

F. Contract Document: The term Contract Document shall have the same meaning as in the Agreement between the Owner and Architect and subsequently to the preparation of Drawings between the Owner and Contractor for the construction of the Project. The Model will not be enumerated as part of the Contract Document and should be considered as such.

G. Level of Development: The Level of Development (LOD) establishes the minimum dimensional, spatial, quantitative, and qualitative aspects of a Model Element, and the degree to which Project Participants may rely upon the Model Element when developed to that level in the Model. The Levels of Development is described further below in this Section.

1.03 MODEL USES AND RELIANCE

A. Model Uses, Sharing and Reliance: Project Participants may share, use and rely upon a Model or Model Portion only to the extent set forth in Items in this Section. Model sharing includes sharing within Design Team, with Contractor, and within the Construction Team

B. Model Uses: The Project Participants shall develop Models on the Project for the following uses:
   1. Planning: Examples include programming, site analysis, scheduling, and documentation of existing conditions
   2. Design: Examples include design authoring, design review, 3D coordination, structural analysis, lighting analysis, and engineering analysis.
   3. Any other uses or preparation of supplemental information or drawings utilizing the BIM model may be developed by the Contractor and/or subcontractors at their own discretion, expense, and risk.

C. Model Reliance: A Project Participant may only rely on Models, Model Portions, and Model Elements as indicated in Paragraph A. The Parties agree that the extent of their reliance on any

Model Version shall be limited to the uses identified in Paragraph B above. Any reliance on a Model Version not in accordance with this Section shall be at the Project Participant's sole risk.

D. Liability: To the fullest extent permitted by law, the Receiving Party shall indemnify and defend the Architect and Architect's Consultants from and against all claims arising from or related to the Receiving Party's modification to, or unlicensed use of, the Digital Data.

E. Model Coordination: If Project Participants discover or become aware of any discrepancies, inconsistencies, errors, or omissions in any Model Version, consistent with the LOD scope described below, they shall promptly report the discrepancy, inconsistency, error, or omission in writing to the Architect; prior to commencing any work.

1.04 LEVEL OF DEVELOPMENT

A. Level of Development Descriptions: The LOD descriptions below shall be used to identify the minimum required characteristics for each Model Element for the Project. Other Project Participants may only rely on a Model Element consistent with the minimum required characteristics for the designated LOD.

B. LOD 100. The Model Element designated for the Project by the Architect and Architect's Consultants for the Project is established to be LOD 100. The Model Element may be graphically represented in the Model with a symbol or other generic representation. Information related to the Model Element (e.g., cost per square foot, quantity, etc). Model Elements are not required to be an actual representation of a specific product as enumerated in the Construction Documents.

1.05 DIGITAL DATA LICENSING AGREEMENT

A. The purpose of this Agreement will be to grant a license from the Architect or Architect's Consultants (the Transmitting Party) to the Receiving Party for the Receiving Party's use of Digital Data and to set forth the license terms. This Exhibit is anticipated to utilize AIA Document C106-2022 Digital Data Licensing Agreement, and will be required to be executed prior to any data transfer.

B. Transmission of Digital Data: The Transmitting Party grants to the Receiving Party a nonexclusive limited license to use the Digital Data solely and exclusively for the uses, and in accordance with the terms, set forth in this Section, and in the Digital Data Licensing Agreement.

C. Access: Only the Receiving Party is permitted to access and use the Digital Data. Unlicensed and unauthorized access or use by third parties is strictly prohibited.

D. License Conditions: The Receiving Party may use and rely upon the Digital Data to the extent set forth below:

1. The Digital Data is transmitted solely for the Receiving Party's information. Receiving Party acknowledges that any use of the Digital Data shall be at Receiving Party's sole risk. The Receiving Party accepts the Digital Data "as is" without any warranty or representations from the Transmitting Party as to whether the Digital Data is accurate, complete, or fit for use as intended by the Receiving Party. The Receiving Party is solely responsible for verifying whether the Digital Data is accurate, complete, or fit for the Receiving Party's intended use.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 005500
MHDC CONDITIONS OF THE CONTRACT

PART 1 - GENERAL

1.01 MHDC REQUIREMENTS

A. The work included under these specifications consists of requirements stipulated by Missouri Housing Development Commission (The "MHDC") pursuant to the current MHDC Design Constraints Compliance Guidelines.

1.02 MHDC WORKFORCE ELIGIBILITY POLICY

A. MHDC has adopted and enacted the enforcement of its policy to support workforce eligibility requirements pursuant to its Commission, effective and made a part of these Specifications. The MHDC, effective the date of this Project, Workforce Eligibility Policy is made a part of this Project and shall be made a part of each General Contractor and each Subcontractors contract for the work to be performed for this Project. A copy of the MHDC Workforce Compliance Handbook is made a part of Work of this Section and available on the MHDC website.

B. As stipulated by the MHDC Workforce Compliance Handbook, submission of various Forms and Lists are required to be submitted to MHDC offices and/or retained on-site for periodic review and inspection to ensure compliance with the Policy. A partial listing of those forms and lists is listed below. MHDC may add to or delete from this list as may be determined to be appropriate for the specific Project or as may be amended from time to time by the Commission.
   1. Designated Workforce Eligibility Contacts, MHDC Form - 2510
   2. Use of E-verify. Each General Contractor and subcontractors who have employees perform labor on site must utilize E-Verify and submit proof of registration to use E-verify.
   3. I-9 Forms and E-Verify for Employees
   4. Labor List, MHDC Form -2509
   5. Master Subcontractor List, MHDC Form -2502
   6. Certified Payroll, MHDC Form - 2504
   7. Daily Sign In Sheet, MHDC Form -2505
   8. Contractor Labor List, MHDC Form - 2503
   9. Subcontractor Bids: Must be submitted to MHDC at the time of Firm Submission and updated as new bids are collected.
   10. Documentation of Good Standing: Each incorporated General Contractor and Subcontractors must submit a certificate of good standing issued by the Missouri Secretary of State that is dated no earlier than six months prior to execution of their contract in connection with the Project.

1.03 CONSTRUCTION DISBURSEMENT

A. General Contractor and all subcontractors shall comply with requirements set forth and made a part of the Specifications as set forth in the current MHDC Construction Disbursement Handbook, MHDC Form 2400..

B. Applicable Forms:
   1. MHDC Form FIN 115, Mortgagor's and/or Contractors Schedule of Values shall be utilized to complete the AIA form of payment request. NO adjustments in the schedule of values may be made without MHDC approval.
   2. American Institute of Architects, AIA Document G702/G703 -1992, Application for Certificate of Payment must be completed and submitted with each application for payment.
   3. AIA Document G701 - 2017, Change Orders
   4. Contractor's Prevailing Wage Certificate, MHDC Form -2450 (if applicable)
   5. MBE/WBE monthly reporting to MHDC, form together with sub-contractor list, Form 2502.

C. Monthly Disbursements:
   1. All amounts requested must be approved by an MHDC designated inspector.

2. The Project must be in good standing with submission of the I-9 Compliance documentation.
3. The monthly amount requested for General Contractor's overhead and profit must not exceed the percentage of completion of the Project.
4. The monthly amount requested for General Contractor's profit must not exceed the percentage of completion of the Project.
5. MHDC shall maintain ten percent (10%) retainage on all work performed on the Project during the construction. No reduction of retainage will be considered nor approved by MHDC until the Project has achieved 90% completion and may be reduced to five percent (5%), subject to MHDC approval.
6. Any adjustments requested by the Contractor to the approved FIN 115 MUST be submitted and processed by MHDC on an AIA Change Order form.
7. Change Orders: Change Orders must be submitted in advance of or concurrent with a monthly application for payment and require signature of Owner, Contractor and Architect. MHDC may require the receipt of appropriate Consent of Surety to any increase/decrease to be submitted with the Change Order to MHDC.

1.04 FIRM SUBMISSION REQUIRED DOCUMENTATION

A. At the time of submission of the Owner's application to MHDC, the following minimum items are required of the General Contractor.
   1. Contractor's Qualification Statement, AIA Document A305, current edition
   2. Financial Income/Balance Statement if required by MHDC
   3. Certificate of Insurance
   4. Certificate or evidence of Bonding
   5. Executed Mortgagor's and Contractors Cost Breakdown, MHDC Form -FIN 115
   6. Master Subcontractor List, MHDC Form -2502
   7. Subcontractor Bids

B. Should MHDC determine that additional documentation is required, the General Contractor shall provide in a timely manner.

1.05 OTHER MHDC REQUIRED DOCUMENTATION

A. During the performance of the work on the Project, General Contractor and all subcontractors shall maintain all required documentation and required Federal and State Notices at the Project Site as required. General Contractor shall post and maintain required MHDC Labor Lists, Master Lists, Sign-In sheets, I-9 documentation, Prevailing Wage notices (if applicable) at the Project site.

B. General Contractor shall ensure all site field personnel are familiar with MHDC requirements, rules/regulations, and procedures to maintain effective communication with Owner, Architect and MHDC designated representative regarding the implementation of MHDC policies.

C. General Contractor shall provide As-built survey and Surveryor's Report of the subject Project indicating all improvements at the site by a licensed land surveyor conforming to all requirements as stipulated and required by MHDC.

D. General Contractor shall provide a Cost Certification performed by independent CPA pursuant to MHDC requirements, guidelines and requirements.

1.06 FIRM COMMITMENT REQUIRED DOCUMENTATION

A. Executed Mortgagor's and Contractors Cost Breakdown, with the Schedule of Values shall be submitted in duplicate (2) copies with original signatures, MHDC Form FIN-115.

B. When subcontractors work and material suppliers exceed $10,000.00, their actual bids must be submitted.

C. A list of all major subcontractors by work category.

D. Contractors' Qualification Statement, AIA Form A305, current edition.

PART 2 PRODUCTS - NOT USED
PART 3 EXECTUION - NOT USED

END OF SECTION

SECTION 007000
GENERAL CONDITIONS

PART 1 GENERAL

1.01 FORM OF GENERAL CONDITIONS

A. AIA Document A201, General Conditions of the Contract for Construction, 2017 Edition, attached, is hereby incorporated herein and made a part of the General Conditions between the Owner and Contractor.

PART 2 PRODUCTS - NOT USED)

PART 3 EXECUTION - NOT USED

END OF SECTION

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

Wilshire Hills III
NE Wilshire Dr.
Lee's Summit, Missouri

THE OWNER:
(Name, legal status and address)

Wilshire Hills III, L.P.
206 Peach Way
Columbia, MO 65203

THE ARCHITECT:
(Name, legal status and address)

Rosemann & Associates, P.C., a Missouri professional corporation
1526 Grand Boulevard
Kansas City, Missouri 64108-1404

TABLE OF ARTICLES

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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(Topics and numbers in bold are Section headings.)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement, and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding or proposal requirements.

§ 1.1.2 The Contract

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants, or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 The Work

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment, and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 The Project

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by Separate Contractors.

§ 1.1.5 The Drawings

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

§ 1.1.6 The Specifications

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 Instruments of Service

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent

consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 Capitalization

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles, or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 Interpretation

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor, within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of, or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

§ 2.3.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements,

assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.3.2 The Owner shall retain an architect lawfully licensed to practice architecture, or an entity lawfully practicing architecture, in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 2.3.3 If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

§ 2.3.4 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.3.5 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.3.6 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

§ 2.4 Owner's Right to Stop the Work

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 Labor and Materials

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 Warranty

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 Permits, Fees, Notices and Compliance with Laws

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- **.1** allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- **.2** Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit, and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- **.3** whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 Superintendent

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

§ 3.10.2 The Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, or fails to provide submittals in accordance with the approved submittal schedule, the

Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules, and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams, and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment, or workmanship, and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples, and similar submittals are not Contract Documents. Their purpose is to demonstrate how the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve, and submit to the Architect, Shop Drawings, Product Data, Samples, and similar submittals required by the Contract Documents, in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of Separate Contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples, and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so, and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples, or similar submittals, until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals, by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples, or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 Cutting and Patching

§ 3.14.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or Separate Contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter construction by the Owner or a Separate Contractor except with written consent of the Owner and of the Separate Contractor. Consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery, and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and the Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with access to the Work in preparation and progress wherever located.

§ 3.17 Royalties, Patents and Copyrights

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for defense or loss when a particular design, process, or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications, or other documents prepared by the Owner or Architect. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation, or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts, or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 4.1.2 Duties, responsibilities, and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified, or extended without written consent of the Owner, Contractor, and Architect. Consent shall not be unreasonably withheld.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the

Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data, and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5, and 3.12. The Architect's review shall not constitute approval of safety precautions or of any construction means, methods, techniques, sequences, or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations

and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either, and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a Separate Contractor or the subcontractors of a Separate Contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

§ 5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 Subcontractual Relations

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work that the Contractor, by these Contract Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor,

prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 Contingent Assignment of Subcontracts

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

.1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each Separate Contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, Separate Contractors, and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6, and Articles 10, 11, and 12.

§ 6.2 Mutual Responsibility

§ 6.2.1 The Contractor shall afford the Owner and Separate Contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work,

promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a Separate Contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a Separate Contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor as provided in Section 10.2.5.

§ 6.2.5 The Owner and each Separate Contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 Owner's Right to Clean Up

If a dispute arises among the Contractor, Separate Contractors, and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor, and Architect. A Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor. An order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.2 Change Orders

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor, and Architect stating their agreement upon all of the following:

- **.1** The change in the Work;
- **.2** The amount of the adjustment, if any, in the Contract Sum; and
- **.3** The extent of the adjustment, if any, in the Contract Time.

§ 7.3 Construction Change Directives

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions, or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
.4 As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;
.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;
.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and
.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.7 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will

affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement, the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and

unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or encumbrances, in favor of the Contractor, Subcontractors, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion, and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work; (2) reviewed construction means, methods, techniques, sequences, or procedures; (3) reviewed copies of requisitions received from Subcontractors and suppliers and other data requested by the Owner to substantiate the Contractor's right to payment; or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 Decisions to Withhold Certification

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;
- **.4** reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- **.5** damage to the Owner or a Separate Contractor;
- **.6** reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- **.7** repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor, no later than seven days after receipt of payment from the Owner, the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors and suppliers to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

§ 9.6.5 The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors or provided by suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.

§ 9.8 Substantial Completion

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.9 Partial Occupancy or Use

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor, and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection. When the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed, corrected, and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of the surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor, or a supplier, shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

The Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 Safety of Persons and Property

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury, or loss to

- **.1** employees on the Work and other persons who may be affected thereby;
- **.2** the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor, a Subcontractor, or a Sub-subcontractor; and
- **.3** other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with, and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities, bearing on safety of persons or property or their protection from damage, injury, or loss.

§ 10.2.3 The Contractor shall implement, erect, and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards; promulgating safety regulations; and notifying the owners and users of adjacent sites and utilities of the safeguards.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 Injury or Damage to Person or Property

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and notify the Owner and Architect of the condition.

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss, or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for hazardous materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.

§ 10.4 Emergencies

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury, or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to

the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns, and legal representatives to covenants, agreements, and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

§ 13.3.2 No action or failure to act by the Owner, Architect, or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed upon in writing.

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

§ 13.4.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.4.5 If the Architect is to observe tests, inspections, or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.4.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.5 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, for any of the following reasons:

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- **.3** Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, repeated suspensions, delays, or interruptions of the entire Work by the Owner as described in Section 14.3, constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- **.1** repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- **.2** fails to make payment to Subcontractors or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;
- **.3** repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- **.4** otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- **.1** Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- **.2** Accept assignment of subcontracts pursuant to Section 5.4; and
- **.3** Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance,

the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 Suspension by the Owner for Convenience

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work, in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

.1 that performance is, was, or would have been, so suspended, delayed, or interrupted, by another cause for which the Contractor is responsible; or

.2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 Termination by the Owner for Convenience

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of notice from the Owner of such termination for the Owner's convenience, the Contractor shall

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.6.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated, and had an adverse effect on the scheduled construction.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the

Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of the request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished, or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

§ 15.3.4 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 Arbitration

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

§ 15.4.4 Consolidation or Joinder

§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.

Additions and Deletions Report for
AIA® Document A201® – 2017

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

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PAGE 1

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Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, , hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 07:41:36 CT on 05/17/2023 under Order No. 2114332649 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A201™ - 2017, General Conditions of the Contract for Construction, other than those additions and deletions shown in the associated Additions and Deletions Report.

_____

(Signed)

_____

(Title)

_____

(Dated)

SECTION 008000
SUPPLEMENTARY CONDITIONS

PART 1 GENERAL

1.01 PREVAILING WAGE

A. See attached prevailing wage document Davis-Bacon Act Wage Determination Number MO170071, dated 06/02/2017. Modification Number 3.

1.02 LABOR STANDARDS

A. See attached Federal Labor Standards Provision form HUD-4010 dated (06/2009)

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED)

END OF SECTION

A. APPLICABILITY

The Project or Program to which the construction work covered by this Contract pertains is being assisted by the United States of America, and the following Federal Labor Standards Provisions are included in this Contract pursuant to the provisions applicable to such Federal assistance.

(1) MINIMUM WAGES

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment, computed at rates not less than those contained in the wage determination of the Secretary of Labor (which is attached hereto and made a part hereof), regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period.

Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii) and the Davis-Bacon poster (WH1321)) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place, where it can be easily seen by the workers.

(ii) Additional Classifications.

(A) Any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination;
(2) The classification is utilized in the area by the construction industry; and
(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor, the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division ("Administrator"), Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget ("OMB") under OMB control number 1235-0023.)

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, or HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise HUD or its designee or will notify HUD or its designee within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB Control Number 1235-0023.)

(D) The wage rate (including fringe benefits, where appropriate) determined pursuant to subparagraphs (1)(ii)(B) or (C) of this paragraph, shall be paid to all workers performing work in the classification under this Contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB Control Number 1235-0023.)

(2) Withholding. HUD or its designee shall, upon its own action or upon written request of an authorized representative of the U.S. Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work, all or part of the wages required by the contract, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the contractor, disburse such amounts withheld for and on account of the contractor or subcontractor to the respective employees to whom they are due. The U.S. Department of Labor shall make such disbursements in the case of direct Davis-Bacon Act contracts.

(3) Payrolls and basic records.

(i) Maintaining Payroll Records. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification(s), hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made, and actual wages paid.

Whenever the Secretary of Labor has found, under 29 CFR 5.5(a)(1)(iv), that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits.

Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and Budget under OMB Control Numbers 1235-0023 and 1215-0018)

(ii) Certified Payroll Reports.

(A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead, the payrolls only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at **https://www.dol.gov/agencies/whd/forms** or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors.

Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to HUD or its designee if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant sponsor, or owner, as the case may be, for transmission to HUD or its designee, the contractor, or the Wage and Hour Division of the U.S. Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this subparagraph for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to HUD or its designee. (Approved by the Office of Management and Budget under OMB Control Number 1235-0008.)

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under 29 CFR 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR 5.5(a)(3)(i), and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract; and

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph (a)(3)(ii)(b).

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 3729 of Title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under subparagraph (a)(3)(i) available for inspection, copying, or transcription by authorized representatives of HUD or its designee or the U.S. Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and Trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency (where appropriate), to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program.

If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringe benefits shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed, unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees, and journeymen under 29 CFR Part 5 shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this Contract.

(6) Subcontracts. The contractor or subcontractor will insert in any subcontracts the clauses contained in subparagraphs (1) through (11) in this paragraph (a) and such other clauses as HUD or its designee may, by appropriate instructions, require, and a copy of the applicable prevailing wage decision, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in this paragraph.

(7) Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act Requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this Contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this Contract shall not be subject to the general disputes clause of this Contract. Such disputes shall be resolved in accordance with the procedures of the U.S. Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of Eligibility.

(i) By entering into this Contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(ii) No part of this Contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(iii) Anyone who knowingly makes, presents, or submits a false, fictitious, or fraudulent statement, representation or certification is subject to criminal, civil and/or administrative sanctions, including fines, penalties, and imprisonment (e.g., 18 U.S.C. §§ 287, 1001, 1010, 1012; 31 U.S.C. §§ 3729, 3802.

(11) Complaints, Proceedings, or Testimony by Employees. No laborer or mechanic, to whom the wage, salary, or other labor standards provisions of this Contract are applicable, shall be discharged or in any other manner discriminated against by the contractor or any subcontractor because such employee has filed any complaint or instituted or caused to be instituted any proceeding or has testified or is about to testify in any proceeding under or relating to the labor standards applicable under this Contract to his employer.

B. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The provisions of this paragraph (b) are applicable where the amount of the prime contract exceeds **$100,000**. As used in this paragraph, the terms "laborers" and "mechanics" include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work, which may require or involve the employment of laborers or mechanics, shall require or permit any such laborer or mechanic in any workweek in which the individual is employed on such work to work in excess of 40 hours in such workweek, unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of 40 hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in subparagraph B(1) of this paragraph, the contractor, and any subcontractor responsible therefor, shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in subparagraph B(1) of this paragraph, **in the sum set by the U.S. Department of Labor at 29 CFR 5.5(b)(2)** for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of 40 hours without payment of the overtime wages required by the clause set forth in subparagraph B(1) of this paragraph. In accordance with the Federal Civil Penalties Inflation Adjustment Act of 1990 (28 U.S.C. § 2461 Note), the DOL adjusts this civil monetary penalty for inflation no later than January 15 each year.

(3) Withholding for unpaid wages and liquidated damages. HUD or its designee shall, upon its own action or upon written request of an authorized representative of the U.S. Department of Labor, withhold or cause to be withheld from any moneys payable on account of work performed by the contractor or subcontractor under any such contract, or any other Federal contract with the same prime contract, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages, as provided in the clause set forth in subparagraph B(2) of this paragraph.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraph B(1) through (4) of this paragraph and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in subparagraphs B(1) through (4) of this paragraph.

C. HEALTH AND SAFETY

The provisions of this paragraph (c) are applicable where the amount of the prime contract exceeds **$100,000**.

(1) No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his or her health and safety, as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.

(2) The contractor shall comply with all regulations issued by the Secretary of Labor pursuant to 29 CFR Part 1926 and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, (Public Law 91-54, 83 Stat 96), 40 U.S.C. § 3701 et seq.

(3) The contractor shall include the provisions of this paragraph in every subcontract, so that such provisions will be binding on each subcontractor. The contractor shall take such action with respect to any subcontractor as the Secretary of Housing and Urban Development or the Secretary of Labor shall direct as a means of enforcing such provisions.

SUPPLEMENTARY CONDITIONS TO THE CONSTRUCTION CONTRACT

U.S. Department of Housing and Urban Development
Office of Housing

OMB Approval No. 2502-0598
(Exp. 9/30/2021)

Article 1: Labor Standards

A. **Applicability.** The Project or program to which the construction work covered by this Contract pertains is being assisted or insured by the United States of America, and the following Federal Labor Standards Provisions are included in this Contract or related instrument pursuant to the provisions applicable to such Federal assistance or insurance. Any statute or regulation contained herein shall also include any subsequent amendment or successor statute or regulation. The terms of this Supplementary Conditions to the Construction Contract (HUD-92554M) takes precedence over all provisions of the "General Conditions of the Contract for Construction" (AIA Document A201) inconsistent with said Supplementary Conditions.

B. **Minimum Wages.** Pursuant to Section 212 of the National Housing Act, as amended, 12 U.S.C. 1715c, the minimum wage provisions contained in this paragraph B do not apply to those projects with Security Instruments insured under Section 221(h)(1) designed for less than 9 families and they do not apply to those projects with Security Instruments insured under either Section 220 or 233 designed for less than 12 families.

1. (i) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the Project) shall be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under Section 1 (b)(2) of the Davis-Bacon Act (40 U.S.C. 3141(2)(B)(ii)) on behalf of laborers or mechanics are considered wages paid to such laborers or

mechanics, subject to the provisions of 29 CFR 5.5(a)(1)(iv); also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs, which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided,* that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under 29 CFR 5.5(a)(1)(ii)) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

(ii) (a) Any class of laborers or mechanics that is not listed in the wage determination and that is to be employed under this Contract shall be classified in conformance with the wage determination. HUD shall approve an additional classification and wage rate and fringe benefits only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(b) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and HUD or its designee agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by HUD or its designee to the Administrator of the Wage and Hour Division, U.S. Department of Labor, Washington, D.C. 20210 (**"Administrator"**). The Administrator, or an authorized representative, shall approve, modify, or disapprove every additional classification action within thirty (30) days of receipt and so advise HUD or its designee or shall notify HUD or its designee within the thirty (30) day period that additional time is necessary.

(c) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives and HUD or its designee do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), HUD or its designee shall refer the questions, including the views of all interested parties and the recommendation of HUD or its designee, to the Administrator for determination. The Administrator, or an authorized representative, shall issue a determination within thirty (30) days of receipt and so advise HUD or its

designee or shall notify HUD or its designee within the thirty (30) day period that additional time is necessary.

(d) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs B.1.(ii)(b) or (c) of this Article, shall be paid to all workers performing work in the classification under this Contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the Contract for a class of laborers or mechanics includes a fringe benefit that is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *Provided*, That the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. **Withholding.** HUD or its designee shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this Contract or any other Federal contract with the same prime contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the Contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the Project), all or part of the wages required by the Contract, HUD or its designee may, after written notice to the Contractor, sponsor, applicant, or Owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased. HUD or its designee may, after written notice to the Contractor, disburse such amounts withheld for and on account of the Contractor or subcontractor to the respective employees to whom they are due.

3. **Payrolls, records, and certifications.**

(i) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the Project). Such records shall contain the name, address, and social security number of each such worker, his or her correct

classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in Section 1 (b)(2)(B) of the Davis-Bacon Act (40 U.S.C. 3141(2)(B)(ii))), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in Section 1 (b)(2)(B) of the Davis-Bacon Act (40 U.S.C. 3141(2)(B)(ii)), the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(a) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to HUD or its designee if the agency is a party to the Contract, but if the agency is not such a party, the Contractor shall submit the payrolls to the applicant, sponsor, or Owner, as the case may be, for transmission to HUD or its designee. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired, whether paper (Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/whd/forms/wh347.pdf or its successor site), or electronically pursuant to Program Obligations. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to HUD or its designee if the agency is a party to the Contract, but if the agency is not such a party, the Contractor will submit the payrolls to the applicant sponsor, or Owner, as the case may be, for transmission to HUD or its designee, the Contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this subparagraph for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to HUD or its designee.

(b) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or

supervises the payment of the persons employed under the Contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under 29 CFR 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR 5.5(a)(3)(i), and that such information is correct and complete.
(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the Contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the Contract.

(c) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph B.3.(ii)(b) of this Article.

(d) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Sections 3801 et seq of Title 31 of the United States Code.

(iii) The Contractor or subcontractor shall make the records required under subparagraph B.3.(i) of this Article available for inspection, copying, or transcription by authorized representatives of HUD or its designee or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, HUD or its designee may, after written notice to the Contractor, sponsor, applicant, or Owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. **Apprentices and Trainees.**

(i) **Apprentices.** Apprentices shall be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship, or with a State Apprenticeship Agency recognized by such Office, or if a person is employed in his or her first ninety (90) days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the

program, but who has been certified by the Office of Apprenticeship, or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where the Contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship, or a State Apprenticeship Agency recognized by such Office, withdraws approval of an apprenticeship program, the Contractor shall no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) **Trainees.** Except as provided in 29 CFR 5.16, trainees shall not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman's hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on

the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor shall no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) **Equal employment opportunity.** The utilization of apprentices, trainees and journeymen under 29 CFR Part 5 shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. **Compliance with Copeland Act Requirements.** The Contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this Contract.

6. **Subcontracts.** The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraphs 1 through 10 of this paragraph B and such other clauses as HUD or its designee may by appropriate instructions require, and a copy of the applicable prevailing wage determination, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all Contract clauses referenced in this subparagraph.

7. **Contract termination and debarment.** A breach of the Contract clauses in 29 CFR 5.5 may be grounds for termination of the Contract, and for debarment as a contractor or a subcontractor as provided in 29 CFR 5.12.

8. **Compliance with Davis-Bacon and Related Act Requirements.** All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this Contract.

9. **Disputes concerning labor standards.** Disputes arising out of the labor standards provisions of this Contract shall not be subject to the general disputes clause of this Contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and HUD or its designee, the U.S. Department of Labor, or the employees or their representatives.

10. **Certification of Eligibility.**

(i) By entering into this Contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of Section 3(a) of the Davis-Bacon Act (40 U.S.C. 3144(b)(2)) or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(ii) No part of this Contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of Section 3(a) of the Davis-Bacon Act (40 U.S.C. 3144(b)(2)) or 29 CFR 5.12(a)(1) or to be awarded HUD contracts or participate in HUD programs pursuant to 24 CFR Part 24.

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001. Additionally, U.S. Criminal Code, Section 1010, Title 18, U.S.C., "Federal Housing Administration transactions", provides in part: "Whoever, for the purpose of . . . influencing in any way the action of such Department . . . makes, passes, utters or publishes any statement, knowing the same to be false . . . shall be fined under this title or imprisoned not more than two years, or both."

C. **Contract Work Hours and Safety Standards Act.**

1. **Applicability and Definitions.** This paragraph C of Article 1 is applicable only if a direct form of federal assistance is involved, such as Section 8, Section 202/811 Capital Advance, grants etc., and is applicable only where the prime contract is in an amount greater than $100,000. As used in this paragraph C, the terms "laborers" and "mechanics" include watchmen and guards.

2. **Overtime requirements.** No contractor or subcontractor contracting for any part of the Contract work that may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty (40) hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty (40) hours in such workweek.

3. **Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the immediately preceding subparagraph C.2, the Contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, the Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of such subparagraph, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty (40) hours without payment of the overtime wages required by the clause set forth in such subparagraph.

4. **Withholding for unpaid wages and liquidated damages.** HUD or its designee shall, upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract, or under any other Federal contract with the same prime contractor, or under any other Federally-assisted contract subject to the Contract Work

Hours and Safety Standards Act which is held by the same prime contractor such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in subparagraph 3 of this paragraph C.

5. **Subcontracts.** The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in subparagraphs 1 through 5 of this paragraph C and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in such subparagraphs 1 through 5.

D. **Certification.**

For projects with Security Instruments insured under the National Housing Act, as amended, that are subject to paragraph B of this Article 1, the Contractor is required to execute the Contractor's Prevailing Wage Certificate within HUD-92448 as a condition precedent to insurance by HUD of the Loan, or an advance thereof, made or to be made by the Lender in connection with the construction of the Project.

Article 2: Equal Employment Opportunity

A. **Applicability.** This Article 2 applies to any contract for construction work, or modification thereof, as defined in the regulations of the Secretary of Labor at 41 CFR Chapter 60, which is paid for in whole or in part with funds obtained from the Federal Government or borrowed on the credit of the Federal Government pursuant to a grant, contract, loan insurance, or guarantee, or undertaken pursuant to any Federal program involving such grant, contract, loan, insurance, or guarantee.

B. The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, disability, or national origin. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, disability or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training including apprenticeship. The Contractor agrees to post in conspicuous places available to employees and applicants for employment notices to be provided setting forth the provisions of this nondiscrimination clause.

C. The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor state that all qualified applicants shall receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, disability, or national origin.

D. The Contractor shall send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding a

notice to be provided advising the said labor union or workers representatives of the Contractor's commitments hereunder, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

E. The Contractor shall comply with all provisions of Executive Order 11246 of September 24, 1965 and of the rules, regulations, and relevant orders of the Secretary of Labor.

F. The Contractor shall furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and shall permit access to its books, records, and accounts by the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

G. In the event of the Contractor's noncompliance with the nondiscrimination clauses of this Contract or with any of the said rules, regulations, or orders, this Contract may be canceled, terminated, or suspended in whole or in part and Contractor may be declared ineligible for further government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulations or order of the Secretary of Labor, or as otherwise provided by law.

H. The Contractor shall include the provisions of paragraphs A through H of this Article 2 in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to Section 204 of Executive Order 11246 of September 24, 1965, so that such provisions shall be binding upon each subcontractor or vendor. The Contractor shall take such action with respect to any subcontract or purchase order as HUD or the Secretary of Labor may direct as a means of enforcing such provisions, including sanctions for noncompliance. *Provided, however,* that in the event the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by HUD or the Secretary of Labor, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

Article 3: Equal Opportunity for Businesses and Lower Income Persons Located Within the Project Area

A. This Article 3 is applicable to projects covered by Section 3, as defined in 24 CFR Part 135.

B. The work to be performed under this Contract is on a project assisted under a program providing Federal financial assistance from HUD and is subject to the requirements of Section 3 of the Housing and Urban Development Act of 1968, as amended, 12 U.S.C. 1701u. Section 3 requires that to the greatest extent feasible opportunities for training and employment be given to low and very-low income residents of the unit of local government or the metropolitan area (or non-metropolitan county) as determined by HUD in which the Project is located and contracts for work in connection with the Project be awarded to business concerns which are located in, or owned in substantial part by persons residing in the same metropolitan area (or non-metropolitan county) as the Project.

Article 4: Health and Safety

A. This Article 4 is applicable only where the prime contract is in an amount greater than $100,000.

B. No laborer or mechanic shall be required to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his or her health and safety as determined under construction safety and health standards promulgated by the Secretary of Labor by regulation.

C. The Contractor shall comply with all regulations issued by the Secretary of Labor pursuant to 29 CFR Part 1926, and failure to comply may result in imposition of sanctions pursuant to the Contract Work Hours and Safety Standards Act, 40 USC 3701 et seq.

D. The Contractor shall include the provisions of this Article 4 in every subcontract so that such provisions shall be binding on each subcontractor. The Contractor shall take such action with respect to any subcontract as HUD or the Secretary of Labor shall direct as a means of enforcing such provisions.

SECTION 009500
MBE/WBE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project Record Documents

B. Certification upon Completion of the Work.

1.02 REQUIREMENTS OF CONTRACTOR AND SUBCONTRCTORS:

A. It is a condition of this Contract that the Contractor and any Subcontractor doing business under this Contract agrees to refrain from any unlawful employment practice as presently defined in Ordinances of the Columbia, Missouri, and that such person(s) will post at their employment office a notice setting forth the provisions of said City and that such person(s) agreed to abide by said provisions.

B. The Contractor shall make good faith efforts to employ minorities and women in all trades throughout the workforce.

C. Each person(s) shall be bound by the terms of Rules and Regulations promulgated for administration of said Sections; an such person(s) agree to execute the supportive documents for one of the following options:
   1. A proposed Affirmative Action Plan
   2. A certificate of compliance.

1.03 MBE/WBE REQUIREMENTS

A. The Contractor must fully comply with the requirements, terms and conditions of the MBE/WBE Requirements, including the use of a goal oriented system for minority/women business participation contained herein and all other requirements, terms and conditions.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GOALS

A. Policy: Minority/Women’s businesses shall have the maximum feasible opportunity to participate in the performance of this contract.

B. Subcontract Award: The Contractor agrees to make every effort to carry out this MBE/WBE policy through award of subcontractors to minority/women’s business enterprises to the fullest extent consistent with the efficient performance of this contract.
   1. It is the Owner’s goal that a minimum of TEN PERCENT (10%) of the total contracted portion of work be awarded to MBE businesses; and
   2. It is the Owner’s goal that a minimum of FIVE PERCENT (5%) of the total contracted portion of work be awarded to WBE businesses.

3.02 DEFINITIONS

A. As used in this Contract the term “minority/women’s businesses” means a business at least fifty-one percent (51%) of which is owned and controlled by minority group members or women and is certified such by a recognized agency as listed and approved by MHDC.

B. Minority/Women’s ownership must exercise actual day to day management.

C. THE MBE/WBE MUST SERVE A USEFUL BUSINESS PURPOSE AND BE CAPABLE OF PERFORMING THE PARTICULAR SCOPE OF WORK INDEPENDENT OF THE CONTRACTOR.

D. For the purpose of this definition, minority group members are Black Americans, Hispanic Americans, Asian Americans, American Indians, American Eskimos and American Aleuts.

E. CONTRCTOR MUST MAKE RESONABLE EFFORTS TO INSURE THAT MBE/WBE SUBCONTRACTORS ARE CERTIFIED AS HAVING THE CAPABILITY OF PERFORMING THE INTENDED SUBCONTRACT SCOPE OF WORK PRIOR TO BEID OPENING. (I.E. THE MBE/WBE MUST BE CABALE OF PROVIDING THE NECESSARY EQUIPMENT AND LABOR

FORCE INDEPENDENT OF THE Contractor, AND BE ABLE TO DEMONSTRATE SATISFACTORY PERFORMANCE ON CAPARIBLE TYPE AND SIZE OF PROJET)

F. For the purpose of this contract, the term “subcontract” includes all construction, modification and service work constructed for and by the Contractor in the execution of the Work under this contract.

G. Although it is not made a requirement herein for approval of a contract that a Contractor in fact meets or exceeds these goals in their contracting, it is a requirement for contract approval that a Contractor objectively demonstrate every effort has been exerted to meet these goals.

3.03 ACCEPTABLE METHODS OF CONFORMANCE TO POLICY

A. Requirements for making every effort possible for minority/women owned subcontractor participation may be satisfied by the following methods; (Other equivalent methods proposed by a Contractor which are described in detail prior to award may also be approved).

1. Negotiated Subcontract: The Contractor, will establish the scope of work in sufficient detail consistent with the capability of minority/women’s firms. Upon establishment of the scope of work to be performed, negotiation of mutually acceptable price may proceed with one or more minority/women’s firms. Most minority/women’s contractors are small, with limited resources, experience, and bonding capacity and cannot be expected to compete with the more experienced and specialized non-minority/women’s subcontractors.
2. Joint Venture: The Contractor may utilize minority/women’s firm(s) and bid jointly with such firm(s) for construction services required in the Plans and Specifications. If the joint venture method is utilized, credit toward the goal attainment will be determined on the basis of the percentage of the dollar amount of the work to be performed by the MBE/WBE (e.g., if a minority majority joint venture proposes to perform fifty percent (50%) of the project quoted at $500,000.00 and fifty percent (50%) of the work is to be performed by the minority party in the joint venture, minority participation will be credited at twenty-five percent (25%) of the work or $125,000.00).
3. The Contractor may negotiate or form joint ventures with minority and women owned subcontractors which are not shown on the current certification list.
4. All Contractors are required to secure Minority/Women’s participation through either negotiated subcontractors or the formation of joint ventures.
5. Records and Awards: The Contractors shall maintain records and shall submit an affidavit showing awards to minority/women’s businesses, delineated by name, address, telephone number, employer identification number, area/scope of work, referencing contract document section and dollar amount of the contract award, giving a narrative or specific efforts to identify and award subcontractors to minority/women’s businesses.

3.04 EVALUATION OF POSITIVE EFFORTS

A. The Contractor shall be deemed to be in compliance with the requirements, terms and conditions if the program goals expressed herein are met or exceeded.

1. No Contractor shall be found to be in non-compliance solely on account of failure to meet the MBE/WBE goal. A Contractor unable to meet the percentage goal assigned to this contract shall be given the opportunity to objectively demonstrate that specific affirmative action steps specified have been instituted and that every effort has been made toward the attainment of the designated goals.

3.05 POST-BID COMPLIANCE

A. If any deficiency(ies) are correctable, the prospective Contractor will be advised what action must be taken to correct the deficiency(ies). The Owner will withhold approval of the proposed contract until satisfactory corrective action has been taken. FAILURE ON THE PART OF THE CONTRACTOR TO TAKE THE REQUISIT CORRECTIVE ACTION OR TO EXPLAIN WHY THE CORRECTIVE ACTION CANNOT BE TAKEN MAY RESULT IN A FINDING THAT THE Contractor IS NON-RESPONSIVE AND MAY BE GROUNDS FOR REJECTION OF THE BID.

3.06 POST-CONTRACT AWARD COMPLIANCE

A. Contractors are required to execute and submit copies of all MBE/WBE’s related sub-agreements within fifteen (15) days after contractor award and, from time to time report on the

status of their compliance with appropriate requirements.

3.07 PROVISIONS FOR MBE/WBE SUBSTITUTION

A. Should it be discovered after bid opening that any one of the intended participant MBE/WBE'S declaration of minority/women's ownership is invalid, or after contract award should an MBE/WBE be unable to perform as originally intended, the general contractor (Contractor) must then make every reasonable attempt to replace the invalid MBE/WBE with a bona fide MBE/WBE from those who have furnished him bids prior to bid opening.

B. In the event this substitution is necessary and no other MBE/WBE's have bid the General Contractor (Contractor) in this particular area of the contract, the General Contractor (Contractor) may, as an alternative to substitution, adjust the MBE/WBE involvement in another area of the total contract bid in order to meet minimum MBE/WBE participation requirements.

3.08 DEVIATION FROM CONTRACTOR'S PROPOSED MBE/WBE PARTICIPATION

A. Any deviation from the MBE/WBE utilization proposal as noted in the contractor's submission, whether before or after contract award and/or whether before or after commencement of work on the project, shall be immediately reported by the Contractor to the Owner.

3.09 SUBMITTAL OF REQUIRED DOCUMENTS

A. The Contractor shall submit as necessary the following completed MBE/WBE information:
   1. TO BE SUMITTED WITH BID:
      a. An Affirmative Action Plan or Certificate of Compliance or Letter of Intent.
      b. Statement of Intended Utilization of Subcontractors.
   2. TO BE SUBMITTED W/BID IF APPLICABLE:
      a. Joint Venture Disclosure
   3. TO BE SUBMITTED AFTER BID OPENING BY LOW CONTRACTOR:
      a. Schedule for MBE/WBE Utilization

3.10 ACCESS TO INFORMATON

A. Every Contractor or subcontractor employed under this contract is hereby deemed to agree to permit the Owner or their duly authorized agents or employees, access at all reasonable times to all such persons, books, papers, as may be necessary to ascertain compliance with the Affirmative Action Program previously filed, and to furnish such further information as may be required, all within ten (10) days of the date of the written request.

END OF SECTION

SECTION 011000
SUMMARY

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes the following:
   1. Work covered by the Contract Documents.
   2. Use of premises.
   3. Specification format and conventions.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Wilshire Hills III
   1. Project Location: Street; Lee's Summit, Missouri

B. Owner: Wilshire Hills III, L.P.
   1. Owner's Representative: Will Markel

C. Architect: Rosemann & Associates, P.C., 1526 Grand, Kansas City, MO 64108

D. Contractor: Fairway Construction, 206 Peach Way, Columbia, MO 65203

E. The Work consists of the following:
   1. The Project consists of the development and construction of fifty (50) residential units for seniors located in one (1), three-story, wood framed, slab-on-grade building. Project will include resident amenities which will include an office, community room with kitchen, multipurpose space with kitchen, meeting room and fitness. The project will be in Lee's Summit, Missouri. This project is being developed and financed through the Missouri Housing Development Corporation (MHDC).

1.03 USE OF PREMISES

A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor’s use of premises is limited only by Owner’s right to perform work or to retain other contractors on portions of Project.

1.04 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 6-digit MasterFormat numbering system.
   1. Division 1: Sections in Division 1 govern the execution of the Work of all Sections in the Specifications.

B. Specification Contract: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
   1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
   2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
      a. The words “shall”, “shall be”, or “shall comply with”, depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 012100
ALLOWANCES

GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

B. Types of allowances include the following:
   1. Base Bid Allowances.

1.02 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.03 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

D. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.04 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.05 LUMP SUM ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
   1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.06 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.

C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins.

D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.07 TESTING AND INSPECTING ALLOWANCES

A. Testing and inspecting allowances include the cost of engaging testing agencies, actual tests and inspections, and reporting results.

B. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.

C. Costs of services not required by the Contract Documents are not included in the allowance.

D. At Project closeout, credit unused amounts remaining in the testing and inspecting allowance to Owner by Change Order.

1.08 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
   1. Include installation costs in purchase amount only where indicated as part of the allowance.
   2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
   3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
   4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
   1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
   2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.02 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

END OF SECTION

SECTION 012600
CONTRACT MODIFICATION PROCEDURES

PART 1 GENERAL

1.01 MINOR CHANGES IN THE WORK

A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.02 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
   2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
      a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Include costs of labor and supervision directly attributable to the change.
      d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
      e. Quotation Form: Use forms acceptable to Architect.

B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
   1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
   2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
   3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
   4. Include costs of labor and supervision directly attributable to the change.
   5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
   6. Comply with requirements in Division 01 Section "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
   7. Proposal Request Form: Use form acceptable to Architect.

1.03 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA G701

1.04 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
   1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 012900
PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
   1. Correlate line items in the schedule of values with other required administrative forms and schedules, including the following:
      a. Application for Payment forms with continuation sheets.
      b. Submittal schedule.
      c. Items required to be indicated as separate activities in Contractor's construction schedule.
   2. Submit the schedule of values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
   3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.

B. Format and Content: Use the specifications table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
   1. Identification: Include the following Project identification on the schedule of values:
      a. Project name and location.
      b. Name of Architect.
      c. Architect's project number.
      d. Contractor's name and address.
      e. Date of submittal.
   2. Arrange schedule of values consistent with format of AIA Document G702
   3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of Contract Sum.
   4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
   5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
   6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
   7. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
   8. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
      a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
   9. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.02 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
   1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Progress payments shall be submitted to Architect by the fifteenth (15) of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

D. Application for Payment Forms: Use AIA Document G702 as form for Applications for Payment.

E. Application for Payment Forms: Use forms provided by Owner for Applications for Payment. Sample copies are included in the Project Manual.

F. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
   1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
   2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

G. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt. One copy shall include waivers of lien and similar attachments if required.
   1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
   1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
   2. When an application shows completion of an item, submit conditional final or full waivers.
   3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
   4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
   1. List of subcontractors.
   2. Schedule of values.
   3. Contractor's construction schedule (preliminary if not final).
   4. Schedule of unit prices.
   5. Submittal schedule (preliminary if not final).
   6. List of Contractor's staff assignments.
   7. List of Contractor's principal consultants.
   8. Copies of building permits.
   9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
   10. Initial progress report.
   11. Report of preconstruction conference.

J. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
   1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
   2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

K. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
   1. Evidence of completion of Project closeout requirements.
   2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
   3. Updated final statement, accounting for final changes to the Contract Sum.
   4. AIA Document G706-1994, "Contractor's Affidavit of Payment of Debts and Claims."
   5. AIA Document G706A-1994, "Contractor's Affidavit of Release of Liens."
   6. AIA Document G707-1994, "Consent of Surety to Final Payment."
   7. Evidence that claims have been settled.
   8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
   9. Final liquidated damages settlement statement.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 013000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General administrative requirements.

B. Preconstruction meeting.

C. Progress meetings.

D. Construction progress schedule.

E. Submittals for review, information, and project closeout.

F. Number of copies of submittals.

G. Requests for Interpretation (RFI) procedures.

H. Submittal procedures.

1.02 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 017000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to Architect:
   1. Requests for Interpretation (RFI).
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.
   9. Coordination drawings.
   10. Correction Punch List and Final Correction Punch List for Substantial Completion.
   11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

A. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor.

B. Agenda:
   1. Execution of Owner-Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.
   3. Distribution of Contract Documents.
   4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
   5. Designation of personnel representing the parties to Contract, _____ and Architect.
   6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   7. Scheduling.

C. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.02 PROGRESS MEETINGS

A. Attendance Required:

1. Contractor.
2. Owner.
3. Architect.
4. Contractor's superintendent.
5. Major subcontractors.

B. Agenda:
1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Maintenance of progress schedule.
7. Corrective measures to regain projected schedules.
8. Planned progress during succeeding work period.
9. Maintenance of quality and work standards.
10. Effect of proposed changes on progress schedule and coordination.
11. Other business relating to work.

C. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE - SEE SECTION 013216

A. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

B. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
1. Include written certification that major contractors have reviewed and accepted proposed schedule.

C. Within 10 days after joint review, submit complete schedule.

D. Submit updated schedule with each Application for Payment.

3.04 REQUESTS FOR INTERPRETATION (RFI)

A. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
1. Prepare a separate RFI for each specific item.

B. RFI Log: Prepare and maintain a tabular log of RFIs for the duration of the project.

3.05 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
1. Product data.
2. Shop drawings.
3. Samples for selection.
4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

C. Samples will be reviewed for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 017800 - Closeout Submittals.

3.06 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
1. Design data.
2. Certificates.

3. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.07 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout in compliance with requirements of Section 017800 - Closeout Submittals:
1. Project record documents.
2. Operation and maintenance data.
3. Warranties.
4. Bonds.
5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.08 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
1. After review, produce duplicates.
2. Retained samples will not be returned to Contractor unless specifically so stated.

3.09 SUBMITTAL PROCEDURES

A. General Requirements:
1. Use a separate transmittal for each item.
2. Submit separate packages of submittals for review and submittals for information, when included in the same specification section.
3. Transmit using approved form.
a. Use Contractor's form, subject to prior approval by Architect.
b. Use form generated by Electronic Document Submittal Service software.
4. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
5. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
6. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.

B. Product Data Procedures:
1. Submit only information required by individual specification sections.
2. Collect required information into a single submittal.
3. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
2. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

3.10 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.

B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.

C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.

D. Architect's and consultants' actions on items submitted for review:
   1. Authorizing purchasing, fabrication, delivery, and installation:
      a. "Approved", or language with same legal meaning.
      b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
         1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
      c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
   2. Not Authorizing fabrication, delivery, and installation:

E. Architect's and consultants' actions on items submitted for information:
   1. Items for which no action was taken:
      a. "Received" - to notify the Contractor that the submittal has been received for record only.
   2. Items for which action was taken:
      a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

SECTION 013100
PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.01 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
   1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of Contractor's construction schedule.
   2. Preparation of the schedule of values.
   3. Installation and removal of temporary facilities and controls.
   4. Delivery and processing of submittals.
   5. Progress meetings.
   6. Preinstallation conferences.
   7. Project closeout activities.
   8. Startup and adjustment of systems.
   9. Project closeout activities.

1.02 REQUESTS FOR INFORMATION (RFIS)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
   1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
   2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
   1. Project name.
   2. Project number.
   3. Date.
   4. Name of Contractor.
   5. Name of Architect.
   6. RFI number, numbered sequentially.
   7. RFI subject.
   8. Specification Section number and title and related paragraphs, as appropriate.
   9. Drawing number and detail references, as appropriate.
   10. Field dimensions and conditions, as appropriate.
   11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.

12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
   1. The following RFIs will be returned without action:
      a. Requests for approval of submittals.
      b. Requests for approval of substitutions.
      c. Requests for coordination information already indicated in the Contract Documents.
      d. Requests for adjustments in the Contract Time or the Contract Sum.
      e. Requests for interpretation of Architect's actions on submittals.
      f. Incomplete RFIs or inaccurately prepared RFIs.
   2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
   3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
      a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:
   1. Project name.
   2. Name and address of Contractor.
   3. Name and address of Architect.
   4. RFI number including RFIs that were dropped and not submitted.
   5. RFI description.
   6. Date the RFI was submitted.
   7. Date Architect's response was received.
   8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.03 PROJECT MEETINGS

A. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
   1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
   2. Agenda: Discuss items of significance that could affect progress, including the following:
      a. Tentative construction schedule.
      b. Phasing.
      c. Critical work sequencing and long-lead items.
      d. Designation of key personnel and their duties.
      e. Procedures for processing field decisions and Change Orders.
      f. Procedures for RFIs.
      g. Procedures for testing and inspecting.

h. Procedures for processing Applications for Payment.
i. Distribution of the Contract Documents.
j. Submittal procedures.
k. Sustainable design requirements.
l. Preparation of record documents.
m. Use of the premises.
n. Work restrictions.
o. Working hours.
p. Owner's occupancy requirements.
q. Responsibility for temporary facilities and controls.
r. Procedures for moisture and mold control.
s. Procedures for disruptions and shutdowns.
t. Construction waste management and recycling.
u. Parking availability.
v. Office, work, and storage areas.
w. Equipment deliveries and priorities.
x. First aid.
y. Security.
z. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

B. Progress Meetings: Conduct progress meetings at biweekly intervals.
1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
1) Review schedule for next period.
b. Review present and future needs of each entity present, including the following:
1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items.
12) Field observations.
13) Status of RFIs.
14) Status of proposal requests.
15) Pending changes.
16) Status of Change Orders.

17) Pending claims and disputes.
18) Documentation of information for payment requests.

3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
   a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 013300
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action.

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.02 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or modifications to submittals noted by the Architect and additional time for handling and reviewing submittals required by those corrections.

1.03 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
   1. Architect will furnish Contractor one set of digital data drawing files of the of requested Contract Drawings for use in preparing Shop Drawings.
      a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
      b. Contractor shall execute a data licensing agreement in the form prepared by the Architect

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Initial Review: Allow 15 calendar days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
   2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
   3. Resubmittal Review: Allow 15 calendar days for review of each resubmittal.

D. Identification and Information: Place a permanent label or title block on each paper copy submittal item for identification.
   1. Indicate name of firm or entity that prepared each submittal on label or title block.
   2. Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
   3. Include the following information for processing and recording action taken:
      a. Project name.
      b. Date.
      c. Name of Architect.

d. Name of Construction Manager.
e. Name of Contractor.
f. Name of subcontractor.
g. Name of supplier.
h. Name of manufacturer.
i. Submittal number or other unique identifier, including revision identifier.
j. Number and title of appropriate Specification Section.
k. Drawing number and detail references, as appropriate.
l. Location(s) where product is to be installed, as appropriate.
m. Other necessary identification.

E. Options: Identify options requiring selection by the Architect.

F. Deviations: Identify deviations from the Contract Documents on submittals.

G. Transmittal: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Use only final submittals that are marked with approval notation from Architect's action stamp.

PART 2 PRODUCTS

2.01 SUBMITTAL PROCEDURES

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
a. Manufacturer's catalog cuts.
b. Manufacturer's product specifications.
c. Standard color charts.
d. Statement of compliance with specified referenced standards.
e. Testing by recognized testing agency.
f. Application of testing agency labels and seals.
g. Notation of coordination requirements.
h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
a. Wiring diagrams showing factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:
a. Three paper copies of Product Data, unless otherwise indicated. Architect will return two copies.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based upon Architect's digital data drawing files is otherwise permitted.
   1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
      a. Identification of products.
      b. Schedules.
      c. Compliance with specified standards.
      d. Notation of coordination requirements.
      e. Notation of dimensions established by field measurement.
      f. Relationship and attachment to adjoining construction clearly indicated.
      g. Seal and signature of professional engineer if specified.
   2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 42 inches (750 by 1067 mm).
   3. Submit Shop Drawings in the following format:
      a. Three opaque copies of each submittal. Architect will retain two copies; remainder will be returned.

C. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
   1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
   2. Identification: Attach label on unexposed side of Samples that includes the following:
      a. Generic description of Sample.
      b. Product name and name of manufacturer.
      c. Sample source.
      d. Number and title of applicable Specification Section.
   3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
      a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
      b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
   4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
      a. Number of Samples: Submit two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return one submittal with options selected.
   5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
      a. Number of Samples: Submit three sets of Samples. Architect will retain one Sample sets; remainder will be returned.
      b. If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
   1. Submit product schedule in the following format:
      a. Three paper copies of product schedule or list, unless otherwise indicated. Architect will return two copies.

E. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

F. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.

G. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

H. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

I. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

J. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

K. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

L. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

M. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.

2.02 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
   1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
   1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 EXECUTION

3.01 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Division 01 Section "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.02 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION

SECTION 014000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

1.02 INFORMATIONAL SUBMITTALS

A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems.
   1. Main wind-force resisting system or a wind-resisting component listed in the wind-force-resisting system quality assurance plan prepared by the Architect.

B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.03 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
   1. Date of issue.
   2. Project title and number.
   3. Name, address, and telephone number of testing agency.
   4. Dates and locations of samples and tests or inspections.
   5. Names of individuals making tests and inspections.
   6. Description of the Work and test and inspection method.
   7. Identification of product and Specification Section.
   8. Complete test or inspection data.
   9. Test and inspection results and an interpretation of test results.
   10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
   11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
   12. Name and signature of laboratory inspector.
   13. Recommendations on retesting and reinspecting.

B. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.04 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
   1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
   2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

G. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
   1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
   2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
   3. Demonstrate the proposed range of aesthetic effects and workmanship.
   4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
      a. Allow five days for initial review and each re-review of each mockup.
   5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
   6. Demolish and remove mockups when directed, unless otherwise indicated.

1.05 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
   1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
   2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
   1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
      a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
   2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
   3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
   4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
   5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a manufacturer's representative to observe and inspect the Work. Manufacturer's representative's services include examination of substrates and conditions, verification of materials, inspection of completed portions of the Work, and submittal of written reports.

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
   1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
   2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
   3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
   4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
   5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
   6. Do not perform any duties of Contractor.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
   4. Preliminary design mix proposed for use for material mixes that require control by testing agency.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.06 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner shall engage and Contractor Shall coordinate a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

B. Special Tests and Inspections: Conducted by a qualified special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:
   1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
   2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
   3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
   4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
   5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
   6. Retesting and reinspecting corrected work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 015000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.

1.02 INFORMATIONAL SUBMITTALS

A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.

1.03 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.04 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 PRODUCTS

2.01 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top rails.

B. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide galvanized steel bases for supporting posts.

2.02 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

2.03 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
   1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
   2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction and clean HVAC system as required in Division 01 Section "Closeout Procedures."

PART 3 EXECUTION

3.01 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
   1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.02 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.
   1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

D. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
   1. Install electric power service underground, unless otherwise indicated.

G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

H. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.
   1. At each telephone, post a list of important telephone numbers.
      a. Police and fire departments.
      b. Ambulance service.
      c. Contractor's home office.
      d. Architect's office.
      e. Engineers' offices.
      f. Owner's office.
      g. Principal subcontractors' field and home offices.
   2. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.03 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.
1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 Section "Earth Moving."
3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section "Asphalt Paving."

D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

E. Parking: Provide temporary parking areas for construction personnel.

F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
   a. Provide temporary, directional signs for construction personnel and visitors.

H. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

I. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 01 Section "Execution" for progress cleaning requirements.

J. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

K. Temporary Elevator Use: Refer to Division 14 Sections for temporary use of new elevators.

L. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

M. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.04 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Division 31 Section "Site Clearing."

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings.

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Comply with requirements specified in Division 01 Section "Temporary Tree and Plant Protection."

F. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

G. Site Enclosure Fence: Prior to commencing earthwork, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
   1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
   2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

H. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

I. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

J. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

K. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
   1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.
   2. Protect air-handling equipment.
   3. Provide walk-off mats at each entrance through temporary partition.

L. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
   1. Prohibit smoking in construction areas.
   2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
   3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.05 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect materials from water damage and keep porous and organic materials from coming into prolonged contact with concrete.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
   1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
   2. Keep interior spaces reasonably clean and protected from water damage.
   3. Discard or replace water-damaged and wet material.
   4. Discard, replace or clean stored or installed material that begins to grow mold.
   5. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
   1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
   2. Remove materials that can not be completely restored to their manufactured moisture level within 48 hours.

3.06 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
   2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION

SECTION 015850
PROJECT SIGNS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project identification sign.

1.02 QUALITY ASSURANCE

A. Design sign and structure to withstand 50 miles/hr wind velocity.

B. Sign Painter: Experienced as a professional sign painter for minimum three years.

C. Finishes, Painting: Adequate to withstand weathering, fading, and chipping for duration of construction.

PART 2 PRODUCTS

2.01 SIGN MATERIALS

A. Structure and Framing: New, wood, structurally adequate.

B. Sign Surfaces: Exterior grade plywood with medium density overlay, minimum ¾ inch thick, standard large sizes to minimize joints.

C. Rough Hardware: Galvanized.

D. Paint and Primers: Exterior quality, two coats; sign background of color as selected.

E. Lettering: Exterior quality paint, colors as needed.

2.02 PROJECT IDENTIFICATION SIGN

A. One painted sign, 32 sq. ft area, and bottom 6 feet above ground.

B. Content: Project sign content to be verified by the Architect. Sign to include but not limited to the following.

1. Project number, title, logo and name of project.
2. Names and titles of authorities.
3. Names and titles of Rosemann & Associates, P.C. and Consultants.
4. Graphic Design, Colors, Style of Lettering: Designated by Rosemann & Associates, P.C.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install project identification sign within 30 days after date fixed by Notice to Proceed.

B. Erect at designated location.

C. Erect supports and framing on secure foundation, rigidly braced and framed to resist wind loadings.

D. Install sign surface pump and level, with butt joints. Anchor securely.

E. Paint exposed surfaces of sign, supports, and framing.

3.02 MAINTENANCE

A. Maintain signs and supports clean, repair deterioration and damage.

3.03 REMOVAL

A. Remove signs, framing, supports, and foundations at completion of Project and restore the area.

END OF SECTION

SECTION 016000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
   2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within [10] days of receipt of request, or [7] days of receipt of additional information or documentation, whichever is later.
      a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
      b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.02 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:
   1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
   2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
   3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
   4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:
   1. Store products to allow for inspection and measurement of quantity or counting of units.
   2. Store materials in a manner that will not endanger Project structure.
   3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
   4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
   5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
   6. Protect stored products from damage and liquids from freezing.
   7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.03 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

B. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 PRODUCTS

2.01 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
   2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
   3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
   4. Where products are accompanied by the term "as selected," Architect will make selection.
   5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

B. Product Selection Procedures:
   1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
   2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
   3. Products:
      a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements.
      b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
   4. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 017300
EXECUTION

PART 1 GENERAL

1.01 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

D. Certified Surveys: Submit three copies signed by land surveyor.

E. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.02 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
    a. Primary operational systems and equipment.
    b. Fire separation assemblies.
    c. Air or smoke barriers.
    d. Fire-suppression systems.
    e. Mechanical systems piping and ducts.
    f. Control systems.
    g. Communication systems.
    h. Fire-detection and -alarm systems.
    i. Conveying systems.
    j. Electrical wiring systems.
    k. Operating systems of special construction.
2. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
    a. Water, moisture, or vapor barriers.
    b. Membranes and flashings.
    c. Exterior curtain-wall construction.
    d. Sprayed fire-resistive material.
    e. Equipment supports.
    f. Piping, ductwork, vessels, and equipment.
    g. Noise- and vibration-control elements and systems.
3. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
   1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
   2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
   1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
   2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
   3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
   1. Description of the Work.
   2. List of detrimental conditions, including substrates.
   3. List of unacceptable installation tolerances.
   4. Recommended corrections.

D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect.

3.03 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
   1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.

2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.
5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.04 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
1. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

D. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.05 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
   2. Allow for building movement, including thermal expansion and contraction.
   3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.06 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
   1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
   2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.07 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
   1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
   2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.08 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.09 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION

SECTION 017700
CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.02 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

1.03 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.04 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by the Owner. Label with manufacturer's name and model number where applicable.
    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section.
5. Submit test/adjust/balance records.
6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."

6. Advise Owner of changeover in heat and other utilities.
7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
8. Complete final cleaning requirements, including touchup painting.
9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements.
   1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.05 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
   1. Organize list of spaces in sequential order.
   2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
   3. Include the following information at the top of each page:
      a. Project name.
      b. Date.
      c. Name of Architect.
      d. Name of Contractor.
      e. Page number.

1.06 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
   1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
   2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
   3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 EXECUTION

3.01 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Remove snow and ice to provide safe access to building.
    f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    h. Sweep concrete floors broom clean in unoccupied spaces.
    i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
    j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
    k. Remove labels that are not permanent.
    l. Wipe surfaces of mechanical and electrical equipment[, elevator equipment,] and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
    p. Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
    q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
    r. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

3.02 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired.

Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
   a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

SECTION 017823
OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 CLOSEOUT SUBMITTALS

A. Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Agent will return copy with comments.
   1. Correct or modify each manual to comply with Architect's and Commissioning Agent's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Agent's comments and prior to commencing demonstration and training.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
   1. Title page.
   2. Table of contents.
   3. Manual contents.

B. Title Page: Include the following information:
   1. Subject matter included in manual.
   2. Name and address of Project.
   3. Name and address of Owner.
   4. Date of submittal.
   5. Name and contact information for Contractor.
   6. Name and contact information for Construction Manager.
   7. Name and contact information for Architect.
   8. Name and contact information for Commissioning Agent.
   9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
   10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
   1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
      a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name,and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
   2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
   3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.

4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

F. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

G. Emergency Procedures: Include the following, as applicable:
1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.02 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Operating standards.
3. Operating procedures.
4. Wiring diagrams.
5. Control diagrams.
6. Piped system diagrams.
7. Precautions against improper use.
8. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:
1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:
1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.03 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:
1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.04 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 EXECUTION

3.01 MANUAL PREPARATION

A. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

B. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

C. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

SECTION 017839
PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit copies of record Drawings as follows:
      a. Final Submittal:
         1) Submit PDF electronic files of scanned record prints and two set(s) of prints.
         2) Print each drawing, whether or not changes and additional information were recorded.

B. Record Specifications: Submit two of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one paper copy of each submittal.
   1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy of each submittal.

PART 2 PRODUCTS

2.01 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
   1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b. Accurately record information in an acceptable drawing technique.
      c. Record data as soon as possible after obtaining it.
      d. Record and check the markup before enclosing concealed installations.
   2. Content: Types of items requiring marking include, but are not limited to, the following:
      a. Dimensional changes to Drawings.
      b. Revisions to details shown on Drawings.
      c. Depths of foundations below first floor.
      d. Locations and depths of underground utilities.
      e. Revisions to routing of piping and conduits.
      f. Revisions to electrical circuitry.
      g. Actual equipment locations.
      h. Duct size and routing.
      i. Locations of concealed internal utilities.
      j. Changes made by Change Order or Construction Change Directive.
      k. Changes made following Architect's written orders.
      l. Details not on the original Contract Drawings.
      m. Field records for variable and concealed conditions.
      n. Record information on the Work that is shown only schematically.
   3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
   4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets, including AS Built Survey and other HUD required documents.
2. Format: Annotated PDF electronic file.

2.02 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as PDF electronic file.
1. Include miscellaneous record submittals directory organized by Specification Section number and title.

PART 3 EXECUTION

3.01 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION

SECTION 017900
DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
   1. Demonstration of operation of systems, subsystems, and equipment.
   2. Training in operation and maintenance of systems, subsystems, and equipment.

1.02 CLOSEOUT SUBMITTALS

A. At completion of training, submit complete training manual(s) for Owner's use.

1.03 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.

B. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals.

PART 2 PRODUCTS

2.01 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: For each module, include instruction for the following as applicable to the system, equipment, or component:
   1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
      a. System, subsystem, and equipment descriptions.
      b. Performance and design criteria if Contractor is delegated design responsibility.
      c. Operating standards.
      d. Regulatory requirements.
      e. Equipment function.
      f. Operating characteristics.
      g. Limiting conditions.
      h. Performance curves.
   2. Documentation: Review the following items in detail:
      a. Emergency manuals.
      b. Operations manuals.
      c. Maintenance manuals.
      d. Project record documents.
      e. Identification systems.
      f. Warranties and bonds.
      g. Maintenance service agreements and similar continuing commitments.
   3. Emergencies: Include the following, as applicable:
      a. Instructions on meaning of warnings, trouble indications, and error messages.
      b. Instructions on stopping.
      c. Shutdown instructions for each type of emergency.
      d. Operating instructions for conditions outside of normal operating limits.
      e. Sequences for electric or electronic systems.
      f. Special operating instructions and procedures.
   4. Operations: Include the following, as applicable:
      a. Startup procedures.
      b. Equipment or system break-in procedures.
      c. Routine and normal operating instructions.

d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:
   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
   a. Diagnostic instructions.
   b. Test and inspection procedures.
7. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.
8. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

PART 3 EXECUTION

3.01 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Division 01 Section "Operations and Maintenance Data."

3.02 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
   1. Owner will furnish Contractor with names and positions of participants.

B. Scheduling: Provide instruction at mutually agreed on times.
   1. Schedule training with Owner with at least seven days' advance notice.

END OF SECTION

SECTION 033000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Floors and slabs on grade.

B. Concrete reinforcement.

C. Joint devices associated with concrete work.

D. Concrete curing.

1.02 REFERENCE STANDARDS

A. ACI PRC-211.1 - Selecting Proportions for Normal-Density and High Density-Concrete - Guide 2022.

B. ACI PRC-302.1 - Guide to Concrete Floor and Slab Construction 2015.

C. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete 2000 (Reapproved 2009).

D. ACI PRC-305 - Guide to Hot Weather Concreting 2020.

E. ACI PRC-306 - Guide to Cold Weather Concreting 2016.

F. ACI PRC-308 - Guide to External Curing of Concrete 2016.

G. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement 2022.

H. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete 2022.

I. ASTM C33/C33M - Standard Specification for Concrete Aggregates 2023.

J. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens 2021.

K. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete 2023.

L. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens) 2021.

M. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete 2020.

N. ASTM C150/C150M - Standard Specification for Portland Cement 2022.

O. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete 2020.

P. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method 2016.

Q. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete 2010a (Reapproved 2016).

R. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete 2019.

S. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete 2019, with Editorial Revision (2022).

T. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete 2023, with Editorial Revision.

U. ASTM C827/C827M - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures 2023.

V. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete 2020a.

W. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink) 2020.

X. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete 2019.

Y. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete 2018.

Z. ASTM D471 - Standard Test Method for Rubber Property--Effect of Liquids 2016a (Reapproved 2021).

AA. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types) 2018.

BB. ASTM E1155 - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers 2020.

CC. ASTM E1155M - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers (Metric) 2014.

DD. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs 2018a.

EE. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs 2017 (Reapproved 2023).

FF. NSF 61 - Drinking Water System Components - Health Effects 2022, with Errata.

GG. NSF 372 - Drinking Water System Components - Lead Content 2022.

1.03 SUBMITTALS

A. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
   1. For curing compounds, provide data on method of removal in the event of incompatibility with floor covering adhesives.
   2. For chemical-resistant waterstops, provide data on ASTM D471 test results.

B. Mix Design: Submit proposed concrete mix design.
   1. Indicate proposed mix design complies with requirements of ACI SPEC-301, Section 4 - Concrete Mixtures.
   2. Indicate proposed mix design complies with requirements of ACI CODE-318, Chapter 5 - Concrete Quality, Mixing and Placing.

C. Test Reports: Submit report for each test or series of tests specified.

D. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

E. Sustainable Design Submittal: If any fly ash, ground granulated blast furnace slag, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used.

F. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.

G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI SPEC-301 and ACI CODE-318.

B. Follow recommendations of ACI PRC-305 when concreting during hot weather.

C. Follow recommendations of ACI PRC-306 when concreting during cold weather.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

B. Moisture Emission-Reducing Curing and Sealing Compound, Membrane-Forming: Provide warranty to cover cost of flooring delamination failures for 10 years.
   1. Include cost of repair or removal of failed flooring, remediation with a moisture vapor impermeable surface coating, and replacement of flooring with comparable flooring system.

C. Termite-Resistant Vapor Barrier Sheet: Provide five year manufacturer's limited warranty.

PART 2 PRODUCTS

2.01 REINFORCEMENT MATERIALS

A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi).
   1. Type: Deformed billet-steel bars.
   2. Finish: Unfinished, unless otherwise indicated.

B. Steel Welded Wire Reinforcement (WWR): Galvanized, plain type, ASTM A1064/A1064M.
   1. Form: Coiled Rolls.

C. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
   2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
   3. Provide stainless steel, galvanized, plastic, or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.

2.02 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal Portland type. Provide _____ manufactured by _____ .
   1. Acquire cement for entire project from same source.

B. Fine and Coarse Aggregates: ASTM C33/C33M.
   1. Acquire aggregates for entire project from same source.

C. Fly Ash: ASTM C618, Class C or F.

D. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

2.03 ADMIXTURES

A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

B. Air Entrainment Admixture: ASTM C260/C260M.

C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.

D. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.

2.04 ACCESSORY MATERIALS

A. Underslab Vapor Retarder:
   1. Accessory Products: Vapor retarder manufacturer's recommended tape, adhesive, mastic, prefabricated boots, etc., for sealing seams and penetrations.

B. Non-Shrink Cementitious Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Grout: Comply with ASTM C1107/C1107M.
   2. Height Change, Plastic State; when tested in accordance with ASTM C827/C827M:
      a. Maximum: Plus 4 percent.
      b. Minimum: Plus 1 percent.
   3. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.

2.05 BONDING AND JOINTING PRODUCTS

A. Epoxy Bonding System:
   1. Complying with ASTM C881/C881M and of Type required for specific application.

B. Waterstops: Bentonite and butyl rubber, complying with NSF 61 and NSF 372.

1. Configuration: As indicated on drawings.
2. Size: As indicated on drawings.

C. Slab Isolation Joint Filler: 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.
   1. Material: ASTM D1751, cellulose fiber.

D. Slab Contraction Joint Device: Preformed linear strip intended for pressing into wet concrete to provide straight route for shrinkage cracking.

E. Slab Construction Joint Devices: Combination keyed joint form and screed, galvanized steel, with rectangular or round knockout holes for conduit or rebar to pass through joint form at 6 inches on center; ribbed steel stakes for setting.

2.06 CURING MATERIALS

A. Evaporation Reducer: Liquid thin-film-forming compound that reduces rapid moisture loss caused by high temperature, low humidity, and high winds; intended for application immediately after concrete placement.

B. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound; complying with ASTM C309.

C. Curing and Sealing Compound, Moisture Emission-Reducing, Membrane-Forming: Clear, liquid sealer for application to newly-placed concrete; capable of providing adequate bond for flooring adhesives, initially and over the long term; with sufficient moisture vapor impermeability to prevent deterioration of flooring adhesives due to moisture emission.
   1. Use this product to cure and seal all slabs to receive adhesively applied flooring or roofing.
   2. Comply with ASTM C309 and ASTM C1315 Type I Class A.
   3. VOC Content: Less than 100 g/L.
   4. Solids Content: 25 percent, minimum.

D. Moisture-Retaining Sheet: ASTM C171.
   1. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch.

E. Water: Potable, not detrimental to concrete.

2.07 CONCRETE MIX DESIGN

A. Admixtures: Add acceptable admixtures as recommended in ACI PRC-211.1 and at rates recommended or required by manufacturer.

B. Normal Weight Concrete:
   1. Compressive Strength, when tested in accordance with ASTM C39/C39M at 28 days: 3500 pounds per square inch.
   2. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
   3. Cement Content: Minimum 500 pounds per cubic yard.
   4. Water-Cement Ratio: Maximum 42 percent by weight.
   5. Total Air Content: 4 percent, determined in accordance with ASTM C173/C173M.
   6. Maximum Slump: 3 inches.
   7. Maximum Aggregate Size: 5/8 inch.

2.08 MIXING

A. Transit Mixers: Comply with ASTM C94/C94M.

B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.

3.02 PREPARATION

A. Verify that forms are clean and free of rust before applying release agent.

B. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.

C. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning and applying bonding agent in according to bonding agent manufacturer's instructions.
   1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.

D. Interior Slabs on Grade: Install vapor retarder under interior slabs on grade. Comply with ASTM E1643. Lap joints minimum 6 inches. Seal joints, seams and penetrations watertight with manufacturer's recommended products and follow manufacturer's written instructions. Repair damaged vapor retarder before covering.

3.03 INSTALLING REINFORCEMENT AND OTHER EMBEDDED ITEMS

A. Comply with requirements of ACI SPEC-301. Clean reinforcement of loose rust and mill scale, and accurately position, support, and secure in place to achieve not less than minimum concrete coverage required for protection.

B. Install welded wire reinforcement in maximum possible lengths, and offset end laps in both directions. Splice laps with tie wire.

C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not interfere with concrete placement.

3.04 PLACING CONCRETE

A. Place concrete in accordance with ACI PRC-304.

B. Place concrete for floor slabs in accordance with ACI PRC-302.1.

C. Notify Architect not less than 24 hours prior to commencement of placement operations.

D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

E. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

F. Place concrete continuously without construction (cold) joints wherever possible; where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

G. Finish floors level and flat, unless otherwise indicated, within the tolerances specified below.

3.05 SLAB JOINTING

A. Locate joints as indicated on drawings.

B. Anchor joint fillers and devices to prevent movement during concrete placement.

C. Isolation Joints: Use preformed joint filler with removable top section for joint sealant, total height equal to thickness of slab, set flush with top of slab.

D. Saw Cut Contraction Joints: Saw cut joints before concrete begins to cool, within 4 to 12 hours after placing; use 3/16 inch thick blade and cut at least 1 inch deep but not less than one quarter (1/4) the depth of the slab.

E. Construction Joints: Where not otherwise indicated, use metal combination screed and key form, with removable top section for joint sealant.

3.06 FLOOR FLATNESS AND LEVELNESS TOLERANCES

A. Minimum F(F) Floor Flatness and F(L) Floor Levelness Values:
   1. Exposed to View and Foot Traffic: F(F) of 20; F(L) of 15, on-grade only.
   2. Under Thick-Bed Tile: F(F) of 20; F(L) of 15, on-grade only.
   3. Under Carpeting: F(F) of 25; F(L) of 20, on-grade only.
   4. Under Thin Resilient Flooring and Thinset Tile: F(F) of 35; F(L) of 25, on-grade only.

B. Measure F(F) Floor Flatness and F(L) Floor Levelness in accordance with ASTM E1155 (ASTM E1155M), within 48 hours after slab installation; report both composite overall values and local values for each measured section.

C. Correct the slab surface if composite overall value is less than specified and if local value is less than two-thirds of specified value or less than F(F) 13/F(L) 10.

D. Correct defects by grinding or by removal and replacement of the defective work. Areas requiring corrective work will be identified. Re-measure corrected areas by the same process.

3.07 CONCRETE FINISHING

A. Concrete Slabs: Finish to requirements of ACI PRC-302.1 and as follows:
   1. Surfaces to Receive Thin Floor Coverings: "Steel trowel" as described in ACI PRC-302.1; thin floor coverings include carpeting, resilient flooring, seamless flooring, resinous matrix terrazzo, thin set quarry tile, and thin set ceramic tile.
   2. Other Surfaces to Be Left Exposed: Trowel as described in ACI PRC-302.1, minimizing burnish marks and other appearance defects.

B. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:100 nominal.

3.08 CURING AND PROTECTION

A. Comply with requirements of ACI PRC-308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Surfaces Not in Contact with Forms:
   1. Slabs and Floors To Receive Adhesive-Applied Flooring: Curing compounds and other surface coatings are usually considered unacceptable by flooring and adhesive manufacturers. If such materials must be used, either obtain the approval of the flooring and adhesive manufacturers prior to use or remove the surface coating after curing to flooring manufacturer's satisfaction.
   2. Initial Curing: Start as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by water ponding, water-saturated sand, water-fog spray, or saturated burlap.
   3. Final Curing: Begin after initial curing but before surface is dry.

3.09 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 014000 - Quality Requirements.

B. Provide free access to concrete operations at project site and cooperate with appointed firm.

C. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cubic yards or less of each class of concrete placed.

D. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.

E. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

3.10 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 24 hours of test.

B. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.

C. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.

D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Architect for each individual area.

3.11 PROTECTION

A. Do not permit traffic over unprotected concrete floor surface until fully cured.

END OF SECTION

SECTION 035400
CAST UNDERLAYMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Liquid-applied self-leveling floor underlayment.
   1. Use gypsum-based type at _____.

1.02 SUBMITTALS

A. Product Data: Provide manufacturer's data sheets documenting physical characteristics and product limitations of underlayment materials. Include information on surface preparation, environmental limitations, and installation instructions.

B. Manufacturer's Instructions.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Keep dry and protect from direct sun exposure, freezing, and ambient temperature greater than 105 degrees F.

1.04 FIELD CONDITIONS

A. Do not install underlayment until floor penetrations and peripheral work are complete.

B. Maintain minimum ambient temperatures of 50 degrees F 24 hours before, during and 72 hours after installation of underlayment.

C. During the curing process, ventilate spaces to remove excess moisture.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Gypsum Underlayment:
   1. ARDEX Engineered Cements; ARDEX K 22 F with ARDEX P51 Primer: www.ardexamericas.com/#sle.
   2. Hacker Industries, Inc; Firm-Fill 2010+: www.hackerindustries.com/#sle.
   3. Maxxon Corporation; Gyp-Crete 2000/3.2K: www.maxxon.com/#sle.

2.02 MATERIALS

A. Cast Underlayments, General:
   1. Comply with applicable code for combustibility or flame spread requirements.

B. Gypsum-Based Underlayment: Gypsum based mix, that when mixed with water in accordance with manufacturer's directions will produce self-leveling underlayment with the following properties:
   1. Compressive Strength: Minimum 2500 pounds per square inch, tested per ASTM C472.
   2. Density: Maximum ___ pounds per cubic foot.
   3. Final Set Time: 1 to 2 hours, maximum.
   4. Thickness: 3/4 inch to maximum 3-1/2 inch.
   5. Surface Burning Characteristics: Flame spread/Smoke developed index of 0/0 in accordance with ASTM E84.

C. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to underlayment mix materials.

D. Primer: Manufacturer's recommended type.

E. Joint and Crack Filler: Latex based filler, as recommended by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum byproducts, or other compounds detrimental to underlayment material bond to substrate.

3.02 PREPARATION

A. Remove substrate surface irregularities. Fill voids and deck joints with filler. Finish smooth.

B. Vacuum clean surfaces.

C. Prime substrate in accordance with manufacturer's instructions. Allow to dry.

D. Close floor openings.

3.03 APPLICATION

A. Install underlayment in accordance with manufacturer's instructions.

B. Place to indicated thickness, with top surface level to 1/8 inch in 10 ft.

3.04 CURING

A. Once underlayment starts to set, prohibit foot traffic until final set has been reached.

B. Air cure in accordance with manufacturer's instructions.

3.05 PROTECTION

A. Protect against direct sunlight, heat, and wind; prevent rapid drying to avoid shrinkage and cracking.

B. Do not permit traffic over unprotected floor underlayment surfaces.

END OF SECTION

SECTION 042000
UNIT MASONRY

PART 1 GENERAL

1.01 SUBMITTALS

A. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

1.02 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 BRICK UNITS

A. Manufacturers:
   1. Meridan Brick - Augusta Collection; Olde Fort Augusta (Georgia).
   2. Meridian Brick; Terre Haute Collection; Heritage Trail (Missouri).
   3. Substitutions: Not permitted.

2.02 MORTAR AND GROUT MATERIALS

A. Masonry Cement: ASTM C91/C91M, Type N.

2.03 REINFORCEMENT AND ANCHORAGE

A. Single Wythe Joint Reinforcement: ASTM A951/A951M.
   1. Type: Truss or ladder.
   2. Material: ASTM A1064/A1064M steel wire, mill galvanized to ASTM A641/A641M Class 3.
   3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

B. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
   1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners.
   2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
   3. Vertical adjustment: Not less than 3-1/2 inches.

2.04 FLASHINGS

2.05 MORTAR AND GROUT MIXING

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
   1. Exterior, non-loadbearing masonry: Type N.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.04 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Brick Units:
   1. Bond: Running.
   2. Mortar Joints: Concave.

3.05 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

3.06 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

3.07 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

3.08 REINFORCEMENT AND ANCHORAGE - MASONRY VENEER

3.09 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

3.10 LINTELS

A. Install loose steel lintels over openings.

3.11 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

3.12 TOLERANCES

A. Install masonry within the site tolerances found in TMS 402/602.

3.13 CLEANING

A. Remove excess mortar and mortar droppings.

B. Clean soiled surfaces with cleaning solution.

END OF SECTION

SECTION 047300
MANUFACTURED STONE MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Adhered manufactured stone masonry veneer (AMSMV).

B. Installation materials.

C. Accessories.

1.02 SUBMITTALS

A. Product Data: Provide data for AMSMV units, mortar, and lath, including:

B. Verification Samples: For each finish product specified, two samples, minimum size 12 inches square, representing actual product, color, patterns and texture.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Prevent mechanical damage and contamination by other materials.

C. Protect products from precipitation combined with freezing temperatures. Do not install products with visible frozen moisture.

D. Protect Portland cement based materials from moisture and humidity. Store under cover off the ground in a dry location.

1.04 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Adhered Manufactured Stone Masonry Veneer (AMSMV):
   1. Dutch Quality: Weather Ledge.
   2. Substitutions: Not permitted.

2.02 ADHERED MANUFACTURED STONE MASONRY VENEER (AMSMV)

A. AMSMV: Cast masonry units using a mixture of cement, lightweight aggregates, concrete additives and color pigments to replicate appearance of natural stone and designed to be applied with a cementitious mortar to a backing surface, complying with ASTM C1670/C1670M and ICC-ES AC51.
   1. Color, Texture, Range, Special Shapes: Prestige.

2.03 MORTAR APPLICATIONS

A. At Contractor's option, mortar may be field-mixed from packaged dry materials, made from factory premixed dry materials with addition of water only, or ready-mixed.

B. Mortar Color: Natural gray unless otherwise indicated.

C. Scratch Coat Mortars: Scratch coat mortars for application directly to metal lath.

D. Setting Bed Mortars: Setting bed used to adhere AMSMV units to scratch coat mortar or to bondable concrete or concrete masonry.

E. Pointing Mortars: Pointing or grouting mortars used to fill the joints between individual AMSMV units once the setting bed mortar has sufficiently cured.

2.04 MORTAR MIXES

2.05 ACCESSORIES

A. Metal Lath with Rainscreen Drainage Material: Factory-assembled combination of mesh drainage material and metal lath.
   1. Diamond Mesh Metal Lath: ASTM C847, galvanized, self-furring.

a. Weight: To suit application and as specified in ASTM C841 for framing spacing.

B. Cleaning Solution: Non-acidic, not harmful to AMSMV work or adjacent materials, approved by AMSMV manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that backup wall system construction complies with AMSMV manufacturer's instructions, MVMA (AMSV), NCMA TEK 20-01, ASTM C1780 and ICC-ES AC51.

B. Verify that substrates to receive mortar scratch coat or setting bed comply with AMSMV manufacturer's instructions, MVMA (AMSV), NCMA TEK 20-01, ASTM C1780 and ICC-ES AC51:

C. Verify that built-in items are in proper location, and ready for installation of AMSMV.

3.02 PREPARATION

A. Dampen masonry surfaces to reduce excessive suction.

B. Clean concrete surfaces of foreign matter using approved acid solutions, solvents, or detergents, and then rinse surfaces thoroughly with clean water.

C. Roughen smooth concrete surfaces and apply bonding compound in accordance with manufacturer's written installation instructions.

D. Apply dash bond coat to solid bases and moist cure for at least 24 hours before applying setting bed.

3.03 INSTALLATION - WATER-RESISTIVE BARRIER

A. Where required by AMSMV manufacturer's instructions, MVMA (AMSV), NCMA TEK 20-01, ASTM C1780 or ICC-ES AC51, install 2 layers of water-resistive barrier in accordance with water-resistive barrier manufacturer's instructions. Integrate water-resistive barrier with all flashing accessories, adjacent water-resistive barriers, doors, windows, penetrations, and cladding transitions.

3.04 INSTALLATION - SCRATCH COAT

A. Apply mortar scratch coat of 1/2 inch nominal to cover metal lath in accordance with ASTM C926. Scratch surface when somewhat firm. If scratch coat dries before applying setting bed mortar and AMSMV, moisten scratch coat by misting it with water.

3.05 INSTALLATION - AMSMV

A. Install AMSMV with a cementitious mortar setting bed to a scratch coat backing surface, in accordance with AMSMV manufacturer's instructions, MVMA (AMSV), NCMA TEK 20-01, ASTM C1780 and ICC-ES AC51.

B. Windows, Doors and Wall Openings: Butt AMSMV units to wall opening.

C. Sills: Install sills where located on drawings.

D. Caps: Install capstones where located on drawings.

E. Seal all joints at wall openings and penetrations with sealant approved for use with AMSMV.

3.06 INSTALLATION - MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

B. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.07 TOLERANCES

A. Maximum Variation from Unit to Adjacent Unit: 1/16 inch.

B. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.

C. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

D. Maximum Variation from Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.

E. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.

3.08 CUTTING AND FITTING

A. Cut and fit for pipes and conduit. Coordinate with other sections of work to provide correct size, shape, and location.

3.09 CLEANING

A. Remove excess mortar and mortar smears as work progresses.

B. Clean soiled surfaces with cleaning solution.

END OF SECTION

SECTION 051200
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural steel framing members.

B. Grouting under base plates.

1.02 REFERENCE STANDARDS

A. AISC (MAN) - Steel Construction Manual 2023.

B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges 2022.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.

D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes 2021a.

E. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts 2021a.

F. ASTM A563M - Standard Specification for Carbon and Alloy Steel Nuts (Metric) 2021a.

G. ASTM A992/A992M - Standard Specification for Structural Steel Shapes 2022.

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength 2023.

I. ASTM E94/E94M - Standard Guide for Radiographic Examination Using Industrial Radiographic Film 2017.

J. ASTM E164 - Standard Practice for Contact Ultrasonic Testing of Weldments 2019.

K. ASTM F436/F436M - Standard Specification for Hardened Steel Washers Inch and Metric Dimensions 2019.

L. ASTM F959/F959M - Standard Specification for Compressible-Washer-Type Direct Tension Indicators for Use with Structural Fasteners, Inch and Metric Series 2017a.

M. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength 2020.

N. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength 2022.

O. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination 2020.

P. AWS D1.1/D1.1M - Structural Welding Code - Steel 2020, with Errata (2023).

Q. IAS AC172 - Accreditation Criteria for Fabricator Inspection Programs for Structural Steel AC172 2019.

R. RCSC (HSBOLT) - Specification for Structural Joints Using High-Strength Bolts; Research Council on Structural Connections 2020.

S. SSPC-SP 3 - Power Tool Cleaning 2018.

1.03 SUBMITTALS

A. Shop Drawings:
   1. Indicate profiles, sizes, spacing, locations of structural members, openings, attachments, and fasteners.
   2. Connections not detailed.
   3. Indicate cambers and loads.
   4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

B. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements.

C. Fabricator Test Reports: Comply with ASTM A1011/A1011M.

D. Designer's Qualification Statement.

E. Fabricator's Qualification Statement.

1.04 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC (MAN) "Steel Construction Manual."

B. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel in accordance with IAS AC172.

C. Design connections not detailed on drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel Angles and Plates: ASTM A36/A36M.

B. Steel W Shapes and Tees: ASTM A992/A992M.

C. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade B.

D. High-Strength Structural Bolts, Nuts, and Washers: ASTM F3125/F3125M, Type 1, with matching compatible ASTM A563 or ASTM A563M nuts and ASTM F436/F436M washers.

E. Tension Control Bolts: Twist-off type; ASTM F3125/F3125M.

F. Unheaded Anchor Rods: ASTM F1554, Grade 36, plain, with matching ASTM A563 or ASTM A563M nuts and ASTM F436/F436M Type 1 washers.

G. Load Indicator Washers: Provide washers complying with ASTM F959/F959M at connections requiring high-strength bolts.

H. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

I. Grout: ASTM C1107/C1107M; Non-shrink; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Minimum Compressive Strength at 48 Hours: 2,000 pounds per square inch.
   2. Minimum Compressive Strength at 28 Days: 7,000 pounds per square inch.

J. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

K. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.02 FABRICATION

A. Shop fabricate to greatest extent possible.

B. Fabricate connections for bolt, nut, and washer connectors.

C. Develop required camber for members.

2.03 FINISH

A. Prepare structural component surfaces in accordance with SSPC-SP 3.

B. Shop prime structural steel members. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.

2.04 SOURCE QUALITY CONTROL

A. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts," testing at least ____ percent of bolts at each connection.

B. Welded Connections: Visually inspect all shop-welded connections and test at least 5 percent of welds using one of the following:
   1. Radiographic testing performed in accordance with ASTM E94/E94M.
   2. Ultrasonic testing performed in accordance with ASTM E164.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel and that the work may properly proceed.

3.02 ERECTION

A. Erect structural steel in compliance with AISC 303.

B. Allow for erection loads and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.

C. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts".

D. Do not field cut or alter structural members without approval of Architect.

E. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

F. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for nonshrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

3.04 FIELD QUALITY CONTROL

A. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with RCSC (HSBOLT) "Specification for Structural Joints Using High-Strength Bolts," testing at least ____ percent of bolts at each connection.

B. Welded Connections: Visually inspect all field-welded connections and test at least ____ percent of welds using one of the following:
   1. Radiographic testing performed in accordance with ASTM E94/E94M.
   2. Ultrasonic testing performed in accordance with ASTM E164.

END OF SECTION

SECTION 055213
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted handrails.

B. Stair railings and guardrails.

C. Free-standing railings at steps.

1.02 SUBMITTALS

A. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

PART 2 PRODUCTS

2.01 RAILINGS - GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.

B. Allow for expansion and contraction of members and building movement without damage to connections or members.

C. Dimensions: See drawings for configurations and heights.

D. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.

E. Provide welding fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.

2.02 STEEL RAILING SYSTEM

A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.

B. Steel Pipe: ASTM A53/A53M Grade B Schedule 80, black finish.

C. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.

D. Galvanizing: In accordance with requirements of ASTM A123/A123M.
   1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic.

2.03 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.

B. Fit and shop assemble components in largest practical sizes for delivery to site.

C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.

D. Welded Joints:
   1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
   2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
   3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Install railings in compliance with ADA Standards for accessible design at applicable locations.

D. Anchor railings securely to structure.

3.03 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per floor level, non-cumulative.

B. Maximum Offset From True Alignment: 1/4 inch.

C. Maximum Out-of-Position: 1/4 inch.

END OF SECTION

SECTION 061000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural dimension lumber framing.

B. Preservative treated wood materials.

C. Fire retardant treated wood materials.

D. Concealed wood blocking, nailers, and supports.

1.02 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2023.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2023.

C. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing 2003 (Reapproved 2017).

D. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing 2010 (Reapproved 2017).

E. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing 2019a.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023b.

G. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings 2018, with Errata (2019).

H. AWPA U1 - Use Category System: User Specification for Treated Wood 2023.

I. PS 1 - Structural Plywood 2019.

J. PS 2 - Performance Standard for Wood Structural Panels 2018.

K. PS 20 - American Softwood Lumber Standard 2021.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Structural Composite Lumber: Submit manufacturer's published structural data including span tables, marked to indicate which sizes and grades are being used; if structural composite lumber is being substituted for dimension lumber or timbers, submit grading agency structural tables marked for comparison.

C. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.04 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

1.05 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.

1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
3. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

B. Provide wood harvested within a 500 mile radius of the project site.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Sizes: Nominal sizes as indicated on drawings, S4S.

B. Moisture Content: S-dry or MC19.

C. Stud Framing (2 by 2 through 2 by 6):
1. Grade: No. 2.

D. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16):
1. Species and Grades: As indicated on drawings for various locations.

E. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
1. Lumber: S4S, No. 2 or Standard Grade.
2. Boards: Standard or No. 3.

2.03 STRUCTURAL COMPOSITE LUMBER

A. At Contractor's option, structural composite lumber may be substituted for concealed dimension lumber and timbers.

B. Structural Composite Lumber: Factory fabricated beams, headers, and columns, of sizes and types indicated on drawings; structural capacity as published by manufacturer.
1. Beams: Use laminated veneer lumber, laminated strand lumber, or parallel strand lumber with manufacturer's published modulus of elasticity, E: 1,800,000 psi, minimum.

2.04 CONSTRUCTION PANELS

A. Subfloor/Underlayment Combination: PS 2 type, rated Single Floor.
1. Bond Classification: Exterior.
2. Span Rating: 48.
3. Performance Category: 1-1/8 PERF CAT.
4. Edges: Tongue and groove.

B. Roof Sheathing: Oriented strand board wood structural panel; PS 2.
1. Grade: Structural 1 Sheathing.
2. Bond Classification: Exposure 1.
3. Performance Category: 5/8 PERF CAT.
4. Span Rating: 40/20.
5. Edges: Square.
6. Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 500 days.
7. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center, respectively.

C. Wall Sheathing: Oriented strand board wood structural panel; PS 2.
1. Grade: Structural 1 Sheathing.
2. Bond Classification: Exposure 1.
3. Performance Category: 5/8 PERF CAT.
4. Span Rating: 40/20.
5. Edges: Square.

6. Exposure Time: Sheathing will not delaminate or require sanding due to moisture absorption from exposure to weather for up to 500 days.
7. Provide fastening guide on top panel surface with separate markings indicating fastener spacing for 16 inches and 24 inches on center, respectively.

D. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.05 ACCESSORIES

A. Fasteners and Anchors:
1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions.
1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

C. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
1. For contact with preservative treated wood in exposed locations, provide minimum G185 galvanizing complying with ASTM A653/A653M.

D. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.

E. Subfloor Adhesives: Waterproof, air cure type, cartridge dispensed; adhesives designed for subfloor applications and complying with either ASTM C557 or ASTM D3498.

F. Water-Resistive Barrier: See Section 072500.

2.06 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:
1. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
b. Do not use treated wood in direct contact with the ground.
2. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
b. Treat rough carpentry items as indicated .
c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:

1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
    a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
    b. Treat lumber in contact with roofing, flashing, or waterproofing.
    c. Treat lumber in contact with masonry or concrete.
    d. Treat lumber less than 18 inches above grade.
    e. Treat lumber in other locations as indicated.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.02 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices unless otherwise specifically detailed.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes, AWC (WFCM) Wood Frame Construction Manual, and _____.

E. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.

F. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

G. Provide bridging at joists in excess of 8 feet span as detailed. Fit solid blocking at ends of members.

H. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.03 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to authorities having jurisdiction may be used in lieu of solid wood blocking.

C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

E. Provide the following specific nonstructural framing and blocking:
    1. Cabinets and shelf supports.
    2. Wall brackets.
    3. Handrails.
    4. Grab bars.
    5. Towel and bath accessories.

6. Wall-mounted door stops.
7. Wall paneling and trim.
8. Joints of rigid wall coverings that occur between studs.

3.04 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide wood curb at each roof opening except where prefabricated curbs are specified and where specifically indicated otherwise; form corners by alternating lapping side members.

3.05 INSTALLATION OF CONSTRUCTION PANELS

A. Subflooring/Underlayment Combination: Glue and nail to framing; staples are not permitted.

B. Roof Sheathing: Secure panels with long dimension perpendicular to framing members, with ends staggered and over firm bearing.
   1. At long edges use sheathing clips where joints occur between roof framing members.
   2. Nail panels to framing; staples are not permitted.

C. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.
   1. Place water-resistive barrier horizontally over wall sheathing, weather lapping edges and ends.

D. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.
   4. Size and Location: As indicated on drawings.

3.06 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.07 CLEANING

A. Waste Disposal: See Section 017419 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 061753
SHOP-FABRICATED WOOD TRUSSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Shop fabricated wood trusses for roof framing.

B. Bridging, bracing, and anchorage.

1.02 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2023.

B. TPI BCSI 1 - Building Component Safety Information Booklet: The Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses 2018.

C. TPI DSB-89 - Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses 1989.

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on plate connectors, bearing plates, and metal bracing components.

C. Shop Drawings: Show truss configurations, sizes, spacing, size and type of plate connectors, cambers, framed openings, bearing and anchor details, and bridging and bracing.
   1. Include identification of engineering software used for design.
   2. Provide shop drawings stamped or sealed by design engineer.

D. Designer's Qualification Statement.

E. Fabricator's Qualification Statement.

1.04 QUALITY ASSURANCE

A. Designer Qualifications: Perform design by or under direct supervision of a Professional Structural _____ Engineer experienced in design of this Work and licensed in the State in which the Project is located.

B. Fabricator Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Handle and erect trusses in accordance with TPI BCSI 1.

B. Store trusses in vertical position resting on bearing ends.

PART 2 PRODUCTS

2.01 TRUSSES

A. Wood Trusses: Designed and fabricated in accordance with ANSI/TPI 1 and TPI DSB-89 to achieve structural requirements indicated.
   1. Connectors: Steel plate.
   2. Structural Design: Comply with applicable code for structural loading criteria.

2.02 MATERIALS

A. Lumber:
   1. Moisture Content: Between 7 and 9 percent.
   2. Lumber fabricated from old growth timber is not permitted.
   3. Provide lumber harvested within a 500 mile radius of the project site.

B. Steel Connectors: Hot-dipped galvanized steel sheet, ASTM A653/A653M Structural Steel (SS) Grade 33/230, with G90/Z275 coating; die stamped with integral teeth; thickness as indicated.

C. Truss Bridging: Type, size and spacing recommended by truss manufacturer.

2.03 ACCESSORIES

A. Wood Blocking, Bridging, Plates, and Miscellaneous Framing: As specified in Section 061000.

B. Fasteners: Electrogalvanized steel, type to suit application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that supports and openings are ready to receive trusses.

3.02 PREPARATION

A. Coordinate placement of bearing items.

3.03 ERECTION

A. Install trusses in accordance with manufacturer's instructions and TPI DSB-89 and TPI BCSI 1; maintain a copy of each TPI document on site until installation is complete.

B. Set members level and plumb, in correct position.

C. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure plumb, and in true alignment until completion of erection and installation of permanent bracing.

D. Do not field cut or alter structural members without approval of Architect.

E. Install permanent bridging and bracing.

F. Coordinate placement of decking with work of this section.

3.04 TOLERANCES

A. Framing Members: 1/2 inch maximum, from true position.

END OF SECTION

SECTION 062000
FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

B. Wood casings and moldings.

1.02 SUBMITTALS

A. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
   2. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

1.03 DELIVERY, STORAGE, AND HANDLING

A. Protect from moisture damage.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Interior Woodwork Items:

2.02 WOOD-BASED COMPONENTS

2.03 FASTENINGS

2.04 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

2.05 SHOP FINISHING

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Opaque:
      a. Color: As selected by Architect.
      b. Sheen: Semigloss.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.02 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

3.03 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 064700
PLASTIC SHUTTERS AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior shutters.

B. Exterior shutter hardware.

C. Arch tops.

D. Transom tops.

1.02 RELATED SECTIONS

A. Section 099000 - Painting and Coating.

1.03 SUBMITTALS

A. Shop Drawings: Show materials, layout, dimensions, profiles, fasteners and anchors, hardware, finishes, and interface with adjacent construction.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened packaging, with labels clearly identifying product name and manufacturer.

B. Store products in manufacturer's unopened packaging until ready for installation.

C. Store materials in a clean, dry area in accordance with manufacturer's instructions.

D. Protect materials during handling and installation to prevent damage.

1.05 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.06 WARRANTY

A. Provide with a Limited Lifetime warranty against cracking, splitting or fading.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Mid-America Siding Components - The Tapco Group, which is located at: 29797 Beck Rd.; Wixom, MI 48393-2834; Toll Free Tel: 800-521-8486; Fax: 888-459-3647; Email: wayne_Sanderson@tapcoint.com; Web: www.thetapcogroup.com/brands/mid-america/shutters/shutters

B. Substitutions: Permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.02 SHUTTERS

A. Standard Open Louver Shutters: Mid-America Cathedral Open Louver Shutters fabricated of maintenance-free, UV-stabilized polypropylene copolymer with molded-through color
   1. Width:

2. Length:
3. Colors:

2.03 SHUTTER ACCESSORIES

A. Fasteners:
1. Shutter-Lok fasteners, 3 inches (76 mm) long, color coordinated to match adjacent shutter. Suitable for any surface.
2. Painted Screws, 3 inches (76 mm) long, color coordinate to match adjacent shutter.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Commencement of work will imply acceptance of substrate.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surface using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Paint in accordance with manufacturer's recommended instructions. Contact manufacturer for recommended paint and shutter surface preparation.

3.04 PROTECTION

A. Protect installed products from damage by weather and other work until Date of Substantial Completion.

B. Touch-up and repair damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 066100
CAST POLYMER FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cast plastic washroom vanities with integral sink.

1.02 SUBMITTALS

A. Shop Drawings: Indicate dimensions, thicknesses, required clearances, tolerances, materials, colors, finishes, fabrication details, field jointing, adjacent construction, methods of support, integration of plumbing components, and anchorages.

B. Product Data: Provide data on specified component products, electrical characteristics and connection requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Cast Polymer Vanities with integral sinks:
   1. St. Louis Marble; Cultured Marble
   2. Color: White on White Swirl
   3. Substitutions: Not permitted.

B. Synthetic Stone Architectural Columns, Balustrade Systems, Balusters, and Facade Elements:

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joint preparation and affected dimensions are acceptable.

3.02 PREPARATION

A. Provide anchoring devices for installation and embedding.

3.03 INSTALLATION

A. Install components in accordance with approved shop drawings and manufacturer's instructions.

B. Align work plumb and level.

C. Rigidly anchor to substrate to prevent misalignment.

3.04 CLEANING

A. Clean and polish surfaces in accordance with manufacturer's instructions.

END OF SECTION

SECTION 067300
COMPOSITE DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior decking [and railing] work made from wood and polypropylene composite material.

1.02 RELATED SECTIONS

A. Division 01 Section "Sustainable Design Requirements" for related LEED general requirements.

B. Division 06 Section "Rough Carpentry" for framing, blocking, and other carpentry work associated with composite decking.

1.03 REFERENCES

A. ASTM International (ASTM):
1. ASTM D 696 – Test Method for Coefficient of Linear Thermal Expansion of Plastics
   a. Between -30 degrees C and 30 degrees C With a Vitreous Silica Dilatometer.
2. ASTM D 1413 – Test Method for Wood Preservatives by Laboratory Soil-Block Cultures.
3. ASTM D 1761 – Test Methods for Mechanical Fasteners in Wood.
4. ASTM D 2394 – Methods for Simulated Service Testing of Wood and Wood-Base Finish Flooring.
5. ASTM D 2565 – Practice for Xenon Arc Exposure of Plastics Intended for Outdoor
   a. Applications.
6. ASTM D 3273 – Standard Test Method for Resistance to Growth of Mold on the Surface
   a. of Interior Coatings in an Environmental Chamber.
7. ASTM D 4060 – Test Method for Abrasion Resistance of Organic Coatings by the Taber
   a. Abraser.
8. ASTM D 4442 – Test Methods for Direct Moisture Content Measurement of Wood and
   a. Wood-Base Material.
9. ASTM D 4812 – Test Method for Unnotched Cantilever Beam Impact Resistance of
   a. Plastics
10. ASTM D 6109 – Test Methods for Flexural Properties of Unreinforced and Reinforced
    a. Plastic Lumber.
11. ASTM D 6111 – Test Method for Bulk Density and Specific Gravity of Plastic Lumber and Shapes by Displacement.
12. ASTM D 6111 – Test Method for Bulk Density and Specific Gravity of Plastic Lumber and Shapes by Displacement.
13. ASTM D 6864 – Standard Specification for Color and Appearance Retention of Solid
    a. Colored Plastic Siding Products
14. ASTM E 84 – Test Method for Surface Burning Characteristics of Building Materials.
15. ASTM E 228 – Test Method for Linear Thermal Expansion of Solid Materials With a Push-Rod Dilatometer.

B. American Wood Preservers' Association (AWPA):
1. AWPA E1 – Standard Method for Laboratory Evaluation to Determine Resistance to Subterranean Termites.

C. Underwriters Laboratories, Inc. (UL):
1. UL 723 – Test For Surface Burning Characteristics of Building Materials.

D. U.S. Green Building Council (USGBC):
1. LEED Green Building Rating System (LEED).

1.04 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide exterior decking [and railing] components capable of meeting the following minimum design loads when installed in the configuration indicated:
1. Deck: Uniform Live Load: 125 lbf/sq. ft. (6 kN/sq. m).
2. Treads of Stairs: Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m), and concentrated load:

a. 300 lbf (1.33 kN) on area of 4 sq. in. (25.8 sq. cm), whichever produces the greater stress.
3. Guard Top Rail Concentrated Load: 200 lbf (0.89 kN) applied at any point in any direction.
4. Guard Top Rail Uniform Load: 50 lbf/ft. (0.73 kN/m) applied in any direction.
5. Intermediate Rail and Baluster Concentrated Load: 50 lbf (0.22 kN) applied to 1 sq. ft. (0.093 sq. m) area.

1.05 SUBMITTALS

A. Product Data: Manufacturer's data sheets, installation instructions, and maintenance recommendations for composite decking materials.

B. Product Test Reports: Indicating compliance of products with requirements, from a qualified independent testing agency.

C. LEED Submittals:
1. Credit MR 4.1 [and 4.2]: Documentation indicating the percentages of post-consumer and post-industrial recycled content of composite decking materials.

D. Samples:
1. 4 inches (102 mm) long for each size and type of composite decking [and railing] component.
2. For each type of fastener and hanger.
3. Selection Samples: For each finish product specified, two complete sets of color chips depicting the manufacturer's full range of available colors and textures.
4. Verification Samples: For each product selected, two samples depicting the specified color and pattern.

E. Research/Evaluation Reports: For composite decking [and railing], from model code organization acceptable to authorities having jurisdiction.

F. Warranty: Submit sample meeting warranty requirements of this Section.

1.06 QUALITY ASSURANCE QUALITY ASSURANCE

A. Manufacturer Qualifications: Approved manufacturer listed in this section, with minimum [5] years experience in manufacture of similar products in use in similar environments.
1. Approval of Comparable Products: Submit the following in accordance with project
a. substitution requirements, within time period allowed for substitution review:
1) Product data, including certified independent test data indicating compliance with
(a) performance requirements in Part 1 and material requirements in Part 2.
2) Samples of each type of product specified.
3) Project references: Minimum of 5 installations not less than 3 years old, with
(a) owner contact information, available for evaluation by Architect.
4) Sample warranty.

B. Source Limitations: Obtain composite decking [and railings] through one source from a
1. single approved manufacturer.

C. Fire-Test-Response Characteristics per ASTM E 84 or UL Standard 723: Flame spread index:
1. 100 or less; Smoke developed index: 450 or less.

D. Mockup: Build mockup to verify approved materials and demonstrate acceptable workmanship.
1. Do not proceed with work until mockup has been approved by the Architect.
2. Approved mockups may be incorporated in finished work.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect materials against weather. Store on flat surface with adequate support. Provide for air
1. circulation within and around stacks and under temporary coverings.

1.08 WARRANTY

A. Special Warranty: Manufacturer's standard form indicating manufacturer's intent to replace composite decking materials that fail within 25 years following Substantial Completion under

normal conditions of use and exposure. Failures are defined to include the following:
1. Rot, decay, splitting, checking, splintering, or termite damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Composite decking design is based upon product of the manufacturer below.
1. Provide basis of design product[, or comparable products approved by Architect prior to
2. bid].
3. Correct Building Products, 8 Morin St, Biddeford, ME 04005; Phone: (877) 332-5877,
a. (207) 284-5600; Fax: (207) 284-1001; Email: specs@correctdeck.com; Website:
b. www.CorrectDeck.com.
4. [Specifier: Insert additional product manufacturers meeting requirements of
a. Quality Assurance Article above, if required for project.]

2.02 MATERIALS

A. Composite Lumber, General: Wood thermoplastic composite material, UV- and heat-stabilized,
1. consisting of combination of wood fiber and polypropylene, extrusion-molded into sizes and
2. shapes indicated, with the following physical characteristics:
3. Flexural Strength, ASTM D 6109: 4000 lbf/sq. in. (27.58 MPa), minimum.
4. Tensile Strength, ASTM D 7031: 2700 lbf/sq. in. (18.62 MPa), minimum.
5. Modulus of Elasticity, ASTM D 6109: 850,000 lbf/sq. in. (5860 MPa), minimum.
6. Modulus of Rupture, ASTM D 6109: 5400 lbf/sq. in. (37.23 MPa), minimum.
7. Weatherability Affect on Modulus of Rupture, 2000 hours, ASTM D 2565: 16 percent
a. reduction of baseline MOR.
8. Density: ASTM D 6111: 6.0 lb/cu. ft. (1.15 g/cu. c), minimum.
9. Impact Resistance: ASTM D 4812: 1.4 ft-lbf/in. (0.747 J/cm) parallel to length,
a. minimum.
10. Coefficient of Thermal Expansion, ASTM E 228: 1.5 x 10-5 in/in/deg. F (2.7 x 10-5
a. mm/mm/deg. C), maximum.
11. Water Absorption, ASTM D 4442: 1.5 percent, maximum.
12. Screw Withdrawal, ASTM D 1761: 1400 lbf (6220 N), minimum.
13. Termite Resistance, AWPA E1: 9.0, minimum
14. Fungal Resistance, ASTM D 1413: No decay.
15. Abrasion Resistance, ASTM D 4060: .06 g/1000 cycles.
16. Flame Spread Index, ASTM E 84: 100 or less (Class III).
17. Coefficient of Friction, ASTM D 2394: 0.7, minimum, dry.
18. Coefficient of Friction, ASTM D 2394: 0.6, minimum, wet.
19. Resistance to Mold Growth, ASTM D 3273, CorrectDeck CX: 10 rating (no mold growth).
20. Fade Resistance, ASTM D 6864, CorrectDeck CX: 1.5 Delta E.

2.03 DECKING

A. Composite Decking:
1. Basis of Design Product: Correct Building Products, [CorrectDeck] [CorrectDeck
a. CX].
2. Nominal Size: [5/4 by 6] [5/4 by 4].
3. Profile: [Edge grooved] [Solid].
4. Fastening: [Concealed fastening clip] [Face fastened].
5. Face Surface: Embossed wood grain textured.
6. Color: As selected by Architect from manufacturer's full line.

B. Stair Treads and Risers:
1. Basis of Design Product: Correct Building Products, [CorrectDeck] [CorrectDeck CX]
a. [and] [CorrectDeck Dimensional Composite Lumber].
2. Size: As indicated.
3. Profile: Solid.

4. Fastening: Face fastened with screws.
5. Color and Texture: As selected by Architect from manufacturer's full line.

C. Composite Trim: Composite lumber components matching decking, of dimension indicated.

2.04 RAILINGS

A. Railing System, Prefabricated: Consisting of newel posts, extruded top and bottom rails,
1. and balusters, with pre-engineered connectors and trim accessories.
2. Basis of Design Product: Correct Building Products, CorrectDeck [RapidRail]
   a. [RapidRail CX].
3. Color and Texture: As selected by Architect from manufacturer's full line.
4. Newel Posts: Nominal 4 by 4.
   1) Post caps and skirts: As selected by Architect from manufacturer's full line.
   2) Post anchors: Attach newel posts in manner identical to attachment method
      (a) recommended by manufacturer and tested to meet requirements of Performance
      (b) Requirements Article.
         (1) Surface-mounting: Install posts using manufacturer's surface-mounted,
         (2) concealed, anchor kit consisting of a screw-attached steel base plate with
         (3) welded steel upright post accepting attachment of newel post.
         (4) Recessed-mounting: Install posts using corrosion-resistant 1/2-inch (12-
         (5) mm) diameter carriage bolts with 5/8-inch (15.9-mm) diameter washers.
5. Railings: 3-1/2 by 2-3/4 inch (88.9 by 69.8 mm) extruded profiles, routed to accept
   a. balusters where required.
6. Balusters: [1-1/4 by 1-1/4 inch (32 by 32 mm) hollow profile] [1-1/2 by 1-3/8
   a. inch (30.5 by 34.9 mm) solid profile].

B. Railing System, Site Fabricated: Composite lumber components matching decking system,
1. consisting of newel posts, rails, and balusters.
2. Basis of Design Product: Correct Building Products, CorrectDeck Dimensional Composite Lumber.
3. Color and Texture: As selected by Architect from manufacturer's full line.
4. Newel Posts: Nominal 4 by 4.
   1) Post caps and skirts: As selected by Architect from manufacturer's full line.
   2) Post anchors: Attach newel posts in manner identical to attachment method
      (a) recommended by manufacturer and tested to meet requirements of Performance
      (b) Requirements Article.
         (1) Surface-mounting: Install posts using manufacturer's surface-mounted,
         (2) concealed, anchor kit consisting of a screw-attached steel base plate with
         (3) welded steel upright post accepting attachment of newel post.
         (4) Recessed-mounting: Install posts using corrosion-resistant 1/2-inch (12-
         (5) mm) diameter carriage bolts with 5/8-inch (15.9-mm) diameter washers.
5. Railings: [3-1/2 by 2-3/4 inch (88.9 by 69.8 mm) extruded profiles, solid
   a. profile] [As indicated].
6. Balusters: [1-1/4 by 1-1/4 inch (32 by 32 mm) hollow profile] [1-1/2 by 1-3/8
   a. inch (30.5 by 34.9 mm) solid profile] [As indicated].

2.05 ACCESSORIES

A. Fasteners for Decking: Trim head screws, stainless steel, non-magnetic, 304 alloy, sized
1. according to manufacturer's recommendations.

B. Brackets, Flanges, and Fittings: Manufacturer's recommended stainless steel, non-magnetic,
1. 304 alloy, bolts, nuts, washers, and screws.

2.06 FABRICATION

A. General: Fabricate railing systems to comply with requirements indicated for design,
1. dimensions, details, finish, and member sizes.

B. Provide inserts and other anchorage devices for connection railing systems to structure.
1. Fabricate anchorage devices capable of withstanding loading imposed by railing systems.
2. Coordinate anchorage devices with supporting structure.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation
1. tolerances and other conditions affecting performance.

B. Proceed with installation of composite decking [and railings] upon correction of unsatisfactory
1. conditions.

3.02 INSTALLATION, GENERAL

A. Install composite decking [and railings] in accordance with manufacturer's recommended
1. installation instructions, details, and requirements of authorities having jurisdiction.
2. Install over support members of adequate size and spacing, sloped as recommended.
a. Provide minimum recommended airspace beneath composite decking. Extend decking
b. across minimum of three supports. Center joints on support.
3. Provide 1/8 inch (3 mm) gap between deck boards for control of drainage and thermal
a. movement. Allow recommended end-to-end gap based upon ambient temperature at
b. time of installation.

B. Install composite decking [and railings] true to line and aligned with adjacent materials. Use
1. secured concealed shims where necessary for alignment. Remove burrs and rough edges.

3.03 DECKING INSTALLATION, CONCEALED FASTENER

A. Fasten channeled decking using specially profiled fastener configured to fit in side channels of
1. deck boards and accept face fastener to secure decking to supports. Face fasten first and last
2. deck boards.

3.04 DECKING INSTALLATION, FACE-FASTENED

A. Fasten decking using two fasteners at each support. Locate fasteners minimum 1/2 inch (12
1. mm) from edge of decking. Predrill decking. Countersink screw heads.

3.05 STAIR INSTALLATION

A. Composite Stair Treads and Risers: Secure composite treads and risers by screwing to
1. carriages. Countersink screw heads. Extend treads over carriages.
2. Install stairs with no more than 3/16-inch (4.7-mm) variation between adjacent treads
a. and risers and with no more than 3/8-inch (9.5-mm) variation between largest and
b. smallest treads and risers within each flight.

3.06 POST AND RAILING INSTALLATION

A. Install posts and railings as indicated and as recommended by railing manufacturer. Set railings accurately in location, alignment, and elevation, measured from established lines and levels and free from rack. Provide anchorage devices and fasteners where necessary for securing

railings to existing construction. Predrill holes for fasteners.

B. Newel Posts: Where required for access to post fasteners, install posts prior to installing decking. Do not notch posts. Secure posts to supports by through-bolting, using post fastening kit supplied by post manufacturer.

C. Railings, Prefabricated: Center pre-routed railings between posts to provide equal spacing between terminal balusters and posts. Install squash block under center of bottom rail at midspan. Secure railings to posts with metal angle brackets and screws. Conceal angle bracket vertical leg with end of railing; mortise railing end to provide snug fit over bracket leg to post.
   1. Balusters: Fit balusters to mortised railings prior to screwing railings in place.

D. Railings, Site Fabricated: Secure railings to posts with fasteners and connectors of size and
   1. type recommended by manufacturer. Install railings parallel to each other and to stair runs.
   2. Balusters: Space balusters evenly and in accordance with requirements of authorities
      a. having jurisdiction. Fasten balusters to railings.

3.07 CLEANING

A. Clean surfaces as required, following procedures and employing cleaning materials as recommended by decking manufacturer.

3.08 PROTECTION

A. Protect installed products from damage by subsequent construction activities, until completion of Project.

B. Field repair of damaged product finishes is limited to surface scratch repairs only. Use manufacturer's recommended field repair procedures. Replace products that have been structurally damaged by subsequent construction activities.

END OF SECTION

SECTION 070523
BUILDING ENVELOPE TESTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. This Section includes testing building envelope systems.

1.02 DEFINITIONS

A. Acceptance Criteria: The measured value(s) or range(s) that determine if the results of the test pass or fail.

B. Accuracy: The capability of an instrument to indicate the true value of a measured quantity.

C. ACH75: The ratio of the air leakage rate at 75 Pa (0.3 in. H20), corrected for a standard air density, to the volume of the test zone (1/h).

D. AHJ: The local governing Authority Having Jurisdiction over the installation.

E. Air Barrier System: A system in the building construction that is designed and installed to reduce air leakage either into or through the building envelope.

F. Air Change Rate: The calculated number of times the total air volume of a defined space is replaced in a given unit of time. This is ordinarily computed by dividing the total volume of the room supply or exhaust air in cubic meters (cubic feet), per unit of time, by the total volume of the subject space. It is normally expressed as air changes per hour, ACH.

G. Air Exfiltration: Air leakage out of the building.

H. Air Infiltration: Air leakage into the building.

I. Airflow Rate: The volume of airflow through the fan or blower door per unit of time (m3/s or ft^3/min, cfm).

J. Air Leakage Area: The effective leakage area (AL) at the test pressure.

K. Air Leakage Change Rate: Air leakage rate in volume units/h divided by the building space volume with identical volume units, normally expressed as air changes per hour, ACH.

L. Air Leakage Graph: A graphic representation that shows the relationship of measured airflow rates to the corresponding measured pressure differences, usually plotted on a log-log scale.

M. Air Leakage Rate: The total volume of air passing through the test zone or building envelope per unit of time (ft^3/min [cfm] or m3/s).
   1. Discussion: This movement includes flow through joints, cracks, and porous surfaces, or a combination thereof. The driving force for such an air leakage, in service can be mechanical pressurization and de-pressurization, natural wind pressures, or air temperature differentials between the building interior and the outdoors, or a combination thereof.

N. Air Leakage Site: A location on the building envelope or air barrier system where air can move between the building interior and the outdoors.

O. Air Tightness: The degree to which a test zone or building envelope resists the flow of air.
   1. Discussion: Air leakage rate, effective leakage area and the rating term such as ACH50 are examples of measures of building tightness.

P. Anomalous Thermal Image: An observed thermal pattern of a structure that is not in accordance with the expected thermal pattern.

Q. Baseline Building Pressure: The natural building pressure difference measured when there is no flow through the blower door. This is also referred to as the Bias Pressure.

R. Blower Door: A fan pressurization device incorporating a controllable fan and instruments for airflow measurement and building pressure difference measurement that mounts securely in a door or other opening.

S. Building Envelope: The boundary or barrier separating the interior volume of a building from the outside environment.
   1. Discussion: For the purpose of this test procedural standards, the interior volume is the deliberately conditioned space within a building, generally not including attics, basements, and attached structures, for example, garages, unless such spaces are connected to the heating and air conditioning system, such as a crawl space plenum.

T. Building Pressure Difference: The pressure differential across the test zone or building envelope.

U. Calibrate: The act of comparing an instrument of unknown accuracy with a standard of known accuracy to detect, correlate, report, or eliminate by adjustment any variation in the accuracy of the tested instrument.

V. Certificate of Compliance (Conformance): A written statement, signed by a qualified party, attesting that the items or services are in accordance with specified requirements, and accompanied by additional information to substantiate the statement.

W. Certification: The process of validation required to obtain a certificate of compliance.

X. CFM75: The airflow leakage value in cubic feet per minute at a test pressure of 75 Pascals (Pa). The subscript value defines the test pressure.

Y. Closed: The condition of a building used to test the air barrier in an unoccupied building to test the air barrier with intentional openings sealed.

Z. Differential Pressure (DP): The difference between two pressures measured between a sample point and reference point.
   1. Discussion: This movement includes flow through joints, cracks, and porous surfaces, or a combination thereof. The driving force for such an air leakage, in service can be wind pressures, or air temperature differentials between the building interior and the outdoors, or a combination thereof.

AA. Deficiency: Any circumstance or operation that affects the measurement results as compared to the design criteria required by the contract documents.

BB. Effective Leakage Area: In order to take values generated by fan pressurization and to use them in determining natural air exchange, the effective leakage area of a building must be calculated. Each gap and crack in the building envelope contributes a certain amount of area to the total leakage area of the building. The Effective Leakage Area assumes that all of the individual leakage areas in the building are combined into a single idealized orifice or hole. The ELA will change depending on the reference pressure used to calculate it.

CC. Envelope: The construction, taken as a whole or in part, that separates the indoors of a building from the outdoors.

DD. Equivalent Leakage Area: EqLA, usually taken at 10Pa using 0.61 discharge coefficient, but for the purposes of this Specification, it is taken at 75 Pa.

EE. Field-of-View (FOV): The total angular dimensions, expressed in degrees or radians, within which objects can be imaged, displayed, and recorded by a stationary imaging device.

FF. Framing Spacing: Distance between the centerlines of joists, studs, or rafters.

GG. Function: Function in this standard refers to the specific type of data measurement specified in Section 4, Standards for Instrumentation and Calibration.

HH. Infrared Imaging System: An instrument that converts the spatial variations in infrared radiance from a surface into a two-dimensional image of that surface, in which variations in radiance are displayed as a range of colors or tones.

II. Infrared Thermography: The process of generating thermal images that represent temperature and emittance variations over the surfaces of objects.

JJ. Instantaneous Field of View (IFOV): The smallest angle, in milliradians, that can be instantaneously resolved by a particular infrared imaging system.

KK. Intentional Opening: Openings within the envelope that are designed to remain open to atmosphere during the building's operation. Intentional openings include building components such as air intake, exhaust louvers, pressure relief dampers or louvers, dryer and exhaust vents, combustion flues and any other leakage site that is designed to remain open during the building's normal operation. Windows, doors, conduits, mechanical piping, sleeves and structural steel are not intentional openings.

LL. $M^3/S75$: The airflow leakage value in cubic meters per second at a test pressure of 75 Pascals (Pa). The subscript value defines the test pressure.

MM. Masonry Veneer: Frame construction with a non-load bearing exterior masonry surface.

NN. May: Used to indicate a course of action that is permissible as determined by the NEBB Certified BET Firm.

OO. Minimum Resolvable Temperature Difference (MRTD): A measure of the ability of the operators of an infrared imaging system to discern temperature differences with that system. The MRTD is the minimum temperature difference between a four-slot test pattern of defined shape and size and its blackbody background at which an average observer can discriminate the pattern with that infrared imaging system at a defined distance.

PP. N/A: Not Available, Not Applicable, or Not Accessible. The simple notation "N/A" without definition is not allowed.

QQ. NEBB Certified BET Firm: A NEBB Certified BET Firm is a firm that has met and maintains all the requirements of the National Environmental Balancing Bureau for firm certification in Building Envelope Testing and is currently certified by NEBB. A NEBB Certified BET Firm shall employ at least one NEBB Certified BET Professional in a full-time management position.

RR. NEBB Certified BET Report: The data presented in a NEBB Certified BET Report accurately represents system measurements obtained in accordance with the current edition of the NEBB Procedural Standards for Building Envelope Testing. A NEBB Certified BET Report does not necessarily guarantee that systems measured conform to the design requirements or stated guidelines. The report is an accurate representation of the measured results only.

SS. NEBB Certified BET Professional: A NEBB Certified BET Professional is a full-time employee of the firm in a management position who has successfully passed the professional level written and practical qualification examinations and maintains the professional re-qualification requirements of NEBB.

TT. Nominal Airflow Rate: The flow rate indicated by the blower door using the manufacturer's calibration coefficients (m3/s or ft^3/min, CFM).

UU. Orifice Blower Door: A blower door in which airflow rate is determined by means of the pressure drop across an orifice or nozzle.

VV. Open: The condition of a building used to test the ventilation rate in a occupied building with intentional openings unsealed.

WW. Precision: The ability of an instrument to produce repeatable readings of the same quantity under the same conditions. The precision of an instrument refers to its ability to produce a tightly grouped set of values around the mean value of the measured quantity.

XX. Precision Index of the Average: The sample standard deviation divided by the square root of the number of samples.

YY. Pressure Station: A specified induced change in the building pressure difference from the initial zero-flow building pressure difference (Pa, in. w.c.).

ZZ. PPM: Parts per million

AAA. Procedure: The approach to and execution of a sequence of work operations to yield a repeatable and defined result.

BBB. Range: The upper and lower limits of an instrument's ability to measure the value of a quantity for which the instrument is calibrated.

CCC. Resolution: The smallest change in a measured variable that an instrument can detect.

DDD. Shall: The term is used to indicate mandatory requirements that must be followed in order for the project to become a NEBB certified project. Work must conform to these standards and procedures and no deviation is permitted: In the event unique circumstances prevent a required action from being fulfilled, a notation shall be included in the BET report explaining the reason that the requirement was not completed. For example, such notation could be one of the following: Not Available, Not Applicable, or Not Accessible. The simple notation “N/A” without definition is not allowed.

EEE. Should: The term is used to indicate that a certain course of action is preferred but not necessarily required.

FFF. Single Zone: A space in which the pressure differences between any two places, differ by no more than 5% of the inside to outside pressure difference.

1. Discussion: A multi-room space that is interconnected within itself with door- sized openings through any partitions or floors is likely to satisfy this criterion if the fan airflow rate is less than 3 m^3/s (6357 ft^3/min).

GGG. Specified Test Pressure: The required induced differential static air pressure across the specimen.

HHH. Standard: A required qualification, action, or result for BET work.

III. Standard Operating Procedure: An internal policy prepared by each BET firm and / or prepared by the Owner/Buyer. Procedures are written to provide guidance, direction,

JJJ. and step-by-step details relating to issues such as safety, testing protocols, acceptance criteria, etc. NEBB BET Firm SOP’s shall be utilized in an absence of SOP’s prepared by the Owner.

KKK. Test Pressure Difference or Differential: The measured pressure difference across the building envelope, expressed in Pascals (Pa) or in inches of water column (in. w.c.).

LLL. Test Zone: A building or a portion of a building that is configured as a single zone for the purpose of this standard. For detached dwellings, the test zone envelope normally comprises the thermal envelope.

MMM. Test Zone Envelope: The barrier or series of barriers between a test zone and the outdoors and internal spaces not included in the test zone.

NNN. Testing: The use of specialized and calibrated instruments to measure fluid quantities, temperatures, pressures, rotational speeds, electrical characteristics, velocities, and sound and vibration levels,

OOO. Testing, Adjusting, and Balancing (TAB): A systematic process or service applied to heating, ventilating and air-conditioning (HVAC) systems and other environmental systems to achieve and document air and hydronic flow rates. The standards and procedures for providing these services are addressed in the current edition of the NEBB “PROCEDURAL STANDARDS FOR THE TESTING, ADJUSTING AND BALANCING OF ENVIRONMENTAL SYSTEMS”.

PPP. Thermal Pattern: A representation of colors or tones that indicate surface temperature and emittance variation.

QQQ. Thermogram: A recorded image that maps the apparent temperature pattern of an object or scene into a corresponding contrast or color pattern.

RRR. Total air flow: The volume of air flowing per unit of time through the test zone inclusive of the air flowing through the test zone under differential test pressure conditions converted to standard conditions for temperature and density.

SSS. Unit of Length: The sum of all perimeters of operable ventilators, sash, or doors that are contained in the test specimen based on overall dimensions of such parts. Where two such operable parts meet two adjacent lengths of perimeter shall be counted as only one length.

TTT. Zone: A volume of building served by a single ventilation system. For buildings with natural ventilation only, the whole building shall be considered a zone.

1.03 BET FIRM QUALIFICATIONS

A. The BET Firm shall be NEBB Certified in Building Envelope Testing. Building envelope testing shall be conducted by the NEBB Certified BET Professional or by technicians directly under the supervision of the NEBB Certified BET Professional.

1.04 BET FIRM SUBMITTALS

A. Qualification Data: When requested, submit 2 copies of evidence that BET firm and this Project's BET team members meet the qualifications specified in Sub-section 1.3 BET Firm Qualifications.

B. BET Agenda: When requested, submit 2 copies of the BET Agenda. Include a complete set of report forms intended for use on this Project.

C. Certified BET Reports: Submit a final BET report in accordance with the current edition of the NEBB Procedural Standards for Building Envelope Testing.

1.05 QUALITY ASSURANCE

A. The NEBB Certified BET Firm shall submit a copy of the firm's NEBB BET Certification.

B. When requested, the NEBB Certified BET Firm shall provide the NEBB Certificate of Conformance Certification.

C. BET Report Forms: Prepare report forms in accordance with the requirements from the current edition of the NEBB Procedural Standards for Building Envelope Testing.

D. Instrumentation Calibration: Calibration of instruments shall be in accordance with the current edition of the NEBB Procedural Standards for Building Envelope Testing.

1.06 CONSTRUCTION TEAM RESPONSIBILITY TO BET AGENCY

A. Provide the NEBB Certified BET Firm with a conformed set of contract documents that pertain to the air barrier (drawings, specifications, and approved submittals), including all current approved change orders and contract modifications.

B. Develop a project schedule with the input of the NEBB Certified BET Firm that coordinates the work of other disciplines and provides adequate time in the construction process to allow successful completion of the building envelope testing and remedial work.

C. Notify the NEBB Certified BET Firm of all schedule changes.

D. Ensure that the building enclosure is complete, including but not limited to, all structural components, the air barrier and vapor barrier complete, windows and doors installed, door hardware complete, door sweeps and weather stripping complete, floor and ceilings complete. Ensure that the building enclosure and components are complete and operational such that the performance of the building envelope tests would not be adversely affected.

E. Provide all project preparation and setup for the BET tests, this may include but is not limited to temporary sealing of intentional openings, removing ceiling tile, opening access doors, opening interior doors and affixing them so they cannot close during the tests. This may include preparation of adjoining spaces. This would also include staging the building so no people will be opening doors or windows during the BET tests.

F. Provide temporary or permanent power for BET tests.

G. For building pressure test method using the Building Air Moving Equipment systems:
   1. Ensure that all necessary building systems are complete and are operating in a safe manner.
   2. Complete the installation of permanent electrical power systems serving the building systems. Such electrical systems shall be properly installed in accordance with all applicable codes to ensure the safety of all construction personnel.
   3. Perform startup of all building systems in accordance with manufacturers' recommendations.
   4. Complete the installation, programming, calibration and startup of all building control systems.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper BET of systems and equipment. Contract Documents are defined in the General and Supplementary Conditions of Contract. Report deficiencies discovered.

3.02 PRELIMINARY PROCEDURES FOR BUILDING ENVELOPE TESTING

A. Conduct the Preliminary Procedures in accordance with procedures contained in the current edition of the NEBB Procedural Building Envelope Testing and this section. This includes that the Design Professionals and/or the Owner are responsible to define the objectives and the acceptance criteria for the testing. Additionally, they are responsible to define which air leakage test(s) are to be performed by the NEBB Certified BET Firm.

3.03 INSTRUMENTS AND EQUIPMENT

A. Instruments and equipment necessary to perform Building Envelope Testing shall meet the requirements of the current edition of the NEBB Procedural Building Envelope Testing and this section.

3.04 COMMON TEST PROCEDURES FOR BUILDING ENVELOPE TESTING

A. Perform Building Envelope Testing on all systems to be tested according to the procedures contained in the current edition of the NEBB Procedural Building Envelope Testing and this section. As stated in Section 3.1 above, the test method shall be defined by the Design Professionals and /or the Owner. The procedures listed below apply to both test methods and shall be followed when performing either the Blower Door Test Method or the Building Air Moving Equipment System Test method.

B. Establish the exterior test zone envelope. This is accomplished by defining the test zone envelope and ensuring it is appropriate for the goals of the test.

C. Select the appropriate test envelope condition; open or closed. For the closed condition, close all operable openings and seal other intentional openings to evaluate envelope air tightness. For the open condition, leave all operable openings in the normal operating condition of the building’s occupancy to assess the envelope's effect on natural air change rates. The closed condition shall be the default option if no compelling reason exists to utilize the open condition.

D. Adjust all building components in accordance with Table 1 below and/or per the specification. For testing a building in the closed condition, close all operable openings and seal other intentional openings to evaluate envelope air tightness. For occupied condition, leave all operable openings in the normal operating condition of the building’s occupancy.

E. Prior to conducting the test, perform the preliminary procedures identified in Section 3.1. If the performance of these preliminary procedures is the responsibility of others, survey the site and building to insure that all preliminary procedures have been properly completed.

F. Establish the interior test zone. This is accomplished by opening all interior building doors including fire doors, corridor doors, pass-throughs, in the test zone so that a uniform inside pressure is created within the zone. If there are hard ceilings with access doors, all access doors are to be open.

G. Measure and record the wind velocity and direction on the windward side of the building at a distance 30 to 50 feet away from the buildings. Preferred test conditions are wind velocity of 0 to 2 m/s (0 to 4 mph). If the surrounding building induced winds or the wind is gusting more than 4 mph above the steady state wind then the test should not be performed due to accuracy limits.

H. Measure and record the outside temperature. Preferred test conditions are outside temperatures from 2°C to 35°C (35°F to 95°F). If test is performed below 2°C (35°F) there is a possibility of freezing pipes. If the test is performed above 35°C (95°F) damaging finished

materials, building finishes or worker safety becomes a concern.

I. Measure and record the indoor and outdoor temperatures at the beginning of the test so that their average values can be calculated.

J. Determine the height & temperature factor. The factor is the product of the absolute value of the indoor/outdoor air temperature difference multiplied by the building height. If the factor is less than 200 m°C (1,180 ft°F), perform the test. If the factor is greater than 200 m°C (1,180 ft°F), the stack effect may influence the building envelope pressure difference and will reduce the accuracy of the result. When the factor is greater than the above stated values, the entire test shall be performed both under a pressurization and depressurization modes utilizing ASTM E 1827 Blower Door Test Method and the minimum induced test pressure shall be 25 Pa (0.10 in.w.c.).

K. TABLE 1: Recommended Pre-Test Building Preparations

	Closed	**Open**
Exhaust fans with back draft dampers	Sealed	No preparation
Supply fans with back draft dampers	Sealed	No preparation
Furnace room door for furnace outside test zone	Closed	Closed
Combustion air intake damper for boilers	Closed	Closed
Outside air intake damper for Air Handling Unit inside test zone	Sealed	Closed
Outside air intake for Air Handling Unit inside test zone without damper	Sealed	No preparation
Exhaust, Air Handling Units, Make-up Air Units, Energy Recovery Units, Supply fans, Furnaces, Fan Coil Units, Boilers, Gas Hot Water Heaters, All equipment requiring combustion air (including kitchen equipment, HVAC, etc.)	Off	Off
Fan inlet grilles with motorized damper	Closed	Closed
Fan inlet grills without motorized damper	Sealed	No preparation
Ventilators designed for continuous use	Sealed	Sealed
Supply and exhaust ventilator dampers	Sealed	Held closed
Clothes dryer	Off	Off
If clothes dryer is connected to the dryer vent	No preparation	No preparation
Vented combustion appliance	Off	Off
Ventilation to other zones	Sealed	Sealed
Windows	Closed and Latched	Closed and Latched
exterior doors	Closed and Latched	Closed and Latched
Window air conditioners	Sealed	No preparation
Through the wall air conditioners outside air vent	Sealed	No preparation
Openings leading to outside the test zone	Closed	Closed
All HVAC ducts going from inside the test zone to outside the test zone and back into the test zone	Sealed	Sealed
All electrical conduits going from inside the test zone to outside the test zone	Sealed	Sealed

and back into the test zone		
Openings within the test zone	Open	Open
Floor drains and plumbing traps	Filled	Filled
Elevator pressure relief openings	Closed	Closed
Elevator Doors	Closed	Closed
Elevator Door Frame spacing between the elevator door and frame if the elevator connects an area outside the air barrier	Sealed	Open
Elevator Door Frame spacing between the elevator door and frame if the elevator connects an area within the air barrier	Open	Open
Rooms with Exterior, non-ducted louvers (interior doors)	Closed	Closed
Loading Dock Doors (interior doors)	Closed	Closed

L. Open all doors, windows, and other openings that connect portions of the building outside the test zone envelope with the outdoors. For example, if the building is a combination of office and warehouse, and only the office portion of the building is to be tested then open the warehouse doors. If the entire office and warehouse is to be tested, then all office and warehouse doors are to be closed to the outside but the doors between the office and warehouse are to be open.

M. Remove sufficient ceiling tiles for lay-in ceilings, or open sufficient access panels for hard ceilings, were the pressure between the ceiling cavity and the room is equalized to within +/-10% of the building envelope test pressure.

N. Record the condition of the building's components including windows, exterior doors, interior doors, stairwell doors, elevator doors, walls, access doors, roof and floor (i.e. sealed or unsealed, open or closed, etc.).

3.05 BLOWER DOOR TEST METHOD PROCEDURES

A. Install the blower door in an entry door, window or vent opening. The openings must be sealed or taped to avoid leakage at these points. Orient the blower door appropriately for depressurization or pressurization as required. The installation should have minimal obstructions of airflow into and out of the building.

B. Install the pressure measuring instrument across the building envelope. It is good practice to use more than one location across the building envelope for pressure measurement. Preferred locations for exterior pressure measurement locations should be those that avoid extremes of exterior pressures. A good location avoids exterior corners and complex architectural features and should be close to the middle of the exterior wall.

C. In addition, buildings more than 4 floors or 12.2 m (48.0 ft) in height, shall have pressures measured at a minimum of 2 locations or every 4 floors, whichever is greater.

D. Average 10 baseline pressures points of 10 seconds per point, where the variation between any point and the mean must be no greater than 1 Pascal.

E. Zero the pressure sensor by connecting the differential ports together. Note: Some blower doors may perform this or an equivalent step automatically. Follow the manufacturer's instructions accordingly.

F. Before beginning the test, measure and record the baseline building differential pressure across the airflow measurement device with the blower off. If a damper is used to control airflow, it should be in a fully closed position for the baseline building pressure measurements. If the air moving equipment employs a blank-off plate, it should be fully closed for the baseline building tests.

G. Start the blower door fans and pressurize / depressurize the building to the highest specified induced pressure differential. Measure and record the building envelope differential pressure.

H. Pressure readings are to be taken to produce an accurate average building pressure. Fluctuations in pressure due to wind require pressure measurements to be taken on both the windward and leeward side of the building and averaged. If the buildings height or building configuration causes internal building pressure fluctuations, then interior pressure shall be taken and averaged.

I. Perform a minimum of 10 building envelope pressure differentials and their corresponding airflow measurements for both the pressurization mode and the depressurization mode (a total of 20 measurements). The measurements shall be taken over a minimum of 10 seconds. The range of the building envelope pressure differences should be from a minimum of 25 Pa (0.10 in. w.c.) to maximum of 75 Pa (0.30 in. w.c.). Use increments of 5 Pa (0.02 in. w.c.) for the full range of building envelope pressure differences. (i.e. 25, 35,40, 45, 50, 55, 60, 65, 70, 75 Pa) or (0.10, 0.14, 0.16, 0.18, 0.20, 0.22, 0.24, 0.26, 0.28, and 0.30 in. w.c.).

J. Conduct tests at each building envelope pressure differential. Allow the fan and instrumentation to stabilize prior to taking any measurements. At each pressure differential, measure the airflow rate and the pressure differences across the envelope over at least a 10 second time interval. Average the airflow and pressure differentials over this time interval. For each building envelope pressure differential test, collect data for both pressurization and de- pressurization.

K. After conducting the pressure tests, measure and record the baseline building differential pressure across the airflow measurement device with the fan off and sealed.

L. Report the building envelope pressure differential, and the airflow for each test and the beginning and ending baseline building differential pressure.

M. Subtract the average baseline differential pressure from the building envelope differential pressure and report this value for both pressurization and depressurization.
   1. NOTE: Some equipment may perform this step, or an equivalent step, automatically follow the manufacturer’s instructions accordingly.

N. Measure and record the indoor and outdoor temperatures at the end of the test so that their average values can be calculated.

O. Repeat steps 8.2.3.9 through 8.2.3.14 for the alternate pressurization.

3.06 BUILDING AIR MOVING EQUIPMENT SYSTEM TEST METHOD PROCEDURES

A. This test method can be utilized for pressurization or depressurization testing of the building envelope; however, the test is not as accurate as the ASTM 779 that is the blower door tests. This test should not be considered an equal to those tests. This is due to several reasons; none of which pertain to the abilities of the NEBB Certified BET Firm or the capabilities of the required instrumentation and equipment to perform the Building Air Moving Equipment Test Method. The major features that could affect the ability to perform the test and the accuracy of this test relate to the following:
   1. The ability of the installed HVAC equipment and systems to mechanically bring in sufficient amounts of outside air for pressurization and / or mechanically exhaust sufficient amounts of building air for depressurization.
   2. The ability of the installed mechanical equipment and systems to generate the required airflows and associated static pressures to properly conduct the test
   3. The configuration of the equipment installed in the system to accurately measure airflow and static pressures. The most accurate method to measure airflow in the field is by performing a duct traverse using a Pitot tube and digital manometer. To accurately perform a traverse measurement requires an adequate length of straight duct downstream from any equipment, fittings or obstructions to provide an ideal duct traverse plane in which to obtain an accurate duct traverse.
   4. The ability of the most building air moving equipment systems to be manipulated in order to produce meaningful building pressure gradients

B. When using the Building Air Moving Equipment System Method Test, the NEBB Certified BET Firm shall follow NEBB TAB procedures to measure the airflow. The preferred method to

measure the airflow is by the traverse method that complies with NEBB procedures. If airflow monitoring stations are used, it is the NEBB firm's responsibility to verify the accuracy of the airflow monitor.

C. If neither the traverse method nor the use of airflow monitoring stations is available, then three (3) alternate methods of measuring airflow per the NEBB TAB procedures shall be used. The three different methods should correlate flow to each other within 10%.

D. The Building Air Moving Equipment Test Method consists of taking two sets of data at two different building pressures. The first set of data, identified as P1, is taken the higher differential pressure value. The second set of data identified as P2, is taken the lower differential pressure value. The criteria limits for values of P1 and P2 values shall be as follows:
   1. P1 value shall be between 75 and 35 Pa (0.30 in.w.c. and 0.14 in.w.c).
   2. P2 value shall be 1/3 of the P1 value and shall be between 25 and 10 Pa (0.10 in.w.c. and 0.04 in.w.c).
      a. If the above criteria cannot be achieved, then the Blower Door Test Method SHALL be performed utilizing both the pressurization and the depressurization modes.
      b. A minimum of five replicate measurements of building envelope differential pressure and the corresponding airflow shall be taken at each value of P1 and P2. Thus, a total of 10 pressures measurements and 10 airflow measurements are required.

E. Install the pressure measuring instrument across the building envelope. It is good practice to use more than one location across the building envelope for pressure measurement. Preferred locations for exterior pressure measurement locations should be those that avoid extremes of exterior pressures. A good location avoids exterior corners and complex architectural features and should be close to the middle of the exterior wall.

F. In addition, buildings more than 4 floors or 12.2 m (48.0 ft) in height shall have pressures measured at a minimum of 2 locations or every 4 floors, whichever is greater.

G. The pressures from each location should be averaged, typically using a manifold. Average the pressures over at least a 10 second time period.

H. Zero the pressure sensor

I. Measure and record the baseline building differential pressure by closing the dampers or otherwise seal off the fan(s) that will be creating the test flows.

J. Conduct five (5) tests at the P1 building envelope pressure differential. Allow the fan and instrumentation to stabilize prior to taking any measurements. Measure the airflow and the building pressure differential simultaneously. Repeat until all 5 airflow measurements and 5 envelope pressure differential measurements have been taken. Each of the flow and corresponding pressure differentials measurements must occur within 5 minutes of each other.

K. Repeat the entire procedure at P2 and conduct five (5) tests at the P2 building envelope pressure differential. Allow the fan and instrumentation to stabilize prior to taking any measurements. Measure the airflow and then measure the building pressure differential. Repeat until all 5 airflow measurements and 5 envelope pressure differential measurements have been taken. Each of the flow and corresponding pressure differentials measurements must occur within 5 minutes of each other.

L. Average the 5 airflow measurements to each other and average the 5 pressure differentials to each other for the data obtained at P1.

M. Average the 5 airflow measurements to each other and average the 5 pressure differentials to each other for the data obtained at P2.

N. Measure and record Baseline Building Pressure Differential at the end of the test.

O. Measure and record the indoor and outdoor temperatures at the end of the test so that their average values can be calculated.
   1. NOTE: It is advisable to check that the condition of the building envelope has not changed after each pressure reading, for example, that sealed openings have not become unsealed or that doors, windows, or dampers have not been forced open by the building envelope pressure testing.

3.07 DATA ANALYSIS AND CALCULATIONS FOR BOTH THE BLOWER DOOR TEST METHOD AND THE BUILDING AIR MOVING EQUIPMENT SYSTEM TEST METHOD

A. If the airflow measuring instrumentation being utilized does not provide the volumetric airflow at the temperature and pressure of the air flowing through the flowmeter during the test, the airflow values must be corrected for density.

B. When correcting the readings of the airflow measurements for density, the preferred method is to use the temperature and the actual barometric pressure. A method to correct for density using temperature and elevation is available but does not account for weather impact. In the pressurization mode this will be the outside air temperature and barometric pressure. For depressurization test this will be the inside air temperature and barometric pressure.

C. Average the baseline building envelope pressures measured before and after the flow measurements. Subtract the average from the measured envelope differential pressures readings to determine the corrected induced envelope pressures.

D. Plot the measured airflow against the corrected induced pressure differences on a log-log plot to complete the air leakage graph for both pressurization and de-pressurization (for an example, see Appendix C, Section C.10 of the current edition of the NEBB Procedural Building Envelope Testing.

E. Use the data to determine the air leakage coefficient.

F. Correct the air leakage coefficient (C) to standard conditions. Use the data to determine the pressure exponent separately for pressurization and depressurization.

G. If the pressure exponent (n) is less than 0.45 or greater than 0.8, then the test is invalid and shall be repeated.

H. Use a log-linearized linear regression technique and the associated equation in Appendix C, Section C.5.5 of the current edition of the NEBB Procedural Building Envelope Testing, where Q is the airflow rate, in m^3/s (cfm), and DP is the differential pressure in Pa (in.w.c.). In determining the fit of the above equation, the confidence intervals of the derived air leakage coefficient (C) and pressure exponent (n) should be calculated.

I. The effective leakage area, AL, can be calculated from the corrected air leakage coefficient and the pressure exponent using a reference pressure (DPr). Calculate the leakage areas separately for pressurization and depressurization.

J. To obtain a single value for flow coefficient, pressure exponent and leakage area for use in other calculations, the average of these values from the pressurization and depressurization envelope flows and pressure differences, with their offsets removed, may be combined together. This combined data set then is used in the same way as each individual data set to obtain C, n, and AL for the combined data. If the flow at a specified pressure difference, such as 50 Pa, is desired, it should be determined using the derived C and n and the specified reference pressure.

K. Determine the upper confidence limits for the derived values which shall not exceed the leakage rate per square footage of air barrier.

3.08 ACCEPTANCE

A. The acceptance criteria should be as specified in the contract documents or as agreed to between the Owner / Buyer and the NEBB Certified BET Firm.

3.09 FINAL REPORT

A. The final report shall be in accordance with the requirements of the current edition of the NEBB Procedural Standards for the Building Envelope Testing.

END OF SECTION

SECTION 072100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at perimeter foundation wall and underside of floor slabs.

B. Batt insulation in exterior wall, ceiling, and roof construction.

C. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.02 SUBMITTALS

A. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

PART 2 PRODUCTS

2.01 FOAM BOARD INSULATION MATERIALS

2.02 BATT INSULATION MATERIALS

PART 3 EXECUTION

3.01 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Install boards horizontally on foundation perimeter.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.02 BOARD INSTALLATION UNDER CONCRETE SLABS

A. Place insulation under slabs on grade after base for slab has been compacted.

B. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

C. Prevent insulation from being displaced or damaged while placing vapor retarder and placing slab.

3.03 BATT INSTALLATION

A. Install insulation in accordance with manufacturer's instructions.

B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.04 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 072126
BLOWN INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Exterior Walls: Blown insulation pneumatically placed into wall spaces through access holes.

B. Ceiling and Attic: Blown insulation pneumatically placed into joist spaces through access holes.

1.02 SUBMITTALS

A. Product Data: Provide data on product characteristics, performance criteria, and limitations.

PART 2 PRODUCTS

2.01 MATERIALS

A. Applications: Provide blown insulation in attic, exterior walls, and ceiling as indicated on drawings.

B. Blown Insulation: ASTM C739, cellulosic fiber type, nodulated for pour and bulk for pneumatic placement.
   1. Installed Thickness: As indicated on drawings.

2.02 ACCESSORIES

A. Roof Ventilation Baffles: Prefabricated ventilation channels for placement under roof sheathing with baffles to prevent wind-washing.
   1. Material: Polyvinyl chloride (PVC).
   2. Roof Joist/Truss Spacing: 16 inch on center, nominal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install insulation and ventilation baffle in accordance with ASTM C1015 and manufacturer's instructions.

B. Place insulation against baffles, and do not impede natural attic ventilation to soffit.

C. Completely fill intended spaces leaving no gaps or voids.

END OF SECTION

SECTION 072700
AIR BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Air barriers.

1.02 DEFINITIONS

A. Air Barrier: Airtight barrier made of material that is virtually air impermeable but water vapor permeable, both to amount as specified, with sealed seams and sealed joints to adjacent surfaces.

1.03 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023b.

B. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a, with Editorial Revision (2023).

C. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials 2021a.

1.04 SUBMITTALS

A. Product Data: Provide data on material characteristics, performance criteria, and limitations.

1.05 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Evaluated Air Barrier Assemblies; www.airbarrier.org/#sle: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture, and use secondary materials approved in writing by primary material manufacturer.

1.06 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 AIR BARRIER MATERIALS (AIR IMPERMEABLE AND WATER VAPOR PERMEABLE)

A. Air Barrier Sheet, Mechanically Fastened:
   1. Air Permeance: 0.004 cfm/sq ft, maximum, when tested in accordance with ASTM E2178.
   2. Water Vapor Permeance: 10 perms, minimum, when tested in accordance with ASTM E96/E96M using Procedure A - Desiccant Method, at 73.4 degrees F.
   3. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 90 days of weather exposure.
   4. Surface Burning Characteristics: Flame spread index of 25 or less, and smoke developed index of 50 or less, Class A, when tested in accordance with ASTM E84.
   5. Seam and Perimeter Tape: Polyethylene self-adhering type, mesh reinforced, 2-1/2 inches wide, compatible with sheet material; unless otherwise indicated.

2.02 ACCESSORIES

A. Sealants, Tapes, and Accessories for Sealing Air Barrier and Adjacent Substrates: As indicated or in compliance with air barrier manufacturer's installation instructions.

B. Sealant for Cracks and Joints In Substrates: Resilient elastomeric joint sealant compatible with substrate and air barrier materials.
   1. Application: Apply at 30 to 40 mil, 0.030 to 0.040 inch, nominal thickness.
   2. Color: Green.

C. Sill Plate Sealer: Closed-cell foam tape with rubberized adhesive membrane; bridges gap between foundation structure and sill plate or skirt board.
   1. Width: 5-1/2 inches.

2. Ultraviolet (UV) and Weathering Resistance: Approved by manufacturer for up to 30 days of weather exposure.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install materials in accordance with manufacturer's installation instructions.

B. Air Barriers: Install continuous airtight barrier over surfaces indicated, with sealed seams and with sealed joints to adjacent surfaces.

C. Apply sealants and adhesives within recommended temperature range in accordance with manufacturer's installation instructions.

D. Mechanically Fastened Sheets - On Exterior:
1. Install sheets shingle fashion to shed water, with seams generally horizontal.
2. Overlap seams as recommended by manufacturer, 6 inches, minimum.
3. Overlap at outside and inside corners as recommended by manufacturer, 12 inches, minimum.
4. Attach to framed construction with fasteners extending through sheathing into framing, and space fasteners at 12 to 18 inches on center along each framing member supporting sheathing.
5. For applications indicated to be airtight, seal seams, laps, penetrations, tears, and cuts with self-adhesive tape; use only large-headed, gasketed fasteners as recommended by manufacturer.
6. Where stud framing rests on concrete or masonry substrate, extend lower edge of air barrier sheet at least 4 inches below bottom of framing and seal to substrate with sealant or approved mounting tape.
7. Install air barrier underneath jamb flashings.
8. At framed openings with frames having nailing flanges, extend sheet into opening and over flanges; at head of opening, seal sheet over flange and flashing.

E. Openings and Penetrations in Exterior Air Barriers:
1. Install flashing over sills, covering entire sill frame member, extending at least 5 inches onto air barrier and at least 6 inches up jambs; mechanically fasten stretched edges.
2. At openings with frames having nailing flanges, seal head and jamb flanges using a continuous bead of sealant compressed by flange and cover flanges with sealing tape at least 4 inches wide; do not seal sill flange.
3. At openings with nonflanged frames, seal air barrier to each side of framing at opening using flashing at least 9 inches wide, and covering entire depth of framing.
4. At head of openings, install flashing under air barrier extending at least 2 inches beyond face of jambs; seal air barrier to flashing.
5. At interior face of openings, seal gap between window/door frame and rough framing, using joint sealant over backer rod.
6. Service and Other Penetrations: Form flashing around penetrating item and seal to air barrier surface.

3.02 PROTECTION

A. Do not leave materials exposed to weather longer than recommended by manufacturer.

END OF SECTION

SECTION 073113
ASPHALT SHINGLES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Asphalt shingle roofing.

B. Flexible sheet membranes for eave protection, underlayment, and valley protection.

1.02 SUBMITTALS

A. Product Data: Provide data indicating material characteristics, performance criteria, limitations, and _____.

B. Samples: Submit two samples of each shingle color indicating color range and finish texture/pattern.

C. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.03 WARRANTY

A. Provide 5-year manufacturer's warranty for wind damage.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Asphalt Shingles:
   1. Certainteed; 30 Year architectural shingle
      a. Color: Driftwood.
   2. Tamko; 30 year architectural shingle.
      a. Color: Weatherwood
   3. Substitutions: Not permitted.

2.02 ACCESSORIES

A. Roofing Nails: Standard round wire shingle type, galvanized steel, stainless steel, aluminum roofing nails, or copper roofing nails, minimum 3/8-inch head diameter, 12-gauge, 0.109-inch nail shank diameter, 1-1/2 inches long and complying with ASTM F1667.

B. Plastic Ridge Vents: Extruded plastic with vent openings that do not permit direct water or weather entry; flanged to receive shingles.

PART 3 EXECUTION

3.01 INSTALLATION

END OF SECTION

SECTION 074646
FIBER-CEMENT SIDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiber-cement siding.

1.02 SUBMITTALS

A. Product Data: Submit manufacturer's data sheets on each product to be used, including:
   1. Manufacturer's requirements for related materials to be installed by others.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods, including nail patterns.

1.03 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Deliver and store materials in manufacturer's unopened packaging, with labels intact, until ready for installation.

C. Store materials under dry and waterproof cover, well ventilated, and elevated above grade on a flat surface.

PART 2 PRODUCTS

2.01 FIBER-CEMENT SIDING

A. Lap Siding: Individual horizontal boards made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
   1. Style: Standard lap style.
   2. Texture: Simulated cedar grain.
   3. Length: 12 feet, nominal.
   4. Width (Height): 8-1/4 inches.
   5. Thickness: 5/16 inch, nominal.
   6. Finish (Projects in Missouri): Factory applied topcoat.
   7. Color: As selected by Architect from manufacturers full range of available colors.
   8. Finish (Projects in Georgia): Factory applied primer.
   9. Warranty: 50 year limited; transferable.
   10. Products:
      a. James Hardie Building Products, Inc: www.jameshardie.com/#sle.
      b. Substitutions: Not permitted.

B. Shingle Panels: Panels giving appearance of multiple shingles made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
   1. Style: Random width, straight edge.
   2. Texture: Wood grain textured.
   3. Length: 48 inches.
   4. Width (Height): 7 inches.
   5. Thickness: 1/4 inch, nominal.
   6. Finish (Projects in Missouri): Factory applied topcoat.
   7. Color: As selected by Architect from manufacturers full range of available colors.
   8. Finish (Projects in Georgia): Factory applied primer.
   9. Warranty: 50 year limited; transferable.
   10. Products:
      a. James Hardie Building Products, Inc: www.jameshardie.com/#sle.
      b. Substitutions: Not permitted.

C. Soffit Panels: Panels made of cement and cellulose fiber formed under high pressure with integral surface texture, complying with ASTM C1186, Type A, Grade II; with machined edges, for nail attachment.
   1. Texture: Smooth.
   2. Length: 96 inches, nominal.
   3. Width: 48 inches.
   4. Thickness: 5/16 inch, nominal.
   5. Finish (Projects in Missouri): Factory applied topcoat.
   6. Color: As selected by Architect from manufacturers full range of available colors.
   7. Finish (Projects in Georgia): Factory applied primer.
   8. Manufacturer: Same as siding.

D. Factory Finish: Monochromic topcoat.

2.02 ACCESSORIES

A. Trim: Same material and texture as siding.

B. Fasteners: Galvanized or corrosion resistant; length as required to penetrate, 1-1/4 inches, minimum.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions and recommendations.
   1. Read warranty and comply with terms necessary to maintain warranty coverage.
   2. Use trim details as indicated on drawings.
   3. Touch up field cut edges before installing.
   4. Pre-drill nail holes if necessary to prevent breakage.

B. Joints in Horizontal Siding: Avoid joints in lap siding except at corners; where joints are inevitable stagger joints between successive courses.

C. Do not install siding less than 6 inches from ground surface, or closer than 1 inch to roofs, patios, porches, and other surfaces where water may collect.

D. After installation, seal joints except lap joints of lap siding; seal around penetrations, and paint exposed cut edges.

END OF SECTION

SECTION 075400
THERMOPLASTIC MEMBRANE ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Adhered system with thermoplastic roofing membrane.

B. Insulation, flat and tapered.

C. Flashings.

1.02 SUBMITTALS

A. Product Data: Provide data indicating membrane materials, flashing materials, insulation, vapor retarder, surfacing, and fasteners.

B. Warranty Documentation:
   1. Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
   2. Submit installer's written verification that installation complies with warranty conditions for waterproof membrane.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in manufacturer's original containers, dry and undamaged, with seals and labels intact, unless otherwise indicated.

B. Store materials in weather protected environment, clear of ground and moisture.

C. Ensure storage and staging of materials does not exceed static and dynamic load-bearing capacities of roof decking.

D. Protect foam insulation from direct exposure to sunlight.

1.04 FIELD CONDITIONS

A. Do not apply roofing membrane during unsuitable weather.

B. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

D. Schedule applications so that no partially completed sections of roof are left exposed at end of workday.

1.05 WARRANTY

A. Material Warranty: Provide membrane manufacturer's warranty agreeing to replace material that shows manufacturing defects within five years after installation.

B. System Warranty: Provide manufacturer's system warranty agreeing to repair or replace roofing that leaks or is damaged due to wind or other natural causes.
   1. Warranty Term: 20 years.
   2. For repair and replacement include costs of both material and labor in warranty.

PART 2 PRODUCTS

2.01 MEMBRANE ROOFING AND ASSOCIATED MATERIALS

A. Membrane Roofing Materials:
   1. TPO: Thermoplastic polyolefin (TPO) complying with ASTM D6878/D6878M, sheet contains reinforcing fabrics or scrims.
      a. Thickness: 60 mil, 0.060 inch, minimum.
   2. Sheet Width:
   3. Color: White.

B. Seaming Materials: As recommended by membrane manufacturer.

C. Flexible Flashing Material: Same material as membrane.

2.02 ACCESSORIES

A. Membrane Adhesive: As recommended by membrane manufacturer.

B. Walkway Pads: Suitable for maintenance traffic, contrasting color or otherwise visually distinctive from roof membrane.
   1. Composition: Asphaltic with mineral granule surface.
   2. Surface Color: White or Yellow.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and site conditions are ready to receive work.

B. Verify deck is supported and secure.

C. Verify deck is clean and smooth, flat, free of depressions, waves, or projections, properly sloped and suitable for installation of roof system.

D. Verify deck surfaces are dry and free of snow or ice.

E. Verify that roof openings, curbs, and penetrations through roof are solidly set, and cant strips are in place.

3.02 PREPARATION - WOOD DECK

A. Verify flatness and tightness of joints in wood decking; fill knot holes with latex filler.

3.03 INSTALLATION, GENERAL

A. Perform work in accordance with manufacturer's instructions, NRCA (RM), and NRCA (WM) applicable requirements.

B. Do not apply roofing membrane during cold or wet weather conditions.

C. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer.

D. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring.

E. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

3.04 INSTALLATION - MEMBRANE

A. Roll out membrane, free from wrinkles or tears. Place sheet into place without stretching.

B. Shingle joints on sloped substrate in direction of drainage.

C. Fully Adhered Application: Apply adhesive to substrate at rate of ___ gallons per square foot. Fully embed membrane in adhesive except in areas directly over or within 3 inches of expansion joints. Fully adhere one roll before proceeding to adjacent rolls.

D. Overlap edges and ends and seal seams by contact adhesive, minimum 3 inches. Seal permanently waterproof. Apply uniform bead of sealant to joint edge.

E. At intersections with vertical surfaces:
   1. Extend membrane over cant strips and up a minimum of 4 inches onto vertical surfaces.
   2. Fully adhere flexible flashing over membrane and up to nailing strips.

F. Around roof penetrations, seal flanges and flashings with flexible flashing.

G. Coordinate installation of roof drains and sumps and related flashings.

3.05 CLEANING

A. See Section 017000 - Execution and Closeout Requirements for additional requirements.

B. Remove bituminous markings from finished surfaces.

C. In areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning advice and comply with their documented instructions.

D. Repair or replace defaced or damaged finishes caused by work of this section.

3.06 PROTECTION

A. Protect installed roofing and flashings from construction operations.

B. Where traffic must continue over finished roof membrane, protect surfaces using durable materials.

END OF SECTION

SECTION 076200
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

PART 2 PRODUCTS

2.01 SHEET MATERIALS

2.02 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18-inch long legs; seam for rigidity, seal with sealant.

F. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.03 GUTTER AND DOWNSPOUT FABRICATION

A. Gutters: SMACNA (ASMM) Rectangular profile.

B. Downspouts: Rectangular profile.

C. Gutters and Downspouts: Size indicated.

D. Seal metal joints.

2.04 ACCESSORIES

A. Fasteners: Galvanized steel, with soft neoprene washers.

B. Primer: Zinc chromate type.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

E. Asphalt Roof Cement: ASTM D4586/D4586M, Type I, asbestos-free.

PART 3 EXECUTION

3.01 INSTALLATION

A. Secure flashings in place using concealed fasteners, and use exposed fasteners only where permitted..

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Secure gutters and downspouts in place with concealed fasteners.

E. Slope gutters 1/4 inch per 10 feet, minimum.

END OF SECTION

SECTION 077200
ROOF ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Roof hatches.

1.02 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

PART 2 PRODUCTS

2.01 ROOF HATCHES AND VENTS, MANUAL AND AUTOMATIC OPERATION

A. Frames and Curbs: One-piece curb and frame with integral cap flashing to receive roof flashings; extended bottom flange to suit mounting.
   1. Insulation: Manufacturer's standard; 1 inch rigid glass fiber, located on outside face of curb.

B. Safety Railing System: Roof hatch manufacturer's standard accessory safety rail system mounted directly to curb.
   1. Railing: Comply with 29 CFR 1910.23 for ladder safety, with a safety factor of two.

C. Hardware: Steel, zinc coated and chromate sealed, unless otherwise indicated or required by manufacturer.
   1. Lifting Mechanisms: Compression or torsion spring operator with shock absorbers that automatically opens upon release of latch; capable of lifting covers despite 10 psf load.
   2. Hinges: Heavy duty pintle type.
   3. Hold open arm with vinyl-coated handle for manual release.
   4. Latch: Upon closing, engage latch automatically and reset manual release.
   5. Manual Release: Pull handle on interior.
   6. Locking: Padlock hasp on interior.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions, in manner that maintains roofing system weather-tight integrity.

END OF SECTION

SECTION 077233
ROOF HATCH HATCHGRIP

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specialty custom designed HATCHGRIP® (Patent Numbers 6,095,283; 6,347,685; 6,619,428) for roof hatches, including,
   1. HATCHGRIP® - Model Number HTG-PCG

1.02 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:

1.03 DELIVER, STORAGE, AND HANDLING

A. Delivery
   1. Deliver materials in manufacturer’s original, unopened, undamaged shipping container with identification labels intact.

B. Storage
   1. Store all materials in a dry, controlled area to protect from elements and damage. If outdoor storage is required, block materials to store at an incline, to prevent pooling of any moisture and promote runoff.
   2. Do not tarp tightly, as this will entrap moisture. Instead, tarp materials in a tent-like arrangement, elevated above the product with open sides to allow airflow.

C. Handling
   1. Use caution when unloading and handling product to avoid bending, denting, crushing, or other damage to the product.
   2. When using forklifts, use forks of proper length to fully support product being moved. Consult shop drawings or consult with factory for proper lift points.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: PS DOORS, 1150 S. 48th Street., Grand Forks, ND 58201. Phone Toll Free: 877-446-1519. Phone: 701-746-4519. Fax: 701-746-8340. Web Site: www.psdoors.com. E-mail: 4psinfo@psdoors.com.

B. Substitutions: Not permitted.

C. Obtain all HATCHGRIP® assemblies from single manufacturer.

2.02 EQUIPMENT

A. Products Details:
   1. HATCHGRIP® provides horizontal grab bars to assist in safely exiting/entering a roof hatch by providing horizontal hand holds to ascend or descend through the hatch opening.
   2. Only horizontal grip members are reliable to sustain a fall of the body if the foot slides off the rung for any reason. If a vertical member is held, no matter what the shape of the side rail or the strength of grip, the force of falling causes the hand to slide, producing an impact with the next rail obstruction, which causes release of the handhold and a resulting fall.
   3. Model/Operation Options:
   4. Model: HTG-PCG - HATCHGRIP®
   5. Material requirements: See Section 2.3 MATERIALS.

2.03 MATERIALS

A. Attributes
   1. HATCHGRIP® to be fabricated from structural or formed steel shapes, ASTM-A-569; tubing, ASTM A513; bar/plate, ASTM-A-36; of appropriate size and strength, welded construction. Optional materials include Stainless Steel (304 or 316L).
   2. Finish on all exposed surfaces to be Powder Coat Gray.

2.04 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

PART 3 EXECUTION

3.01 EXAMINATION

A. Compliance: Comply with all manufacturer's product data, including installations instructions, reference drawings, shipping, handling, and storage instructions, and product carton instructions for installation.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION/APPLICATION

A. HATCHGRIP® Installation
   1. Install in accordance with manufacturer's installation instructions, shop drawings, and details.
   2. All bolted connections must be tight with no fewer than two threads exposed and the nuts are to be positively locked by provide lock nuts.

B. Tolerances
   1. All dimensional requirements must be in accordance with manufacturer's installation instructions and shop drawings.

3.04 FIELD QUALITY CONTROL

A. Installation: Product to be installed using good general construction methods and practices, in accordance with manufacturer's instructions and drawings.

B. Field Tests/Installation Verification:
   1. Verify all anchorage is in accordance with manufacture's installation instructions and applicable data sheets.

3.05 CLEANING

A. Repair or replace damaged installed products or components.

B. Touch up damaged finish.

3.06 PROTECTION

A. Protect installed product and finish surfaces from damage during handling, storage, and installation.

B. Protect installed product and finish surfaces during normal and general use.

END OF SECTION

SECTION 078400
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 SUBMITTALS

A. Product Data: Provide data on product characteristics, performance ratings, and limitations.

1.03 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.
   1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.

1.04 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

PART 2 PRODUCTS

2.01 MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

2.02 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.

B. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.

C. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.

D. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

2.03 FIRESTOPPING SYSTEMS

A. Firestopping: Any material meeting requirements.
   1. Fire Ratings: Use system that is listed by FM (AG), ITS (DIR), or UL (FRD) and tested in accordance with ASTM E814, ASTM E119, or UL 1479 with F Rating equal to fire rating of penetrated assembly and minimum T Rating Equal to F Rating and in compliance with other specified requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to prevent liquid material from leakage.

3.03 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

C. Install labeling required by code.

3.04 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 079200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Joint backings and accessories.

1.02 SUBMITTALS

A. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.

B. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

PART 2 PRODUCTS

2.01 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
      a. Wall expansion and control joints.
      b. Joints between door, window, and other frames and adjacent construction.
      c. Joints between different exposed materials.
      d. Openings below ledge angles in masonry.
   2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.
      b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
   3. Do not seal the following types of joints.
      a. Intentional weepholes in masonry.
      b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
      c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
      d. Joints where installation of sealant is specified in another section.
      e. Joints between suspended panel ceilings/grid and walls.

B. Exterior Joints: Use non-sag non-staining silicone sealant, unless otherwise indicated.
   1. Lap Joints in Sheet Metal Fabrications: Butyl rubber, non-curing.

C. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
   1. In Sound-Rated Assemblies: Acrylic emulsion latex sealant.

D. Interior Wet Areas: Bathrooms and kitchens; fixtures in wet areas include plumbing fixtures, countertops, cabinets, and other similar items.

E. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

2.02 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Non-Staining to Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
   2. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   3. Color: To be selected by Architect from manufacturer's standard range.

B. ---- Hybrid Silane Polyether for Interior and Exterior Horizontal, Vertical and Overhead Use -----

C. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus ____ percent, minimum.
   2. Color: To be selected by Architect from manufacturer's standard range.

D. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.
   1. Color: To be selected by Architect from manufacturer's standard range.

E. ---- Unique Water-Based Elastomeric Acrylic Latex, Interior and Exterior Use ----

F. Non-Curing Butyl Sealant: Solvent-based; ASTM C1311; single component, non-sag, non-skinning, non-hardening, non-bleeding; vapor-impermeable; intended for fully concealed applications.

2.03 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Perform acoustical sealant application work in accordance with ASTM C919.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

END OF SECTION

SECTION 081113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Fire-rated hollow metal doors and frames.

C. Thermally insulated hollow metal doors with frames.

1.02 SUBMITTALS

A. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.02 HOLLOW METAL DOORS

A. Exterior Doors: Thermally insulated.
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.
   2. Door Thickness: 1-3/4 inches, nominal.

B. Interior Doors, Non-Fire-Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.
   2. Door Thickness: 1-3/4 inches, nominal.

C. Fire-Rated Doors:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 1 - Standard-duty.
      b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
      c. Model 1 - Full Flush.
      d. Door Face Metal Thickness: 20 gauge, 0.032 inch, minimum.

2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").
3. Provide units listed and labeled by UL (DIR) or ITS (DIR).
   a. Attach fire rating label to each fire rated unit.
4. Door Thickness: 1-3/4 inches, nominal.

2.03 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Exterior Door Frames: Knock-down type.
   1. Weatherstripping: Separate, see Section 087100.

C. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.

D. Door Frames, Fire-Rated: Knock-down type.
   1. Fire Rating: Same as door, labeled.

2.04 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.05 ACCESSORIES

A. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

B. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Install fire rated units in accordance with NFPA 80.

C. Coordinate frame anchor placement with wall construction.

D. Install door hardware as specified in Section 087100.
   1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.

3.03 TOLERANCES

A. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.04 ADJUSTING

A. Adjust for smooth and balanced door movement.

END OF SECTION

SECTION 081250
APPLIED CASING STEEL DOOR FRAMES

PART 1 - GENERAL

1.01 WORK INCLUDED

1.02 SUBMITTALS

A. Product Data: Indicate frame material, gauge, configuration and finishes.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Timely Industries, A Division of SDS Industries, Inc., 10241 Norris Avenue, Pacoima, CA, 91331-2292; Phone toll free: 800-247-6242; Fax: 818-492-3530. Web site: www.timelyframes.com.

B. Frames: Provide interior frames shown on drawings and door schedule.

C. Substitutions: Refer to Section 016000

2.02 FRAMES

A. Frame Material: Hot dipped galvanized steel, for interior frames in normal atmospheric exposures.

B. Frame Throat Opening: As shown on plan details to suit finished wall thickness.

C. Where shown, fire rated frames to have kerf formed into frame profile for installation of smoke gasket or weatherstrip material

D. Frame Profile - Unequal Rabbet profile, standard with manufacturer
   1. AK" Series, 0.9 mm (20 guage) thick, with kerf for door seal/gasket, fire rated room entry, exterior locations - available as prime finish only (Specify only if using field applied finishes)

E. Side Light Frames: 1.2 mm (18 guage) Verify glass dimensions for fire rated sidelights and borrowed lights

F. Casings
   1. Wood (Provided by Others) - Refer to Section 064100 - Architectural Woodwork. Provide frames with nail holes and oval slots only.

2.03 FRAME REINFORCEMENT AND ACCESSORIES

A. Silencers: TA-5 vinyl, clear stick-on type. Silencers not required on Kerfed frames or frames schedule to receive stop mounted gasket or weatherstrip

B. Glass Stops: TA-14 removable rolled steel, shape, butted ends. Pre-punch and countersink for flat head tek screws.

C. Installation fasteners (Provided by others)
   1. Interior Frames: #6 Drywall type length sufficient to penetrate studs or structure at least ½".

2.04 FABRICATION

A. Openings for single swing, pair, borrowed light and sidelight frames to be pre-cut, notched and fabricated at the manufacturer's facility. For fire rated and exterior openings, provide kerf at stop for installation of smoke gasket or weatherstrip

B. Provide minimum 14 guage hinge reinforcement plate tapped for machine screws supplied with hinges. Hinge plate to be mechanically attached to hinge emboss on frame.

C. Provide notches, tabs and/or stops for positive alignment of frame parts at all corners

D. Mullions to be notched as required to provide tight joints

E. Provide manufacturer's standard mullion brackets for positive connection of frame and mullion parts

F. Provide manufacturer's standard steel glass stop pre-cut to exact length. Fire rated glazed openings to have hole for installation screw within 2" of each end of stop piece

G. Provide insert channel full width of borrowed lights installed on finish floor. Provide full width head channel for ceiling height units.

H. Attach approved mylar label to each fire-rated frame indicating fire rating details

2.05 FINISHING

A. Frame Units: Prefinished with factory applied impact resistant, polyurethane baked enamel finish or optional electrostatic applied water based paint system

B. Colors:
   1. High Definition White Primer - for AK series frames only

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify acceptability of existing conditions before starting work.

B. Verify that opening sizes and wall thicknesses are within specified tolerances. Verify that all finished walls are in plane to ensure proper door alignment.

3.02 INSTALLATION

A. Install frames in accordance with manufacturer's requirements.

B. Anchor frames with screws located at every casing clip or every 11" as shown on manufacturer's instructions. Field verify quantity and location of fasteners prior to installing casing.

C. Coordinate installation of glass and glazing in glazed units.

END OF SECTION

SECTION 081416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush and flush glazed configuration; fire-rated and non-rated.

1.02 SUBMITTALS

A. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

B. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging, and inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

PART 2 PRODUCTS

2.01 DOORS AND PANELS

A. Doors: See drawings for locations and additional requirements.

2.02 DOOR AND PANEL CORES

A. Fire-Rated Doors: Mineral core type, with fire resistant composite core (FD), plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.

2.03 DOOR FACINGS

2.04 DOOR CONSTRUCTION

A. Cores Constructed with stiles and rails:

B. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

C. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

D. Provide edge clearances in accordance with the quality standard specified.

2.05 FINISHES - WOOD VENEER DOORS

PART 3 EXECUTION

3.01 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.
   1. Install fire-rated doors in accordance with NFPA 80 requirements.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

3.02 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION

SECTION 081433
STILE AND RAIL WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wood doors, stile and rail design; fire rated and non-fire rated.

1.02 SUBMITTALS

A. Product Data: Indicate stile and rail core materials and construction; veneer species, type and characteristics.

B. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver, and store doors in accordance with quality standard specified.

B. Accept doors on site in manufacturer's packaging, and inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

PART 2 PRODUCTS

2.01 DOORS

A. Quality Standard: Premium Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless otherwise indicated.

B. Interior Doors: 1-3/8 inches thick unless otherwise indicated; solid lumber construction; mortise and tenon joints. Opaque finish.

C. Wood veneer facing for field opaque finish.

D. Design Style/Pattern: Manufacturer's standard 6 panel.

2.02 DOOR AND PANEL FACINGS

A. Materials for Opaque Finishes: Hardboard faces.

B. Adhesive: Type I - Waterproof.

2.03 DOOR CONSTRUCTION

A. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standards.
   1. Install fire-rated doors in accordance with NFPA 80 requirements.

B. Field-Finished Doors: Trimming to fit is acceptable.
   1. Adjust width of non-rated doors by cutting equally on both jamb edges.
   2. Trim door height by cutting bottom edges to a maximum of 3/4 inch.
   3. Trim fire-rated doors in strict compliance with fire rating limitations.

C. Machine cut for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

3.02 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION

SECTION 084313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

C. Weatherstripping.

1.02 SUBMITTALS

A. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.04 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum-Framed Storefront and Doors:
   1. Substitutions: Not permitted.

2.02 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Glazing Position: Centered (front to back).
   2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
   3. Finish: Superior performing organic coatings.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
      b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
   4. Finish Color: White.
   5. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   6. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   7. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   8. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
   9. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.

10. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

B. Performance Requirements
   1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
      a. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
   2. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.
   3. Air Leakage: 0.06 cfm/sq ft maximum leakage of storefront wall area when tested in accordance with ASTM E283/E283M at 1.57 psf pressure difference.

2.03 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, thermally broken with interior section insulated from exterior, drainage holes and internal weep drainage system.
   1. Glazing Stops: Flush.

B. Glazing: See Section 088000.

C. Swing Doors: Glazed aluminum.
   1. Thickness: 1-3/4 inches.
   2. Top Rail: 4 inches wide.
   3. Vertical Stiles: 4-1/2 inches wide.
   4. Bottom Rail: 10 inches wide.
   5. Glazing Stops: Square.
   6. Finish: Same as storefront.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel.

C. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

2.05 FINISHES

A. Color: White.

2.06 HARDWARE

A. For each door, include weatherstripping, sill sweep strip, and threshold.

B. Other Door Hardware: See Section 087100.

C. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

D. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

E. Threshold: Extruded aluminum, one piece per door opening, ribbed surface; provide on all doors.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that storefront wall openings and adjoining water-resistive and/or air barrier seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Set thresholds in bed of sealant and secure.

J. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.05 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

END OF SECTION

SECTION 085313
VINYL WINDOWS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vinyl-framed, factory-glazed windows.

B. Operating hardware.

C. Insect screens.

1.02 SUBMITTALS

A. Product Data: Provide component dimensions, anchors, fasteners, and glass.

B. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work, and installation requirements.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

B. Jig, brace, and box the window frame assemblies for transport to minimize flexing of members or joints.

1.04 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and after installation of sealants.

1.05 WARRANTY

A. Correct defective work within a 5-year period after Date of Substantial Completion.

B. Manufacturer's Warranty: Provide five-year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same. Include coverage for degradation of vinyl color finish. Complete form in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Vinyl Windows:
   1. Silver Line by Andersen: www.silverlinewindows.com/#sle.
      a. New Construction:
         1) Single Hung: 2200 Series.
   2. Substitutions: See Section 016000 - Product Requirements.

2.02 DESCRIPTION

A. Vinyl Windows: Factory fabricated frame and sash members of extruded, hollow, ultra-violet-resistant, polyvinyl chloride (PVC) with integral color; with factory-installed glazing, hardware, related flashings, anchorage and attachment devices.
   1. Configuration: As indicated on drawings.
      a. Product Type: FW - Fixed window and H - Hung window, vertically sliding in accordance with AAMA/WDMA/CSA 101/I.S.2/A440.
   2. Color: White.
   3. Size to fit openings with minimum clearance around perimeter of assembly providing necessary space for perimeter seals.
   4. Framing Members: Fusion welded corners and joints, with internal reinforcement where required for structural rigidity; concealed fasteners.
   5. System Internal Drainage: Drain to exterior side by means of weep drainage network any water entering joints, condensation within glazing channel, or other migrating moisture within system.

6. Glazing Stops, Trim, Flashings, and Accessory Pieces: Formed of rigid PVC, fitting tightly into frame assembly.
7. Mounting Flange: Integral to frame assembly, providing weather stop at entire perimeter of frame.
8. Insect Screens: Tight fitting for operating sash location.

2.03 PERFORMANCE REQUIREMENTS

A. Grade: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific window type:
   1. Performance Class (PC): LC.

2.04 COMPONENTS

A. Glazing: Insulated double pane, annealed glass, clear, low-E coated, argon filled, with glass thicknesses as recommended by manufacturer for specified wind conditions.
   1. Glass Stops: Snap-on PVC glazing bead with color to match sash and frame.
   2. Glazing Tape: Closed cell foam type with double sided adhesive.
   3. Setting Blocks: Manufacturer's standard.

B. Frame Depth: 2-11/16 inches.

C. Insect Screens: Aluminum, extruded or roll-formed frame with mitered and reinforced corners; apply screen mesh taut to frame; secure to window with hardware to allow easy removal.
   1. Hardware: Manufacturer's standard; quantity as required per screen.
   2. Screen Mesh: Vinyl-coated fiberglass, window manufacturer's 18 x 16 mesh.
   3. Frame Finish: Manufacturer's standard, color to match window frame and sash color.

D. Operable Sash Weatherstripping: Nylon pile; permanently resilient, profiled to maintain weather seal in accordance with AAMA 701/702.

E. Fasteners: Stainless steel.

F. Accessories: Provide related flashings, anchorage and attachment devices as necessary for full assembly.

G. Sealants for Setting Window Sill Pan Flashing: Provide butyl tape, non-hardening butyl, polyurethane, or silicone sealant; in compliance with ASTM E2112 installation practices.

2.05 HARDWARE

A. Sash lock: Lever handle and keeper with cam lock, provide at least one for each operating sash.

B. Window Opening Control Devices (WOCD): Provide operable window sash hardware that limits openings to only allow passage of 4 inch diameter rigid sphere or less, and are easily releasable to fully open without use of keys, tools, or special knowledge.

C. Finish of Exposed Hardware: Baked enamel, match interior sash and frame color.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify wall openings and adjoining water-resistive barrier seal materials are ready to receive this work.

3.02 INSTALLATION

A. Install window unit assemblies in accordance with manufacturers instructions and applicable building codes.

B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities as necessary.

C. Align window plumb and level, free of warp or twist, and maintain dimensional tolerances and alignment with adjacent work.

D. Set sill members and sill flashing in continuous bead of sealant.

E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal

barrier.

F. Install operating hardware.

3.03 TOLERANCES

A. Maximum Variation from Level or Plumb: 0.06 inches every 3 ft non-cumulative or 0.5 inches per 100 ft, whichever is less.

3.04 ADJUSTING

A. Adjust hardware for smooth operation and secure weathertight closure.

3.05 CLEANING

A. Remove protective material from pre-finished surfaces.

B. Wash surfaces by method recommended and acceptable to window manufacturer; rinse and wipe surfaces clean.

C. Remove excess glazing sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer and appropriate for application indicated.

END OF SECTION

SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Intent: The intent of this Section is to provide finish hardware for the proper operation and control of all wood, hollow metal, and aluminum doors in the Project. Prior to bidding, notify the Architect of any doors that do not have hardware meeting this intention.

B. Section Includes: Provide all items of finish hardware required to adequately trim, hang, and operate all doors, as is hereinafter specified and listed in the Hardware Schedule.
1. The hardware supplier will be responsible to furnish correct hardware on labeled doors to satisfy State and Local Building Codes.
2. Should items of hardware, not definitely specified, be required for completion of work, furnish such items of type and quality suitable to the services required and comparable to the adjacent hardware.
3. Provide all necessary standard and special fasteners, screws, bolts, expansion shields or anchors to properly secure hardware to its intended door, frame, or other surface.

C. Related Sections include the following:

1.	Hollow Metal Frames:	Section 08 12 13.
2.	Flush Wood Doors:	Section 08 14 16.
3.	High-Impact Resistant Wood Doors:	Section 08 14 20.
4.	Automatic Door Operators:	Section 08 71 13.
5.	Radiation Protection	Section 13 49 10.

D. This Section includes, but is not necessarily limited to furnishing and installing complete, the following:
1. Finish hardware for proper operation, function, control and protection of all doors, as required.

1.2 REFERENCES

A. The following reference standards and model code documents shall be used in estimating and detailing door hardware, and shall considered as a standard of quality, function, and performance, as applicable:
1. I.B.C. 2018 Edition.
2. NFPA-80 Fire Doors & Windows (current year adopted).
3. NFPA-101 Life Safety Code (current year adopted).
4. NFPA-105 Smoke Control Door Assembly. (current year adopted)
5. ANSI-117.1 1992 Edition Providing Accessibility and Usability for Physically Handicapped People.
6. A.D.A.A.G Americans with Disabilities Act Accessibility Guidelines.

1.3 ACTION SUBMITTALS

A. General: Submit the following in accordance with Section 01 33 00.

B. Product Data: Provide a catalog cut sheet, clearly marked and identified, illustrating and describing each product included in the Hardware Schedule.
1. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Formulate catalog cut sheets into sets and include a set with each copy of the Hardware Schedule submitted.

C. Door Hardware Schedule: Prepared by or under the supervision of Architectural Hardware Consultant, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
   1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
   2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.
   3. Content: Include the following information:
      a. Type, style, function, size, label, hand, and finish of each door hardware item.
      b. Complete designations of every item required for each door or opening including name and manufacturer.
      c. Fastenings and other pertinent information.
      d. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule. Use same scheduling sequence and format and use same door numbers and hardware set numbers as in the Contract Documents.
      e. Explanation of abbreviations, symbols, and codes contained in schedule.
      f. Mounting locations for door hardware.
      g. Door and frame sizes and materials.
      h. Description of each electrified door hardware function, including location, sequence of operation, and interface with other building control systems.
   4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other Work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

D. Wiring Diagrams: For electrified hardware items specified for this Project, Provide complete wiring diagrams along with riser drawings and elevations, showing locations where such material is to be installed. Wiring Diagrams shall be submitted with Hardware Schedule. Verify and coordinate with the electrical systems installer.
   1. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.

E. Samples for Verification: If so requested by the Architect, provide a sample of any product or item requested, properly marked and tagged, for the opening for which it is intended.

F. Keying: Submit separate detailed schedule indicating keying for all locks. Keying schedule must be approved by the Owner prior to ordering any permanent cylinders.

1.4 INFORMATIONAL SUBMITTALS

A. Operation and Maintenance Data: For each type of door hardware to include in maintenance manuals. Provide latest, revised and updated schedule of finish hardware, complete with catalog cuts and keying schedule. In addition, furnish one (1) copy of maintenance and parts manuals for those items for which they are readily available and normally provided.
   1. Submit in accordance with provisions of Section 01 78 23.

1.5 QUALITY ASSURANCE

A. Substitutions: Request for substitutions for alternative hardware items will not be accepted on this Project unless specifically indicated. If any specified product is listed as a “No Substitution” product, only that specified product shall be provided as indicated.

B. Installer Qualifications: An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Supplier Qualifications: Door hardware supplier with warehousing facilities in Project's vicinity and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
   1. The hardware supplier shall be engaged regularly in the furnishing, delivery and servicing of contract builder's hardware and must be experienced and knowledgeable in all phases of estimating, detailing, scheduling, masterkeying, shipping and installation practices.
   2. When electro-mechanical or electronic hardware is supplied, a qualified individual with a minimum five- (5) year's experience shall be available for assistance.

D. Architectural Hardware Consultant Qualifications: A person who is currently certified by the Door and Hardware Institute as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.

E. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

F. Regulatory Requirements: Comply with provisions of the following:
   1. Provide hardware that complies with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," and ANSI A117.1.

G. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

H. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

I. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
   1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
   2. Preliminary key system schematic diagram.
   3. Requirements for key control system.
   4. Address for delivery of keys.
   5. Requirements and/or location of Key Cabinet.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Marking and Packaging: All items of hardware shall be delivered to the site in manufacturer's original cartons or boxes. Mark each box with hardware heading and door number according to approved hardware schedule.

B. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation: Provide a complete packing list showing items, door numbers and hardware headings with each shipment.

C. Store hardware in shipping cartons above ground and under cover to prevent damage. Provide secure lockup for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable -so that completion of the Work will not be delayed by hardware losses both before and after installation

1.7 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, security system, and building control system, as applicable.

1.8 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

B. Maintenance Service: If there are any products listed hereinafter that normally require a maintenance or service contract, provide the Owner and Architect with details and costs of standard maintenance or service contract.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:
1. Provide the materials or products indicated by trade names, manufacturer's name, or catalog number.
2. Provide manufacturer's standard products meeting the design intent of this Specification, free of imperfections affecting appearance or serviceability.
3. Hand of door: Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.

2.2 SPECIAL REQUIREMENTS

A. Hinges:
1. Provide non-removable pins for all exterior doors. Use nonrising pins for all other doors. Provide continuous hinge at exterior doors where specified.

B. Locksets:
1. All locksets to be grade 1 heavy duty cylindrical in high traffic areas.

C. Closers:
1. Comply with manufacturer's recommendations for unit size based on door size, weather exposure and usage.
2. Provide parallel arms for all overhead closers, except as otherwise indicated.
3. All Closers UL Certified to be in compliance with UBC 7.2 and UL 10C.
4. Closers with Pressure Relief Values will not be acceptable.
5. Supplier to provide any brackets or plates required for proper installation of door closers.

D. Exit Devices:
1. All latchbolts to be deadlatching type.
2. All touchbars to be stainless steel.

E. Special Notes
1. All doors to have operable hardware
2. Provide stop that is required for the application. A wall stop is preferred. If an overhead stop or floor stop is a better application, it is to be provided.
3. Smoke seal and intumescent seal are to be provided as required on fire labeled openings.
4. Provide drop plates and mounting brackets for closers if required.

2.3 MATERIALS

A. Screws and Fasteners: Provide all screws and fasteners of the proper size and type to properly anchor or attach the item of hardware scheduled. Provide all fasteners with Phillips heads, unless security type screws (spanner-head or torx-head) are hereinafter specified.

2.4 HARDWARE PRODUCTS

ITEM	SPECIFIED	APPROVED EQUAL
Hinges	Ives	Bommer, Hager
Locksets	Schlage AL Series	Falcon B Series, Sargent 10Line
Exit Device	Falcon 25 Series	Sargent 8800, Precision Apex 2000
Closers	LCN 4050/1450 Series	Falcon SC70/80, Norton 7700/8000
Flatgoods	Ives	Burns, Rockwood
Stops	Ives	Burns, Rockwood
Overhead Stops	Glynn Johnson	Rixson
Thresholds	Zero	National Guard, Reese
Weatherstrip	Zero	National Guard, Reese

2.5 FINISHES

A. Provide matching finishes for hardware units at each door to the greatest extent possible, unless otherwise indicated. In general, match items to the finish for the latch, lock or push pull unit for color and texture.

B. Hardware finishes as follows:
1. 626 – Satin Chrome - Plated
2. 630 – Satin Stainless Steel

2.6 KEYING

A. Keying of locks and cylinders throughout project shall be scheduled through a key meeting with Architect, Owner, and hardware supplier. Key schedule shall be prepared and submitted to the Owner for approval. Copies of final key schedule with the bitting instructions shall be submitted as part of the Project Record Documents.

B. All Locks shall be keyed to a new master key system. Distributor to verify proper key system. Keying Schedule must be approved by the Owner prior to ordering any locks.

C. Key all locks separately, or alike, as directed by the Owner's Representative and Architect.

D. Provide keys as follows:
1. Change Keys: 2 per lock.
2. Master Keys: 6 required (per system).

E. Identification: Stamp all (master-type) keys with the following:
1. Do Not Duplicate.
2. Key change number (all keys).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Steel Doors and Frames: Comply with DHI A115 series.
   1. Surface-Applied Door Hardware: Drill and tap doors and frames according to SDI 107 or ANSI A250.6, whichever is more stringent.

B. Wood Doors: Comply with DHI A115-W series.

3.3 INSTALLATION

A. Installation shall be by a qualified installer with a minimum five (5) years experience in the installation of commercial grade hardware. Manufacturer’s instructions shall dictate templating and installation.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
   1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
   2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors.”

C. Prior to hardware installation, the General Contractor shall setup a meeting with the Hardware Supplier and the Hardware installer to ensure the installer has and understands the manufacturers installation requirements for all hardware items

D. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
   1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
   2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

E. Key Control System: Place keys on markers and hooks in key control system cabinet, as determined by final keying schedule.

F. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants.”

3.4 FIELD QUALITY CONTROL

A. Perform final inspection with hardware installer and hardware supplier present to ensure correct installation and operation, and check for any damaged or defective items. Observe and inspect that all hardware has been installed to its correct destination in proper working order.

B. Independent Architectural Hardware Consultant: Owner reserves the right to engage a qualified independent Architectural Hardware Consultant to perform a separate independent inspection and to prepare an inspection report.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended.
   1. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
   2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
   3. Door Closers: Adjust door closers immediately upon installation. Adjust in exact conformance with manufacturer's printed instructions. Advance backcheck to eliminate shock at dead stop. Set closer latching speed to assure unassisted positive latching.
      a. Degree of swing of door for self-limiting closers shall be maximum available.
   4. Adjust all exit devices immediately upon installation. Adjust in exact conformance with manufacturers' printed instructions.
   5. Seal weather protection components attached to the exterior sides of doors and frames, such as drip caps and weather-stripping, in place with clear silicone caulk in such a manner as to ensure a continuously filled seam throughout the joinery.
   6. Cut and fit weatherstripping accurately to provide the greatest possible continuity of the contact element. Adjust closer template as required.

B. At completion of the installation and prior to Substantial Completion, make final adjustments to door closures and other items of hardware. Leave all hardware clean and fully operable. Should any item be found to be defective, it shall be repaired or replaced as directed.

C. Occupancy Adjustment: Approximately three months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DEMONSTRATION

A. Instruct Owner's Personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

B. After hardware is installed and adjusted, the Supplier shall inspect the job with the Architect and the General contractor to determine if the hardware is functioning properly

3.8 HARDWARE SCHEDULE.

The hardware sets listed below represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process.

Legend:
Link to catalog cut sheet

Hardware Group No. 1

For use on Door #(s):
S1-1.0 S2-1.0

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER			FINISH	MFR
1	EA	CONT. HINGE	112XY			628	IVE
1	EA	PANIC HARDWARE	24-R-NL-OP			626	FAL
1	EA	RIM CYLINDER	20-021			626	SCH
1	EA	ELECTRIC STRIKE	6111 FSE 12/24 VAC/VDC		✓	630	VON
1	EA	LONG DOOR PULL	9264 36" 20" O			630-316	IVE
1	EA	SURFACE CLOSER	4050A SCUSH			689	LCN
1	EA	DOOR SWEEP	8197AA			AA	ZER
1	EA	THRESHOLD	566A-223			A	ZER
1	EA	RAIN DRIP	142A			A	ZER
1	EA	CARD READER	PROVIDED BY OTHERS		✓	B	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC		✓	LGR	SCE
1			WEATHERSTRIP BY DOOR MFR.				

Hardware Group No. 2

For use on Door #(s):
C1-1 C2-1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	112XY		628	IVE
1	EA	PANIC HARDWARE	24-R-EO		626	FAL
1	EA	SURFACE CLOSER	4050A SCUSH		689	LCN
1	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	566A-223		A	ZER
1	EA	RAIN DRIP	142A		A	ZER
1			WEATHERSTRIP BY DOOR MFR.			

Hardware Group No. 3

For use on Door #(s):
1000

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	112XY		628	IVE
2	EA	DUMMY PUSH BAR	250DT		626	FAL
2	EA	LONG DOOR PULL	9264 36" 20" O		630-316	IVE
1	EA	OH STOP	100S		630	GLY
1	EA	SURFACE CLOSER	4050A SCUSH		689	LCN
1	EA	AUTO OPERATOR	8242 MS 120 VAC		689	FAL
2	EA	ACTUATOR PKG WALL MT	8310-3857TW		630	LCN
2	EA	MEETING STILE	8195AA		AA	ZER
2	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	566A-223		A	ZER
1			WEATHERSTRIP BY DOOR MFR.			

Hardware Group No. 4

For use on Door #(s):
1001

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	CONT. HINGE	112XY EPT		628	IVE
2	EA	POWER TRANSFER	EPT10		689	VON
1	EA	ELEC PANIC HARDWARE	RX-MEL-24-C-C-718 24 VDC		626	FAL
1	EA	ELEC PANIC HARDWARE	RX-MEL-24-C-EO 24 VDC		626	FAL
1	EA	CYLINDER	VERIFY TYPE REQ'D		626	SCH
2	EA	LONG DOOR PULL	9264 36" 20" O		630-316	IVE
1	EA	OH STOP	100S		630	GLY
1	EA	SURFACE CLOSER	4050A SCUSH		689	LCN
1	EA	AUTO OPERATOR	8242 MS 120 VAC		689	FAL
1	EA	ACTUATOR PKG WALL MT	8310-3857TW		630	LCN
1	EA	CARD READER	PROVIDED BY OTHERS		B	SCE
2	EA	DOOR CONTACT	7764		628	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC		LGR	SCE

OPERATION: DOOR NORMALLY CLOSED AND LOCKED, UNLESS ELECTRONICALLY DOGGED BY ACCESS CONTROL SYSTEM. WHEN LOCKED, ENTRY BY CARD READER, MOMENTARILY RETRACTING DEVICE LATCH. INSIDE PUSH PAD ALWAYS FREE EGRESS.

Hardware Group No. 5

For use on Door #(s):

S1-1 S1-2 S1-3 S2-1 S2-2 S2-3

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	FIRE EXIT HARDWARE	F-25-R-L-BE-AVA		626	FAL
1	EA	SURFACE CLOSER	4050A RW/PA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	FIRE/LIFE WALL MAG	SEM7850		689	LCN
1	EA	GASKETING	188SBK PSA		BK	ZER

ELECTRICAL OPERATION DESCRIPTION:
THE DOOR IS NORMALLY CLOSED AND LOCKED. DOORS NORMALLY HELD OPEN BY MAGNETIC HOLDERS. MAGNETIC HOLDERS TO BE CONNECTED TO BUILDING'S FIRE/SMOKE ALARM SYSTEM TO RELEASE IMMEDIATELY UPON ACTIVATION OF BUILDING'S FIRE/SMOKE ALARM SYSTEM ALLOWING DOORS TO CLOSE.

Hardware Group No. 6

For use on Door #(s):

1007 2002 3003

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY LOCK	L9040 07A L583-363 L283-722		626	SCH
1	EA	SURFACE CLOSER	1450 RW/PA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER

Hardware Group No. 7

For use on Door #(s):

1002.1

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	AL80P6D JUP		626	SCH
1	EA	WALL STOP	WS406/407CCV		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 8

For use on Door #(s):
1003.0

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		630	IVE
1	EA	STOREROOM LOCK	AL80P6D JUP		626	SCH
1	EA	SURFACE CLOSER	4050A RW/PA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	SET	GASKETING	429AA-S		AA	ZER
1	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	566A-223		A	ZER

Hardware Group No. 9

For use on Door #(s):
1003 1008

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	AL80P6D JUP		626	SCH
1	EA	SURFACE CLOSER	1450 RW/PA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	DOOR SWEEP	39A		A	ZER

Hardware Group No. 10

For use on Door #(s):
3001

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	AUTO FLUSH BOLT	FB31T/FB41T		630	IVE
1	EA	PASSAGE SET	AL10S JUP		626	SCH
1	EA	COORDINATOR	COR X FL		628	IVE
2	EA	OVERHEAD STOP	90S		630	GLY
2	EA	SURFACE CLOSER	4050A RW/PA		689	LCN
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	MEETING STILE	8195AA		AA	ZER

Hardware Group No. 11

For use on Door #(s):
1002

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	ENTRANCE/OFFICE LOCK	AL50P6D JUP		626	SCH
1	EA	OVERHEAD STOP	90S		630	GLY
1	EA	SURFACE CLOSER	1450 RW/PA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER

Hardware Group No. 12

For use on Door #(s):
1004

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	AL80P6D JUP		626	SCH
1	EA	SURFACE CLOSER	1450 SCUSH		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER

Hardware Group No. 13

For use on Door #(s):
1005

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	AUTO FLUSH BOLT	FB31T/FB41T		630	IVE
1	EA	CLASSROOM LOCK	AL70P6D JUP		626	SCH
1	EA	COORDINATOR	COR X FL		628	IVE
2	EA	OVERHEAD STOP	90S		630	GLY
2	EA	SURFACE CLOSER	4050A RW/PA		689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER
2	EA	DOOR SWEEP	39A		A	ZER
1	EA	MEETING STILE	8195AA		AA	ZER

Hardware Group No. 14

For use on Door #(s):
1005.0

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
1	EA	CONT. HINGE	112XY		628	IVE
1	EA	PANIC HARDWARE	24-R-L-NL-AVA		626	FAL
1	EA	RIM CYLINDER	20-021		626	SCH
1	EA	SURFACE CLOSER	4050A SCUSH		689	LCN
1	EA	DOOR SWEEP	8197AA		AA	ZER
1	EA	THRESHOLD	566A-223		A	ZER
1	EA	RAIN DRIP	142A		A	ZER
1			WEATHERSTRIP BY DOOR MFR.			

Hardware Group No. 15

For use on Door #(s):
3002

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	AL70P6D JUP		626	SCH
1	EA	SURFACE CLOSER	1450 RW/PA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER

Hardware Group No. 16

For use on Door #(s):
1006

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	AL80P6D JUP		626	SCH
1	EA	SURFACE CLOSER	1450 RW/PA		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CCV		630	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER

Hardware Group No. U1

For use on Door #(s):
001

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
2	EA	SPRING HINGE	3SP1 4.5 X 4.5		652	IVE
1	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRANCE LOCK	CS210-B500RD JUP PLY		626	SCH
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	DOOR STOP	060/70 AS REQ'D		626	IVE
1	EA	GASKETING	188SBK PSA		BK	ZER
1	EA	THRESHOLD	PER DETAIL			ZER
1	EA	VIEWER	U698		626	IVE

PROVIDE 2 VIEWERS AT ACCESSIBLE UNITS

Hardware Group No. U2

For use on Door #(s):
007 008 009 010 012

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	PRE-HUNG BY DOOR MFR.		652	IVE
1	EA	PRIVACY LOCK	F40 MNH		626	SCH
1	EA	DOOR STOP	060/70 AS REQ'D		652	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. U3

For use on Door #(s):
006 010 013

Provide each PR door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
6	EA	HINGE	PRE-HUNG BY DOOR MFR.		652	IVE
2	EA	ROLLER LATCH	RL32		626	IVE
2	EA	SINGLE DUMMY TRIM	F170 LAT		626	SCH
2	EA	DOOR STOP	69		652	IVE
2	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. U4

For use on Door #(s):
005

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	PRE-HUNG BY DOOR MFR.		652	IVE
1	EA	STOREROOM LOCK	F80 MNH		626	SCH
1	EA	DOOR STOP	060/70 AS REQ'D		652	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. U5

For use on Door #(s):
002 010 011 014

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	PRE-HUNG BY DOOR MFR.		652	IVE
1	EA	PASSAGE SET	F10 MNH		626	SCH
1	EA	DOOR STOP	060/70 AS REQ'D		652	IVE
3	EA	SILENCER	SR64		GRY	IVE

SECTION 088000
GLAZING

SPECIFYING STRATEGY

1.01 HOW TO USE THIS SECTION

A. The most important step is the selection of companion narrow scope sections which contain the bulk of Part 2 content relevant to specific glazing product type.

B. Part 3 of this section is intended to function as a single location for "glazing methods" applicable to any number of glazing products. Therefore, installation accessories have been retained in this section. The other sections in this group have their installation methods linked to this section.

C. Edit the "Installation - Glazing Methods" list in Part 3 to correspond with types of openings and applications in the project. Glazing methods differ based on application, framing, and location (exterior or interior). Type of glazing material is a less critical criterion for selection of optimal glazing method.

PART 1 GENERAL

2.01 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Glazing compounds.

2.02 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

2.03 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

PART 2 PRODUCTS

3.01 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
   2. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
   3. Glass thicknesses listed are minimum.

B. Weather-Resistive Barrier Seals: Provide completed assemblies that maintain continuity of building enclosure water-resistive barrier, vapor retarder, and/or air barrier.
   1. In conjunction with weather barrier related materials described in other sections, as follows:

C. Thermal and Optical Performance: Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:
   1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
   2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.

3. Solar Optical Properties: Comply with NFRC 300 test method.

3.02 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
   2. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
   3. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.

3.03 INSULATING GLASS UNITS

A. Insulating Glass Units: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
   3. Metal-Edge Spacers: Aluminum, bent and soldered corners.
   4. Spacer Color: Aluminum.
   5. Edge Seal:
      a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
      b. Color: Gray.
   6. Purge interpane space with dry air, hermetically sealed.

B. Insulating Glass Units: Vision glass, double glazed.
   1. Applications: Exterior glazing unless otherwise indicated.
   2. Space between lites filled with air.
   3. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
      a. Tint: Clear.
      b. Coating: Low-E (passive type), on #2 surface.
   4. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
      a. Tint: Clear.
   5. Total Thickness: 1 inch.
   6. Thermal Transmittance (U-Value), Summer - Center of Glass: _____, nominal.
   7. Visible Light Transmittance (VLT): _____ percent, nominal.
   8. Solar Heat Gain Coefficient (SHGC): _____, nominal.

3.04 GLAZING UNITS

A. Monolithic Interior Vision Glazing:
   1. Applications: Interior glazing unless otherwise indicated.
   2. Glass Type: Annealed float glass.
   3. Tint: Clear.
   4. Thickness: 1/4 inch, nominal.

B. Monolithic Safety Glazing: Non-fire-rated.
   1. Applications:
      a. Glazed lites in doors, except fire doors.
      b. Glazed sidelights to doors, except in fire-rated walls and partitions.
      c. Other locations required by applicable federal, state, and local codes and regulations.
      d. Other locations indicated on drawings.
   2. Glass Type: Fully tempered safety glass as specified.
   3. Tint: Clear.
   4. Thickness: 1/4 inch, nominal.

3.05 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet

space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

4.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

4.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

4.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

4.04 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

4.05 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

4.06 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 088300
MIRRORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass mirrors.

1.02 SUBMITTALS

A. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

1.03 FIELD CONDITIONS

A. Do not install mirrors when ambient temperature is less than 50 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

PART 2 PRODUCTS

2.01 MATERIALS

A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.

B. Mirror Glass: ASTM C1036, Type 1 - Transparent Flat, Class 1 - Clear, Quality - Q1 (high-quality mirrors); silvering, protective coating, and quality requirements in compliance with ASTM C1503.
   1. Thickness: 1/4 inch.
   2. Size: As indicated on drawings.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install mirrors in accordance with manufacturer's recommendations.

B. Set mirrors plumb and level, and free of optical distortion.

C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

3.02 CLEANING

A. Remove labels after work is complete.

END OF SECTION

SECTION 092116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal stud wall framing.

B. Acoustic insulation.

C. Cementitious backing board.

D. Gypsum wallboard.

E. Joint treatment and accessories.

1.02 SUBMITTALS

A. Product Data: Provide data on gypsum board, accessories, and joint finishing system.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

2.02 BOARD MATERIALS

A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
   3. Thickness:
      a. Vertical Surfaces: 5/8 inch.
      b. Ceilings: 5/8 inch.
      c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.

B. Backing Board For Wet Areas: One of the following products:
   1. Application: Surfaces behind tile in wet areas including tub and shower surrounds.
   2. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.

C. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
   1. Application: Ceilings, unless otherwise indicated.
   2. Thickness: 5/8 inch.
   3. Edges: Tapered.

2.03 GYPSUM WALLBOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 2 inch.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

C. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
   1. Corner Beads: Low profile, for 90 degree outside corners.

D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
   1. Joint Compound: Drying type, vinyl-based, ready-mixed.

E. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

A. Studs: Space studs at 16 inches on center.
   1. Extend partition framing to structure where indicated and to ceiling in other locations.

B. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

C. Acoustic Furring: Install resilient channels at maximum 24 inches on center. Locate joints over framing members.

D. Furring for Fire Ratings: Install as required for fire resistance ratings indicated.

E. Blocking: Install wood blocking for support of:
   1. Framed openings.
   2. Wall-mounted cabinets.
   3. Plumbing fixtures.
   4. Toilet accessories.
   5. Wall-mounted door hardware.
   6. Handrails

3.03 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
   1. Place one bead continuously on substrate before installation of perimeter framing members.
   2. Place continuous bead at perimeter of each layer of gypsum board.
   3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.04 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Double-Layer Non-Rated: Use gypsum board for first layer, placed parallel to framing or furring members, with ends and edges occurring over firm bearing. Place second layer perpendicular to framing or furring members. Offset joints of second layer from joints of first layer.

D. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

E. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

F. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For nonrated assemblies, install as follows:
   1. Single-Layer Applications: Screw attachment.
   2. Double-Layer Application: Install base layer using screws. Install face layer using screws.

3.05 JOINT TREATMENT

A. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.

B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:

1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
2. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
3. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.

C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.

END OF SECTION

SECTION 092700
PLASTER FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass-fiber-reinforced gypsum fabrications as indicated on drawings.
   1. Interior column covers.

1.02 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including dimensions, finishes, storage and handling requirements and recommendations, and installation recommendations.

B. Shop Drawings: For custom items, provide drawings showing dimensions, layout, joints, details, fastening, and interface with adjacent work; include field measured dimensions of the spaces where items are to be installed, if critical to proper installation.

C. Samples: For each custom finish specified, two samples, minimum size 6 inches square, representing actual product, color, and patterns.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Transport, lift, and handle units with care, avoiding excessive stress and preventing damage; use appropriate equipment.

B. Store products in manufacturer's unopened packaging until ready for installation, in a clean dry area protected from weather, moisture and damage; store units upright and not stacked unless permitted by manufacturer.

PART 2 PRODUCTS

2.01 GYPSUM FABRICATIONS (INTERIOR USE ONLY)

A. Glass-Fiber-Reinforced Gypsum Fabrications: Molded glass fiber reinforced gypsum with structural reinforcing as required.
   1. Surface Burning Characteristics: Flame spread index of 0 (zero), smoke developed index of 10, maximum, when tested in accordance with ASTM E84.
   2. Surface Finish: Suitable for flat paint finish, without pinholes , voids, or roughness..
   3. Material Characteristics: Complying with ASTM C1355/C1355M.
   4. Items Too Large or Heavy to be Adhesively Installed: Provide concealed anchorage points for plaster type wire anchors.
   5. Glass Content: Minimum 5 percent by weight.
   6. Method of Construction: Hand or spray lay-up process in molds.
   7. Shell Thickness: 3/16 inch, minimum.
   8. Shell Thickness at Part Edges and at Fastening Points: 5/16 inch, minimum.
   9. Outside Corner Radius: 1/8 inch, maximum.
   10. Draft Angle: 3 degrees, minimum, on returns, setbacks, reveals, and grooves.
   11. Dimensional Tolerances of Molded Surfaces:
      a. Straightness: Maximum of 1/8 inch in 8 linear feet variation from straight at any point along any plane, edge, or surface.
      b. Overall Width and Length: Plus/minus 1/8 inch.
      c. Dimensions Within Overall Width and Length: Plus/minus 1/16 inch.

B. Joint Cement: Type recommended by fabrication manufacturer.

C. Joint Tape and Compound: Types recommended for gypsum wallboard work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly constructed; verify that substrates are plumb and true.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Check field dimensions before beginning installation. If dimensions vary too much from design dimensions for proper installation, notify Architect and wait for instructions before beginning installation.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Install supplementary temporary and permanent supports as required for proper installation.

3.03 INSTALLATION

A. Install in accordance with applicable code and manufacturer's recommendations, plumb and true to line; shim where necessary.

B. Coordinate work with installation of substrates.

C. Join pieces with cemented butt joints except at control and expansion joints.

D. Provide control joints at not more than 35 feet on center if not indicated on drawings.

E. Finish joints and surfaces as required for Level 5 in ASTM C840.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 093000
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Tile for wall applications.

C. Cementitious backer board as tile substrate.

1.02 SUBMITTALS

A. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

B. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches in size illustrating pattern, color variations, and grout joint size variations.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Tile: 1 percent of each size, color, and surface finish combination.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 TILE

A. Manufacturers: All products by the same manufacturer.
   1. Dal-Tile Corporation; _____: www.daltile.com/#sle.
   2. Substitutions: Not permitted.

B. Glazed Wall Tile: _____ .
   1. Products:
      a. Daltile; Rittenhouse #0190.
      b. Size: 3" X 6"
      c. Color: Artic White
      d. Surface Finish: Semi-Gloss
      e. Location: Community Room Kitchen Backsplash
      f. Substitutions: Not permitted.

C. Porcelain Tile:
   1. Products:
      a. Daltile; Santino.
         1) Color: SN07
         2) Dimensions/Finish: Chiaro, 6" X 24"
         3) Location: Surround of fireplace
         4) Substitutions: Not permitted.
      b. Daltile; Santino.
         1) Color: SN07
         2) Dimensions/Finish: Chiaro, 12" X 24"
         3) Location: Entryways
         4) Substitutions: Not permitted.
      c. Daltile; Santino.
         1) Color: SN06
         2) Dimensions/Finish: Chiaro, 12" X 24"
         3) Location: Elevator Flooring
         4) Substitutions: Not permitted.
      d. Daltile; Santino.
         1) Color: SN07
         2) Dimensions/Finish: Chiaro, 18" X 18"

3) Location: Tile Border around walkoff matt at vestibule and fireplace hearth
4) Substitutions: Not permitted.

2.02 SETTING MATERIALS

A. Organic Adhesive: ANSI A136.1, thinset mastic type.

2.03 GROUTS

A. Standard Grout: ANSI A118.6 standard cement grout.
1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
3. Colors:
a. Mapei #11 Sahara Beige; 1/8", sealed
1) Location: Fireplace surround, entryways, elevator flooring, tile border around walk off matat vestibule and fireplace hearth.
b. Mapei #38 Avalanche; 1/16", non-sanded/sealed
1) Location: Community room kitchen backsplash
c. Substitutions: Not permitted.

2.04 MAINTENANCE MATERIALS

A. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
1. Composition: Water-based colorless silicone.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

3.03 INSTALLATION - GENERAL

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.13, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Sound tile after setting. Replace hollow sounding units.

G. Keep control and expansion joints free of mortar, grout, and adhesive.

H. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

I. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

J. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Elevator: Running Bond with 33% overlap

3.05 INSTALLATION - WALL TILE

A. Over gypsum wallboard on wood or metal studs install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat, unless otherwise indicated.

B. Fireplace Surround: Running bond with a 33% overlap

C. Kitchen Backsplash: Running bond

3.06 CLEANING

A. Clean tile and grout surfaces.

END OF SECTION

SECTION 095100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 SUBMITTALS

A. Product Data: Provide data on suspension system components and acoustical units.

1.03 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

B. Acoustical Tile: Painted mineral fiber,ASTM E1264 Type III, with the following characteristics:
   1. Size: 24 by 48 inches with 24 inch x 24 inch look
   2. Edge: Beveled tegular.
   3. Surface Color: White.
   4. Location: Common areas and corridors
   5. Products:
      a. Armstrong; Dune Second Look II.
      b. Substitutions: Not permitted.

C. Acoustical Tile: Painted mineral fiber,ASTM E1264 Type III, with the following characteristics:
   1. Size: 24 by 24 inches.
   2. Surface Color: Black.
   3. Location: Theater
   4. Products:
      a. Armstrong; Shastat 2904.
      b. Substitutions: Not permitted.

2.02 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

B. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

C. Exposed Steel Suspension System: Formed steel, commercial quality cold rolled; intermediate-duty.
   1. Finish: White painted except it shall be black where tile is black

2.03 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.

B. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

C. Perimeter Moldings: Same metal and finish as grid.

PART 3 EXECUTION

3.01 INSTALLATION - SUSPENSION SYSTEM

A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

B. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.

C. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

D. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

E. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

F. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

G. Do not eccentrically load system or induce rotation of runners.

3.02 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
   1. Make field cut edges of same profile as factory edges.

3.03 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION

SECTION 096500
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient sheet flooring.

B. Resilient tile flooring.

C. Installation accessories.

1.02 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

B. Verification Samples: Submit two samples, ___ by ___ inch in size illustrating color and pattern for each resilient flooring product specified.

1.03 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

PART 2 PRODUCTS

2.01 SHEET FLOORING

A. Vinyl Sheet Flooring: Homogeneous without backing, with color and pattern throughout full thickness.
   1. Manufacturer:
      a. Mohawk; Portico Collection, Scottsdale.
      b. Color: #592 Cool Sands
      c. Substitutions: Not permitted.

2.02 TILE FLOORING

A. Luxury Vinyl Plank: Printed film type, with transparent or translucent wear layer.
   1. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
   2. Wear Layer Thickness: 0.020 inch.
   3. Total Thickness: 0.125 inch.

2.03 ACCESSORIES

A. Primers, Adhesives, and Seam Sealer: Waterproof; types recommended by flooring manufacturer.

B. Sound Control Underlayment:
   1. Manufacturers:
      a. Shaw; Groundworks, 087VS.
      b. Substitutions: Not permitted.
   2. Thickness: 1.4 mm.
   3. Location: Elevated floors under Luxury Vinyl Plank Flooring

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

3.04 INSTALLATION - SOUND CONTROL UNDERLAYMENT

A. Install in accordance with underlayment manufacturer's instructions.

3.05 INSTALLATION - SHEET FLOORING

A. Lay flooring with joints and seams parallel to longer room dimensions, to produce minimum number of seams. Lay out seams to avoid widths less than 1/3 of roll width; match patterns at seams.

3.06 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Install plank tile with a random offset of at least 6 inches from adjacent rows.

3.07 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.08 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 096813
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

1.02 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

B. Samples: Submit two carpet tiles illustrating color for each carpet color selected.

1.03 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tile Carpeting - Multi Story Building:
   1. Mohawk Group; Uncharted Restore Tile.
   2. Color: 359 Ecoactive
   3. Loation: Common Spaces
   4. Substitutions: Not permitted.

B. Tile Carpeting - Multi Story Building:
   1. Mohawk Group; Uncharted Solve II Tile.
   2. Color: 359 Ecoactive
   3. Location: Corridors
   4. Substitutions: Not permitted.

C. Tile Carpeting - Free Standing Community Building:
   1. Mohawk Group; Uncharted Restore Tile.
   2. Color: 359 Ecoactive
   3. Location: Office, workroom, fitness room, computer room and library
   4. Substitutions: Not permitted.

2.02 ACCESSORIES

A. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to subfloor surfaces.

3.02 INSTALLATION

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Lay carpet tile in brick ashlar pattern pattern, with pile direction parallel to next unit, set parallel to building lines.

F. Fully adhere carpet tile to substrate.

G. Trim carpet tile neatly at walls and around interruptions.

H. Complete installation of edge strips, concealing exposed edges.

3.03 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 096816
SHEET CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet, stretched-in with cushion underlay and direct-glued.

1.02 SUBMITTALS

A. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

B. Samples: Submit two samples ____by____ inch in size illustrating color and pattern for each carpet and cushion material specified.

1.03 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during and 24 hours after installation.

C. Ventilate installation area during installation and for 72 hours after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Carpet - Type "A" Units (Glue Down):
   1. Mohawk; Sleek Upgrade.
   2. Color: Leather Bound
   3. Substitutions: Not permitted.

B. Carpet - Type "B" Units (Stretched):
   1. Mohawk; Neutral Shift.
   2. Color: Sumatra Blend
   3. Substitutions: See Section 016000 - Product Requirements.

C. Carpet - Multi Story Building:
   1. Mohawk Group; New Basics III 26.
   2. Color: Majolica Tin
   3. Substitutions: See Section 016000 - Product Requirements.

2.02 CUSHION

A. Cushion: Rebond.
   1. Nominal Thickness: 437 inch.

2.03 ACCESSORIES

A. Subfloor Filler: Type recommended by carpet manufacturer.

B. Tackless Strip: Carpet gripper, of type recommended by carpet manufacturer to suit application, with attachment devices.

C. Seam Adhesive: Recommended by carpet manufacturer.

D. Carpet Adhesive: Recommended by carpet manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive carpet.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesives to subfloor surfaces.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install carpet and cushion in accordance with manufacturer's instructions and CRI 104 (Commercial).

C. Verify carpet match before cutting to ensure minimal variation between dye lots.

D. Lay out carpet.
   1. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic.
   2. Do not locate seams perpendicular through door openings.
   3. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
   4. Locate change of color or pattern between rooms under door centerline.
   5. Provide monolithic color, pattern, and texture match within any one area.

E. Install carpet tight and flat on subfloor, well fastened at edges, with a uniform appearance.

3.04 STRETCHED-IN CARPET

A. Install tackless strips with pins facing the wall around entire perimeter, except across door openings. Use edge strip where carpet terminates at other floor coverings.

B. Space tackless strips slightly less than carpet thickness away from vertical surfaces, but not more than 3/8 inch.

C. Install cushion in maximum size pieces using spot adhesive to adhere to subfloor.

D. Lay out cushion so that seams will be perpendicular to, or offset from, minimum 6 inches from carpet seams.

E. Butt cushion edges together and tape seams.

F. Trim cushion tight to edge of tackless strip and around projections and contours.

G. Double cut carpet seams, with accurate pattern match. Make cuts straight, true, and unfrayed. Apply seam adhesive to all cut edges immediately.

H. Join seams using hot adhesive tape. Form seams straight, not overlapped or peaked, and free of gaps.

I. Following seaming, hook carpet onto tackless strip at one edge, power stretch, and hook firmly at other edges. Follow manufacturer's recommendations for method and amount of stretch.

J. Trim carpet neatly at walls and around interruptions. Tuck edges into space between tackless strip and wall.

3.05 DIRECT-GLUED CARPET

A. Double cut carpet seams, with accurate pattern match. Make cuts straight, true, and unfrayed. Apply seam adhesive to cut edges of woven carpet immediately.

B. Apply contact adhesive to floor uniformly at rate recommended by manufacturer. After sufficient open time, press carpet into adhesive.

C. Apply seam adhesive to the base of the edge glued down. Lay adjoining piece with seam straight, not overlapped or peaked, and free of gaps.

D. Roll with appropriate roller for complete contact of adhesive to carpet backing.

E. Trim carpet neatly at walls and around interruptions.

3.06 INSTALLATION ON STAIRS

A. Use one piece of carpet for each tread and the riser below. Apply seam adhesive to all cut edges.

B. Install carpet with pile direction in the length of the stair.

C. Adhere carpet tight to stair treads and risers.

3.07 CLEANING

A. Remove excess adhesive from floor and wall surfaces without damage.

B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 099113
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.02 SUBMITTALS

A. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
   2. MPI product number (e.g. MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

B. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.04 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the paint product manufacturer's temperature ranges.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless required to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.

2. Supply each paint material in quantity required to complete entire project's work from a single production run.
3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is described explicitly in manufacturer's product instructions.

2.02 PAINT SYSTEMS - EXTERIOR

A. Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including fiber cement siding, primed wood, and primed metal.
   1. Two top coats and one coat primer.
   2. Top Coat(s): Exterior Latex; MPI #10, 11, 15, 119, or 214.
   3. Primer: As recommended by top coat manufacturer for specific substrate.

B. Paint ME-OP-3A - Ferrous Metals, Unprimed, Alkyd, 3 Coat:
   1. One coat of alkyd primer.
   2. Gloss: Two coats of alkyd enamel.

C. Paint ME-OP-2A - Ferrous Metals, Primed, Alkyd, 2 Coat:
   1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
   2. Semi-gloss: Two coats of alkyd enamel.

D. Paint MgE-OP-3A - Galvanized Metals, Alkyd, 3 Coat:
   1. One coat galvanize primer.
   2. Gloss: Two coats of alkyd enamel.

2.03 PRIMERS

A. Primers: Provide the following unless other primer is required or recommended by manufacturer of top coats.
   1. Anti-Corrosive Alkyd Primer for Metal; MPI #79.
   2. Water Based Primer for Galvanized Metal; MPI #134.
   3. Rust-Inhibitive Water Based Primer; MPI #107.
   4. Alkyd/Oil Primer for Exterior Wood; MPI #5.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Fiber Cement Siding: 12 percent.
   2. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Fiber Cement Siding: Remove dirt, dust and other foreign matter with a stiff fiber brush. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.

G. Exterior Wood Surfaces to Receive Opaque Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior calking compound after prime coat has been applied. Back prime concealed surfaces before installation.

3.03 APPLICATION

A. Exterior Wood to Receive Opaque Finish: If final painting must be delayed more than 2 weeks after installation of woodwork, apply primer within 2 weeks and final coating within 4 weeks.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 SCHEDULE - PAINT SYSTEMS

A. Fiber Cement Siding: Finish surfaces exposed to view.
   1. Exterior trim and frames: FCE-OP-3L.
   2. Exterior siding: FCE-OP-3L.
   3. Exterior shingles and shakes: FCE-OP-3L.

B. Wood: Finish surfaces exposed to view.
   1. Exterior trim and frames: WE-OP-3A, semi-gloss.

C. Steel Fabrications: Finish surfaces exposed to view.
   1. Exterior: ME-OP-3A, gloss.

D. Galvanized Steel: Finish surfaces exposed to view.
   1. Exterior: Paint MgE-OP-3A, gloss.

E. Shop-Primed Metal Items: Finish surfaces exposed to view.
   1. Finish the following items:
      a. Exposed surfaces of lintels.
      b. Elevator pit ladders.
      c. Exposed surfaces of steel stairs and railings.
   2. Exterior: Paint-ME-OP-2A, semi-gloss.

END OF SECTION

SECTION 099123
INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.

D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
   5. Floors, unless specifically indicated.
   6. Glass.
   7. Concealed pipes, ducts, and conduits.

1.02 SUBMITTALS

A. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
   2. MPI product number (e.g., MPI #47).
   3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.

B. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
   1. Where sheen is specified, submit samples in only that sheen.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.04 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.

2. Supply each paint material in quantity required to complete entire project's work from a single production run.
3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

2.02 PAINT SYSTEMS - INTERIOR

A. Paint GI-OP-3L - Gypsum Board/Plaster, Latex, 3 Coat:
   1. One coat of alkyd primer sealer.
   2. Eggshell: Two coats of latex enamel; _____.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

F. Galvanized Surfaces:
   1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
   2. Prepare surface according to SSPC-SP 2.

G. Ferrous Metal:
   1. Solvent clean according to SSPC-SP 1.
   2. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

H. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

I. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Sand wood and metal surfaces lightly between coats to achieve required finish.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 SCHEDULE - PAINT SYSTEMS

A. Gypsum Board: Finish surfaces exposed to view.

B. Wood: Finish surfaces exposed to view.
   1. Interior trim and frames: WI-OP-3A, semi-gloss.

C. Steel Doors and Frames: Finish surfaces exposed to view; MI-OP-3A, gloss.

D. Steel Fabrications: Finish surfaces exposed to view.
   1. Interior: MI-OP-3L, gloss.

E. Galvanized Steel: Finish surfaces exposed to view.
   1. Interior: Mgl-OP-3L.

F. Shop-Primed Metal Items: Finish surfaces exposed to view.
   1. Finish the following items:
      a. Elevator pit ladders.
      b. Exposed surfaces of steel stairs and railings.
   2. Interior: MI-OP-2A.

END OF SECTION

SECTION 101400
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Room and door signs.

1.02 SUBMITTALS

A. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

B. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

1.03 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 SIGNAGE APPLICATIONS

A. Accessibility Compliance: Signs are required to comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
   1. Sign Type: Flat signs with engraved panel media as specified.
   2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
   3. Character Height: 1 inch.
   4. Sign Height: 2 inches, unless otherwise indicated.
   5. Office Doors: Identify with the room numbers indicated on drawings.
   6. Unit Doors: Identify with the room numbers indicated on drawings[<>].
   7. Service Rooms: Identify with the room names and numbers indicated on drawings.
   8. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", and braille.

2.02 SIGN TYPES

A. Flat Signs: Signage media without frame.
   1. Edges: Square.
   2. Corners: Square.
   3. Wall Mounting of One-Sided Signs: Tape adhesive.

B. Color and Font: Unless otherwise indicated:
   1. Character Font: Helvetica, Arial, or other sans serif font.
   2. Character Case: Upper case only.
   3. Background Color: As selected from manufacturer's standard colors.
   4. Character Color: Contrasting color.

2.03 TACTILE SIGNAGE MEDIA

A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
   1. Total Thickness: 1/16 inch.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION

SECTION 102600
WALL AND DOOR PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Protective corridor handrails.

1.02 SUBMITTALS

A. Product Data: Indicate physical dimensions, features, wall mounting brackets with mounted measurements, anchorage details, and rough-in measurements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Protective Corridor Handrails:
   1. Construction Specialties, Inc; HR-6CN: www.c-sgroup.com/#sle.
   2. Substitutions: Not permitted.

2.02 PRODUCT TYPES

A. Protective Corridor Handrails: Factory- or shop-fabricated, with preformed end caps and internal and external corners:
   1. Comply with accessibility requirements of ICC A117.1 and ADA Standards.
   2. Performance of Installed Assembly:
      a. Support vertical live load of 100 lb/lineal ft with deflection not to exceed 1/50 of span between supports.
      b. Resist lateral force of 250 lbs at any point without damage or permanent set.
   3. Mounting: Surface.

2.03 FABRICATION

A. Fabricate components with tight joints, corners and seams.

B. Pre-drill holes for attachment.

C. Form end trim closure by capping and finishing smooth.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to supporting construction.

B. Position top of corridor hand rail 36 inches from finished floor.

C. Terminate rails 1 inch short of door openings and intersecting walls.

3.02 TOLERANCES

A. Maximum Variation From Required Height: 1/4 inch.

B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

END OF SECTION

SECTION 102800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Residential toilet, shower, and bath accessories.

C. Under-lavatory pipe supply covers.

D. Utility room accessories.

1.02 SUBMITTALS

A. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:
   1. American Specialties, Inc: www.americanspecialties.com/#sle.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Mirror Glass: Annealed float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

2.03 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser: Single roll, surface mounted bracket type, stainless steel, spindleless type for tension spring delivery designed to prevent theft of tissue roll.

B. Paper Towel Dispenser: Folded paper type, stainless steel, semi-recessed, with viewing slots on sides as refill indicator and tumbler lock.
   1. Capacity: 300 C-fold minimum.

C. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.

D. Grab Bars: Aluminum, smooth surface.
   1. Dimensions: 1-1/4 inch outside diameter, minimum 0.080 inch wall thickness, bracket, 1-1/2 inch clearance between wall and inside of grab bar.

2.04 RESIDENTIAL UNIT TOILET, SHOWER, AND BATH ACCESSORIES

A. Toilet Paper Holder (Missouri Projects): Surface mounted, single roll, concealed attachment.
   1. Material: Stainless steel; bright polished finish.
   2. Products:
      a. American Specialties; 7305B.
      b. Substitutions: Not permitted.

B. Toilet Paper Holder (Georgia Projects): Surface mounted, single roll, concealed attachment.
   1. Material: Stainless steel; bright polished finish.

C. Towel Bar (Missouri Projects): Square tubular bar; rectangular mounting posts, concealed attachment.
   1. Mounting Post Material: Stainless steel; bright polished finish.
   2. Bar Material: Stainless steel; bright polished finish.
   3. Products:
      a. American Specialties; 7360B.
      b. Substitutions: Not permitted.

D. Towel Bar (Georgia Projects): Square tubular bar; rectangular mounting posts, concealed attachment.

1. Mounting Post Material: Stainless steel; bright polished finish.
2. Bar Material: Stainless steel; bright polished finish.
3. Products:
   a. Harney; 12016.
   b. Substitutions: Not permitted.

E. Towel Ring (Missouri Projects): Post with hanging ring, concealed attachment.
1. Post Material: Stainless steel; bright polished finish.
2. Ring Material: To match post material.
3. Products:
   a. American Specialties; 0785Z.
   b. Substitutions: Not permitted.

F. Towel Ring (Georgia Projects): Post with hanging ring, concealed attachment.
1. Post Material: Stainless steel; bright polished finish.
2. Ring Material: To match post material.
3. Products:
   a. Harney; 12010.
   b. Substitutions: Not permitted.

G. Shower Curtain Rod: Straight tube, 1 inch diameter, with mounting flanges for concealed attachment.
1. Material: Stainless steel; satin finish.
2. Products:
   a. American Specialties; 1214.
   b. Substitutions: Not permitted.

2.05 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Under-Lavatory Pipe and Supply Covers:
1. Insulate exposed drainage piping, including hot, cold, and tempered water supplies under lavatories or sinks to comply with ADA Standards.
2. Exterior Surfaces: Smooth non-absorbent, non-abrasive surfaces.
3. Construction: 1/8 inch flexible PVC.
   a. Surface Burning Characteristics: Flame spread index of 25 or less and smoke developed index of 450 or less, when tested in accordance with ASTM E84.
   b. Microbial and Fungal Resistance: Comply with ASTM G21.
4. Color: White.
5. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces.

2.06 UTILITY ROOM ACCESSORIES

PART 3 EXECUTION

3.01 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.02 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 103090
MANUFACTURED ELECTRIC FIREPLACES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Manufactured electric fireplaces.

B. Accessories.

1.02 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

B. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

C. Manufacturer’s warranty.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.

1.04 WARRANTY

A. Provide the manufacturers 2 year limited warranty on electrical components.

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Pre-fabricated Electric Fireplace:
   1. Base: Dimplex Electric Fireplace
      Dimplex North America
      1367 Industrial Road
      Cambridge ON N1R 7G8
      1-888-DIMPLEX
      www.dimplex.com
      archdesign@dimplex.com
   2. Substitutions not permitted

2.02 ELECTRIC FIREPLACES

A. General:
   1. Provide all components and accessories required for a complete, functional unit.
   2. UL or CSA listed.

B. Pre-fabricated Electric Fireplace:
   1. Base Product:
      a. Dimplex Electric Fireplace
      b. Model Number: BF39DXP
   2. Description: Realistic 39” Direct-wire electric firebox
   3. Dimensions:
      a. Width: 38-3/4”
      b. Height: 32-3/4”
      c. Depth: 15-1/4”
      d. Height at back: 30-1/8”
   4. Framing Dimensions:
      a. Width: 39-1/2”
      b. Height: 33-1/2”
      c. c) Depth: 16”

5. Electrical:
    a. Volts: 120 / 240 / 208
    b. Watts: 1,440 / 2,700 / 2,100
    c. BTUs: 5,000 / 9,200 / 7,200
    d. Amps: 12.0 / 11.3 / 10.1
6. Venting: Non-venting
7. Operation: Flame only, flame and heat
8. Heating: Louver-less, fan-forced circulation
9. Liner: Refractory brick-look
10. Standard features:
    a. Flame/ember bed on/off
    b. Purifire® Air Treatment System
    c. Direct wire 120V or 240V
    d. 3D flame effect with mirrored rear glass
    e. On-demand fan-forced heater
    f. Operable mesh spark screens
    g. Cast urethane, inner-glow logs and pulsing ember bed
11. Optional door kits:
    a. Tamper-proof glass door
    b. Bi-fold look glass door
    c. Swing door
12. Optional trim kit: 3” black surround trim
13. Control options:
    a. 3-stage remote control (flame, flame and half-heat, flame and full-heat)
    b. Wall switch remote control kit
    c. Wall-mount thermostat
    d. 110/120V plug kit with 7 ft. cord

PART 3 - EXECUTION

3.01 INSPECTION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify proper power supply and fuel source are available.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of authorities having jurisdiction.

B. Use manufacturer's guidelines for minimum clearances to combustibles, walls, and finishes.

C. Anchor all components firmly in position for long life under hard use.

D. Upon completion of installation, visually inspect all exposed surfaces. Touch up scratches and abrasions with touch up paint recommended byt Manufacturer; make imperfections invisible to the unaided eye from a distance of 5 feet.

3.04 3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 104400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.02 SUBMITTALS

A. Product Data: Provide extinguisher operational features, extinguisher ratings and classifications, color and finish, anchorage details, and installation instructions.

PART 2 PRODUCTS

2.01 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Class: A:B:C type.
   2. Size: 10 pound.
   3. Finish: Baked polyester powder coat, color as selected.

2.02 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

B. Fire Rated Cabinet Construction: One-hour fire rated.

C. Cabinet Configuration: Semi-recessed type.
   1. Size to accommodate accessories.
   2. Projected Trim: Returned to wall surface, with [4] inch projection.

D. Door: 0.036 inch metal thickness, reinforced for flatness and rigidity with nylon catch. Hinge doors for 180 degree opening with continuous piano hinge.

E. Door Glazing: Tempered glass, clear, 1/8 inch thick, and set in resilient channel glazing gasket.

F. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

G. Fabrication: Weld, fill, and grind components smooth.

H. Finish of Cabinet Exterior Trim and Door: Baked enamel, color as selected.

I. Finish of Cabinet Interior: White colored enamel.

2.03 ACCESSORIES

A. Lettering: FIRE EXTINGUISHER decal, or vinyl self-adhering, pre-spaced black lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify rough openings for cabinet are correctly sized and located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install cabinets plumb and level in wall openings, ____ inches from finished floor to inside bottom of cabinet.

C. Secure rigidly in place.

D. Place extinguishers in cabinets.

END OF SECTION

SECTION 105500
POSTAL SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Central mail delivery boxes.

1.02 SUBMITTALS

A. Product Data: Provide manufacturer's specifications and descriptive literature, installation instructions, maintenance information, and current USPS approval documentation.

B. Shop Drawings: Indicate plans for each unit or groups of units, front elevations with compartment layout and model number, overall dimensions, rough-in opening sizes, construction and anchorage details.

C. Samples: Submit two sets of manufacturer's available colors.

1.03 WARRANTY

A. Provide manufacturer's warranty against defects in materials or workmanship for a period of 5 years from Date of Substantial Completion.

PART 2 PRODUCTS

2.01 CENTRAL MAIL DELIVERY BOXES

A. Manufacturers:
   1. Florence Manufacturing Company; _____: www.florencemailboxes.com/#sle.
   2. Substitutions: See Section 016000 - Product Requirements.

B. Central Mail Delivery Boxes: Provide products approved for United States Postal Service (USPS) delivery.
   1. Materials: Aluminum with stainless steel hardware.
   2. Finish: Powder coat in color selected by Architect from manufacturer's standard colors.
   3. Unit Types and Sizes: As indicated on drawings.
   4. Configurations: See drawings for overall dimensions and layouts.

C. Wall-Mounted Mailboxes: Fully-recessed, complying with 39 CFR 111 (USPS-STD-4C).

D. Cluster Box Units (CBU): Pedestal-mounted, mail receptacle with weather-resistant cabinet for outdoor installation; front-loading, double-column design.

2.02 RENT DROP BOX (RDB):

A. Wall Drop Box: Through-wall, adjustable chute.
   1. Keyed Lock
   2. 12" X 6" X 16"

B. Protex Model MDL-170

C. Finish: Beige

2.03 COMPONENTS

A. Locking - Front Loading Master Door: Three-point latching mechanism with USPS master lock furnished and installed by postmaster.

B. Locking - Customer Compartment Doors: USPS approved cam lock, 3 keys each lock.

C. Locking - Parcel Compartment Doors: Double-lock arrangement with USPS approved cam lock for customer access, and USPS master lock furnished and installed by postmaster.

D. Pedestals: Standard aluminum pedestal with rubber mounting pad designed to meet USPS and height requirements of ADA Standards.

E. Identification - Customer and Parcel Compartments: Sequential numerical or alphabetic characters, top to bottom, left to right; factory-installed.
   1. Engraved characters, 3/4 inch high, with black fill.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that concrete base and anchor bolts are ready to receive pedestal-mounted units.

B. Verify that rough-openings are ready to receive wall-mounted units.

C. Do not begin installation until unacceptable conditions are corrected.

3.02 INSTALLATION

A. Install postal specialties in accordance with approved shop drawings, manufacturer's instructions, and USPS requirements.

B. Adjust and lubricate door hardware to operate properly.

END OF SECTION

SECTION 105723
CLOSET AND UTILITY SHELVING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall mounted wire closet shelving.

B. Accessories.

1.02 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, with installation instructions.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store products under cover and elevated above grade.

C. Store flat to prevent warpage and bending.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wire Storage Shelving:
   1. ClosetMaid Corporation: www.closetmaid.com/#sle.
   2. Rubbermaid, Inc; Wire Closets: www.rubbermaidpro.com/#sle.

2.02 WIRE STORAGE SHELVING SYSTEMS

A. Wire Shelving: Factory-assembled coated wire mesh shelf assemblies for wall-mounting, with components and connections required to produce a rigid structure that is free of buckling and warping.
   1. Construction: Cold-drawn steel wire with average tensile strength of 100,000 psi resistance welded into uniform mesh units, square, rigid, flat, and free of dents or other distortions, with wires trimmed smooth.
   2. Coating: PVC or epoxy, applied after fabrication, covering surfaces.
   3. PVC Coating: 9 to 11 mils thick.
   4. Epoxy Coating: Nontoxic epoxy-polyester powder coating baked-on finish, 3 to 5 mils thick.
   5. Standard Mesh Shelves: Cross deck wires spaced at 1 inch.
   6. Free-Sliding Hanging Rod: Integral hanging rod that permits uninterrupted sliding of hangers the full width of the shelf.
   7. Corner Units: Same wire spacing as standard mesh shelves; provide wherever shelves meet at right angles.

B. Mounting Hardware for Wire Shelving: Provide manufacturer's standard mounting hardware; include support braces, wall brackets, back clips, end clips, poles, and other accessories as required for complete and secure installation; factory finished to match shelving.

PART 3 EXECUTION

3.01 EXAMINATION

A. Inspect areas to receive shelving or storage system, to verify that spaces are properly prepared to receive shelf units, and are of dimensions indicated on shop drawings.

B. Verify appropriate fastening hardware.

C. Do not begin installation until substrates have been properly prepared.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.02 INSTALLATION

A. Install wire shelving in accordance with manufacturer's instructions, with shelf surfaces level.

B. Cap exposed ends of cut wire shelving.

C. Install wire shelving back clips, end clips at side walls, and support braces at open ends. Install intermediate support braces as recommended by manufacturer.

3.03 PROTECTION

A. Protect installed work from damage.

B. Touch-up, repair, or replace damaged products before Substantial Completion in a manner that eliminates evidence of replacement.

END OF SECTION

SECTION 113013
RESIDENTIAL APPLIANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Kitchen appliances.

B. Laundry appliances.

1.02 SUBMITTALS

A. Product Data: Manufacturer's data indicating dimensions, capacity, and operating features of each piece of residential equipment specified.

1.03 QUALITY ASSURANCE

A. Electric Appliances: Listed and labeled by UL (DIR) and complying with NEMA Standards (National Electrical Manufacturers Association).

1.04 WARRANTY

A. Provide five (5) year manufacturer warranty on refrigeration system of refrigerators.

B. Provide ten (10) year manufacturer warranty on magnetron tube of microwave ovens.

C. Provide ten (10) year manufacturer warranty on tub and door liner of dishwashers.

PART 2 PRODUCTS

2.01 KITCHEN APPLIANCES - RESIDENTIAL UNITS

A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.

B. Refrigerator, All Units
   1. ADA Approved
   2. Exterior Finish: Porcelain enameled steel, color white.
   3. Manufacturers:
      a. GE Appliances; GIE18ETHWW: www.geappliances.com/#sle.
      b. Substitutions: Not permitted.

C. Range, Type "B" Units
   1. Exterior Finish: Porcelain enameled steel, color white.
   2. Manufacturers:
      a. GE Appliances; JB2558DMWW: www.geappliances.com/#sle.
      b. Substitutions: Not permitted.

D. ADA Range, Type "A" Units
   1. ADA Approved
   2. Exterior Finish: Porcelain enameled steel, color white.
   3. Manufacturers:
      a. GE Appliances; JD630DFWW: www.geappliances.com/#sle.
      b. Substitutions: Not permitted.

E. ADA Range Backguard Kit
   1. Exterior Finish: Porcelain enameled steel, color white
   2. Manufacturers:
      a. GE Appliances; [JXS32WW]: www.geappliances.com/#sle.
      b. Substitutions: Not permitted

F. Range Hood (Vented), Type "A" Units
   1. Exterior Finish: Porcelain enameled steel, color white.
   2. Manufacturers:
      a. GE Appliances; JV348LWW: www.geappliances.com/#sle.
      b. Substitutions: Not permitted.

G. Range Hood (Recirculating), Type "A" Units
   1. Exterior Finish: Porcelain enameled steel, color white.

2. Manufacturers:
    a. GE Appliances; JN327HWW: www.geappliances.com/#sle.
    b. Substitutions: Not permitted.

H. Range Hood (Vented), Type "A" Units
1. Exterior Finish: Porcelain enameled steel, color white.
2. Manufacturers:
    a. GE Appliances; JV348L: www.geappliances.com/#sle.
    b. Substitutions: Not permitted.

I. Over-the-Range Microwave, Type "B" Units
1. Exterior Finish: Porcelain enameled steel, color white.
2. Manufacturers:
    a. GE Appliances; JNM3163DJWW: www.geappliances.com/#sle.
    b. Substitutions: Not permitted.

J. ADA Microwave, Type "A" Units
1. ADA Approved
2. Exterior Finish: White.
3. Manufacturers:
    a. GE Appliances; PEM31DJWW: www.geappliances.com/#sle.
    b. Substitutions: Not permitted.

K. Garabage Disposal
1. Exterior Finish: Black.
2. Manufacturers:
    a. GE Appliances; GFC525V: www.geappliances.com/#sle.
    b. Badger; Badger 5 Half Horsepower, 76037H.
    c. Substitutions: Not permitted.

L. Dishwasher, Type "B" Units
1. Finish: Porcelain enameled steel , color white.
2. Manufacturers:
    a. GE Appliances; GSD3301KWW: www.geappliances.com/#sle.
    b. Substitutions: Not permitted.

M. ADA Dishwasher, Type "A" Units
1. ADA Approved
2. Finish: Porcelain enameled steel, color white.
3. Manufacturers:
    a. GE Appliances; GDT225SGLWW: www.geappliances.com/#sle.
    b. Substitutions: Not permitted.

2.02 KITCHEN APPLIANCES - MULTI STORY BUILDING COMMON AREAS

A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.

B. Refrigerator:
1. ADA Approved
2. Exterior Finish: Stainless/Black.
3. Manufacturers:
    a. GE Appliances; GFE26GSKSS: www.geappliances.com/#sle.
    b. Substitutions: Not permitted.

C. Under Counter Refrigerator:
1. Exterior Finish: Stainless.
2. Manufacturers:
    a. GE Appliances; ZIFS241: www.geappliances.com/#sle.
    b. Substitutions: Not permitted.

D. Range:
1. ADA Approved

2. Exterior Finish: Stainless/Black.
3. Manufacturers:
    a. GE Appliances; JD630SFSS: www.geappliances.com/#sle.
    b. Substitutions: Not permitted.

E. Oven/Microwave Combo
1. Exterior Finish: Stainless.
2. Manufacturers:
    a. GE Appliances; JT3800S: www.geappliances.com/#sle.
    b. Substitutions: Not permitted.

F. Range Hood
1. Exterior Finish: Stainless.
2. Manufacturers:
    a. GE Appliances; JVX3300S: www.geappliances.com/#sle.
    b. Substitutions: Not permitted.

G. Microwave
1. Exterior Finish: Stainless/Black.
2. Manufacturers:
    a. GE Appliances; PEM31S: www.geappliances.com/#sle.
    b. Substitutions: Not permitted.

H. Microwave Trim Kit
1. Exterior Finish: Stainless.
2. Manufacturers:
    a. GE Appliances; JX830SF: www.geappliances.com/#sle.
    b. Substitutions: Not permitted.

I. Garbage Disposal
1. Exterior Finish: Black.
2. Manufacturers:
    a. GE Appliances; GFC525V: www.geappliances.com/#sle.
    b. Badger; Badger 5 Half Horsepower, 76037H.
    c. Substitutions: Not permitted.

J. Dishwasher
1. Finish: Stainless.
2. Manufacturers:
    a. GE Appliances; GDT225SSLSS: www.geappliances.com/#sle.
    b. Substitutions: Not permitted.

K. ADA Dishwasher
1. ADA Approved
2. Finish: Stainless/Black.
3. Manufacturers:
    a. GE Appliances; GLDT696JSS: www.geappliances.com/#sle.
    b. Substitutions: Not permitted.

L. ADA Ice Maker
1. ADA Approved
2. Finish: Stainless.
3. Manufacturers:
    a. U-Line; ADA151M.
    b. GE/Summit; BIM44GADA
    c. Substitutions: Not permitted.

M. Ice Maker
1. Finish: Stainless.
2. Manufacturers:

a. GE Appliances; UCC15N: www.geappliances.com/#sle.
b. Substitutions: Not permitted.

2.03 LAUNDRY APPLIANCE - RESIDENTIAL UNITS

A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.

B. Stacked Washer/Dryer
1. Finish: Painted steel , color white.
2. Manufacturers:
a. GE Appliances; GUD27ESSJWW: www.geappliances.com/#sle.
b. Substitutions: Not permitted.

C. Top-Loading Clothes Washer
1. Finish: Painted steel , color white.
2. Manufacturers:
a. GE Appliances; GTW220ACKWW: www.geappliances.com/#sle.
b. GE Appliances; GTW490AC: www.geappliances.com/#sle.
c. Substitutions: Not permitted.

D. Clothes Dryer
1. Finish: Painted steel, color white.
2. Manufacturers:
a. GE Appliances; GTX22EASKWW: www.geappliances.com/#sle.
b. Substitutions: Not permitted.

E. Washer/Dryer Combo
1. Finish: Painted steel, color white.
2. Manufacturers:
a. GE Appliances; HLC1700AXW: www.geappliances.com/#sle.
b. Substitutions: Not permitted.

F. Front-Loading Clothes Washer
1. Finish: Painted steel , color white.
2. Manufacturers:
a. GE Appliances; GFW400SCKWW: www.geappliances.com/#sle.
b. Substitutions: Not permitted.

G. Front-Loading Clothes Dryer
1. Finish: Painted steel , color white.
2. Manufacturers:
a. GE Appliances; GFD40ESC: www.geappliances.com/#sle.
b. Substitutions: Not permitted.

2.04 LAUNDRY APPLIANCES - MULTI STORY BUILDING COMMON AREAS

A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.

B. Stacked Washer/Dryer
1. Finish: Painted steel , color white.
2. Manufacturers:
a. GE Appliances; GUD27ESSJWW: www.geappliances.com/#sle.
b. Substitutions: Not permitted.

2.05 LAUNDRY APPLIANCES - FREE STANDING COMMUNITY BUILDING

A. Provide Equipment Eligible for Energy Star Rating: Energy Star Rated.

B. Stacked Washer/Dryer
1. Finish: Painted steel, color white.
2. Manufacturers:
a. GE Appliances; GUD27ESSJWW: www.geappliances.com/#sle.
b. Substitutions: Not permitted.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify utility rough-ins are provided and correctly located.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Anchor built-in equipment in place.

3.03 ADJUSTING

A. Adjust equipment to provide efficient operation.

3.04 CLEANING

A. Remove packing materials from equipment and properly discard.

B. Wash and clean equipment.

END OF SECTION

SECTION 113300
RETRACTABLE STAIRS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Manual disappearing stairways.

1.02 SUBMITTALS

A. Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

B. Shop Drawings for Stairs:
   1. Plan and section of stair installation.
   2. Indicate rough opening dimensions for ceiling and/or roof openings.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Store stairway until installation inside under cover in manufacturer's unopened packaging. If stored outside, under a tarp or suitable cover.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Acceptable Manufacturer: Precision Ladders, LLC, P. O. Box 2279; Morristown, TN 37816-2279; Tel: 423-586-2265; Fax: 423-586-2091; www.PrecisionLadders.com

2.02 MANUAL DISAPPEARING STAIRWAY.

A. Manual Disappearing Stairway.
   1. Standard Model: Super Simplex Disappearing Stairway as manufactured by Precision Ladders LLC. Stairs for ceiling heights 7’-0” - 12’-0”: Model 1000 (ceiling height in inches). Stairs for ceiling heights 12’-1” - 13’-6”: Model 2000 (ceiling height in inches).

B. Performance Standard: Unit shall comply with ANSI A14.9, Commercial Type, for rough openings between 27 inches to 39 inches. Residential Type for rough openings between 22-1/2” and 27”. Stairway capacity shall be rated at 500 lbs.

C. Accessories:
   1. Steel pole to aid opening and closing stairways.
   2. Stairs for ceiling heights 9’ -10” - 12’ -0” shall be equipped with a patented Precision Fold Assist to aid in folding and unfolding of sections. Stairs for ceiling heights 12’ 1” - 13’6” shall be equipped with 2 Fold Assists. Precision Fold-Assist is optional on stairways for ceiling heights of 9’ 9” and below.
   3. Keyed lock for door (standard on fire-rated models, optional on non-fire-rated models).

D. Components:
   1. Ceiling Opening
      a. Ceiling height of 9’ 9” or less requires an opening of 30” x 54”
      b. Ceiling heights from 9’ 10” - 12’ 0” require opening of 30” x 64”
      c. Ceiling heights from 12’ 1” - 13’ 6” require opening of 22 ½” x 72”
   2. Stairway Stringer: 6005-T5 Extruded aluminum channel 5” x 1” x 1/8”; tri-fold design; steel blade type hinges; adjustable feet with plastic Mar-guard. Pitch shall be 63°.
   3. Stairway Tread: 6005-T5 extruded aluminum channel 5 3/16 inches by 1 1/4 inches by 1/8 inch. Depth is 5 3/16 inches. Deeply serrated top surface. Riser Height: 9-1/2 inches. Clear Tread Width for Standard Width: 18 inches.
   4. Railing: Aluminum bar handrail riveted to stringers, upper section only.
   5. Frame:
      a. If ceiling to floor (or roof deck) above is under 12”, frame shall be 1/8” steel formed channel, box.

b. When ceiling to floor (or roof deck) above is 12” or greater, the frame shall be 1/8” steel, 63° (with built-in steps) on the hinge end, 90° on the other end, custom depth to fill distance from ceiling to floor above. This custom frame will require a longer opening in the floor above than is required at the ceiling level.

6. Door Panel
   a. Standard (non-fire rated) door shall be constructed of 1/8 inch aluminum sheet attached to stairway frame with a steel piano hinge. Door overlaps bottom flange of frame. Eye bolt accommodates pole for opening and closing door.
   b. On fire-rated models, the door panel shall be constructed of 20 gauge steel and have a 2 hour fire rating for use in fire-rated ceiling assemblies as issued by Warnock-Hersey or other appropriate independent testing/licensing agency.
7. Hardware:
   a. Steel blade type hinge connecting stringer sections. Zinc plated and chromate sealed.
   b. Steel operating arms, both sides. Zinc coat with clear trivalent chromate.
   c. Double acting steel springs and cable, both sides.
   d. Rivets rated at 1100 lb shear strength each.
   e. Steel section alignment clips at stringer section joints.
   f. Molded rubber guards at corners of aluminum door panel.
8. Finishes: Mill finish on aluminum stairway components. Prime coat on frame.

2.03 FABRICATION

A. Completely fabricate ladder ready for installation before shipment to the site.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Do not begin installation until rough opening and structural support have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Examine materials upon arrival at site. Notify the carrier and manufacturer of any damage.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.03 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 122113
HORIZONTAL LOUVER BLINDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Horizontal slat louver blinds.

B. Operating hardware.

1.02 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the placement of concealed blocking to support blinds.

1.03 SUBMITTALS

A. Product Data: Provide data indicating physical and dimensional characteristics.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Horizontal Louver Blinds - FREE STANDING COMMUNITY BUILDING AND MULTI-STORY BUILDING COMMON AREAS:
   1. Royal Windows; STK Faux Wood.

B. Horizontal Louver Blinds - RESIDENTIAL UNITS:
   1. Vinyl Plu Mini Blind.

2.02 BLINDS - FREE STANDING COMMUNITY BUILDING AND MULTI-STORY BUILDING COMMON AREAS.

A. Description: Horizontal slat louvers hung from full-width headrail with full-width bottom rail.

B. Manual Operation: Control of raising and lowering by cord with full range locking; blade angle adjustable by cord.

C. Plastic Slats: PVC foam, square slat corners.
   1. Width: 2 inch.
   2. Color: Antique White.
   3. Texture: Smooth.

D. Slat Support: Woven polypropylene cord, ladder configuration.

E. Head Rail: Pre-finished, formed aluminum box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats.
   1. Color: Same as slats.

F. Bottom Rail: Pre-finished, formed PVC; with end caps.
   1. Color: Same as headrail.

G. Lift Cord: Braided nylon; continuous loop; complying with WCMA A100.1.
   1. Free end weighted.
   2. Color: As selected by Architect.

H. Headrail Attachment: Wall brackets.

I. Accessory Hardware: Type recommended by blind manufacturer.

2.03 BLINDS - RESIDENTIAL UNITS

A. Description: Horizontal slat louvers hung from full-width headrail with full-width bottom rail.

B. Manual Operation: Control of raising and lowering by cord with full range locking; blade angle adjustable by control wand.

C. Plastic Slats: Vinyl, square slat corners.
   1. Width: 1 inch.
   2. Color: Alabaster.
   3. Texture: Smooth.

D. Slat Support: Woven polypropylene cord, ladder configuration.

E. Head Rail: Pre-finished, formed steel box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats.
   1. Color: Same as slats.

F. Bottom Rail: Pre-finished, formed steel; with end caps.
   1. Color: Same as headrail.

G. Lift Cord: Braided nylon; continuous loop; complying with WCMA A100.1.

H. Control Wand: Extruded hollow plastic; hexagonal shape.
   1. Color: Same as slats.

I. Headrail Attachment: Wall brackets.

J. Accessory Hardware: Type recommended by blind manufacturer.

2.04 FABRICATION

A. Determine sizes by field measurement.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings are ready to receive the work.

B. Ensure structural blocking and supports are correctly placed. See Section 061000.

3.02 INSTALLATION

A. Install blinds in accordance with manufacturer's instructions.

B. Secure in place with flush countersunk fasteners.

3.03 TOLERANCES

A. Maximum Variation of Gap at Window Opening Perimeter: 1/4 inch.

B. Maximum Offset From Level: 1/8 inch.

3.04 ADJUSTING

A. Adjust blinds for smooth operation.

3.05 CLEANING

A. Clean blind surfaces just prior to occupancy.

END OF SECTION

SECTION 123530
RESIDENTIAL CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Kitchen cabinets.

B. Vanity cabinets.

1.02 SUBMITTALS

A. Product Data: Provide component dimensions, configurations, and construction details.

B. Shop Drawings: Indicate casework locations, large scale plans, elevations, clearances required, rough-in and anchor placement dimensions and tolerances.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Residential Casework - Residental Units:
   1. Masco Cabinetry; Quality Seacrest 2.
   2. Material: Birch
   3. Color: Clove
   4. Substitutions: Not permitted.

B. Residential Casework - Multi Story Building Common Areas:
   1. Masco Cabinetry; Merillat Collins.
   2. Material: Birch
   3. Color: Twilight
   4. Substitutions: Not permitted.

C. Residential Casework - Free Standing Community Buildings:
   1. Masco Cabinetry; Merillat Collins.
   2. Material: Birch
   3. Color: Clove
   4. Substitutions: Not permitted.

2.02 HARDWARE

A. Hardware: Manufacturer's standard unless noted otherwise.

B. Drawer and Door Pulls: Liberty Hardware P0270A-SN-C, 3-3/4 inches wide.
   1. Substitutions: Not permitted.

2.03 FABRICATION

A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.

B. Fabricate corners and joints without gaps.

C. Fabricate each unit to be rigid and not dependent on adjacent units for rigidity.

D. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install casework, components and accessories in accordance with manufacturer's instructions.

B. Set casework items plumb and square, securely anchored to building structure.

C. Carefully scribe casework abutting other components.

3.02 ADJUSTING

A. Adjust doors, drawers, hardware, and other moving or operating parts to function smoothly.

3.03 CLEANING

A. Clean casework, countertops, shelves, and hardware.

3.04 PROTECTION

A. Do not permit finished casework to be exposed to continued construction activity.

END OF SECTION

SECTION 123600
COUNTERTOPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work.

B. Countertops for manufactured casework.

1.02 SUBMITTALS

A. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.

B. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.04 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Plastic Laminate Countertops: High-pressure decorative laminate (HPDL) sheet bonded to substrate.
   1. Laminate Sheet: NEMA LD 3, Grade HGS, 0.048 inch nominal thickness.
      a. Manufacturers:
         1) Wilsonart; _____: www.wilsonart.com/#sle.
         2) Substitutions: Not permitted.
   2. Exposed Edge Treatment: Postformed laminate; front edge substrate built up to minimum 1-1/4 inch thick with raised radiused edge, integral coved backsplash with radiused top edge.
   3. Back and End Splashes: Same material, same construction.
   4. Fabricate in accordance with manufacturer's standard requirements.

2.02 MATERIALS

A. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

2.03 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
   1. Join lengths of tops using best method recommended by manufacturer.
   2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
   3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
   1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.

2. Height: 4 inches, unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Attach plastic laminate countertops using screws with minimum penetration into substrate board of 5/8 inch.

C. Seal joint between back/end splashes and vertical surfaces.

3.04 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

C. Field Joints: 1/8 inch wide, maximum.

3.05 CLEANING

A. Clean countertops surfaces thoroughly.

3.06 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 142423
HYDRAULIC PASSENGER ELEVATORS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Hydraulic passenger elevators.

1.02 DESIGN REQUIREMENTS

A. Arrange elevator components in machine room so equipment can be removed for repairs or replaced without dismantling or removing other equipment components.

1.03 SUBMITTALS

A. Product Data: Submit manufacturer/installer's product data, including installation instructions.

B. Shop Drawings: Submit manufacturer/installer's shop drawings, including plans, elevations, sections, and details, indicating location of equipment, loads, dimensions, tolerances, materials, components, fabrication, fasteners, hardware, finish, options, accessories, and other information to render totally functional elevators.

C. Samples: Submit manufacturer/installer's samples of standard colors and finishes of finish materials.

D. Operation and Maintenance Manual: Submit manufacturer/installer's operation and maintenance manual; including operation, maintenance, adjustment, and cleaning instructions; trouble shooting guide; renewal parts catalogs; and electrical wiring diagrams.

E. Warranty: Submit manufacturer/installer's standard warranty.

1.04 QUALITY ASSURANCE

A. Manufacturer/Installer's Qualifications: Specialize in manufacturing and installing elevator equipment, with a minimum of 5 years successful experience.

B. Regulatory Requirements:
   1. Elevator design, clearances, construction, workmanship, materials, and installation, unless specified otherwise, shall be in accordance with ANSI/ASME A17.1, handicap accessibility, Americans with Disabilities Act, and other codes having legal jurisdiction.
   2. ANSI/ASME A17.1 shall govern, except where codes having legal jurisdiction include more rigid requirements or conflict with ANSI/ASME A17.1.
   3. Elevator shall follow design and manufacturing procedures certified in accordance with ISO 9001-2000 to meet product and service requirements for quality assurance for new products.

C. Pre-installation Meeting:
   1. Convene pre-installation meeting before start of installation of elevators.
   2. Require attendance of parties directly affecting work of this section, including Contractor, and elevator manufacturer/installer.
   3. Review examination, installation, field quality control, adjusting, cleaning, protection, and coordination with other work.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer/installer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer/installer.

B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer/installer's instructions.

C. Handling: Protect materials during handling and installation to prevent damage.

1.06 PROJECT CONDITIONS

A. Temporary Electricity:
   1. Owner will arrange for temporary 3-phase electricity to be available for installation of elevator components.

B. Temporary Use of Elevator:
   1. Owner will negotiate with manufacturer/installer for temporary use of elevator, if required.
   2. Temporary use of elevator shall be in accordance with terms and conditions of manufacturer/installer's temporary acceptance form.

1.07 SCHEDULING

A. Coordinate elevator work with work of other trades, for proper time and sequence to avoid construction delays.

1.08 WARRANTY

A. Manufacturer/installer shall guarantee materials and workmanship of equipment installed under these specifications and make good, defects not due to ordinary wear or to improper use, which may develop within 1 year after completion of installation or acceptance thereof by beneficial use, whichever is earlier.

1.09 MAINTENANCE SERVICE

A. Elevator maintenance service shall be performed by elevator manufacturer/installer.

B. Elevators shall receive regular maintenance on each unit for period of 12 months after completion of work specified herein or acceptance thereof by beneficial use, whichever is earlier.

C. Trained employees shall make periodic examinations and perform work including necessary adjusting, greasing, oiling, and replacing parts to keep elevators in operation, except parts that require replacement because of accidents, vandalism, misuse, or negligence by parties other than manufacturer/installer.

D. Manufacturer/installer shall perform all Work, except emergency minor adjustment call-back service, during regular work hours of the elevator trade. Manufacturer/installer shall provide emergency minor adjustment call-back service, during regular working hours.

E. Should Owner request that examinations, cleaning, lubrication, adjustments, repairs, replacements, or emergency minor adjustment call-back service, unless specified herein, be performed on other than manufacturer/installer's regular working hours of regular working days, manufacturer/installer shall absorb straight-time labor charges and Owner will compensate manufacturer/installer for overtime premium, travel time, and expense at standard billing rates.

F. Continuing Maintenance Service: Installer shall provide a continuing maintenance proposal to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on date construction contract maintenance requirements are concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

G. Elevator Control System:
   1. Include built-in remote diagnostic module to relay constant status of elevators and control system to a 24-hour, 7-days-a-week central-monitoring facility.
   2. Remote Monitoring Device: Transmit information on the status of elevator(s), including malfunctions, system errors, and shutdown.

PART 2 - PRODUCTS

2.01 MANUFACTURER/INSTALLER

A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
   1. Schindler Elevator Corporation, 330A 4500 lb or equivalent, Website www.us.schindler.com.

B. Elevator shall be installed by elevator manufacturer.

2.02 ELEVATOR SYSTEM AND COMPONENTS

A. Hydraulic Passenger Elevators: Model 330A

B. Elevator Equipment Summary:
   1. Application: Hole-less Dual Piston

2. Service: Hospital/service- Class A Loading
3. Quantity: 1 Unit
4. Capacity: 4500 lbs.
5. Speed: 100 Fpm
6. Travel: _____
7. Landings: 3
8. Front Openings: 3
9. Rear Openings: 0
10. Operation: Microprocessor Single Car Automatic Operation
11. Machine Room: Adjacent To Elevator Hoistway
12. Platform Size: 6'-0" Wide x 8'-9" Deep
13. Door Type: Two Speed Side Opening
14. Cab Height: 8'-0"
15. Guide Rails: Equivalent to 16 lb. per foot
16. Hoistway Entrances: 4'-0" Wide x 7'-0" high doors
17. Power Supply: 208 Volts 3 Phase 60 Hz

C. Elevator Components:
1. Anti-stall feature.
2. Braille and audible signals.
3. Door open and close stall protection.
4. Emergency lighting.
5. Firefighter's Service: Sensors as specified in Section _____.
6. Independent service feature.
7. Infrared light curtain door protection.
8. Low oil return.
9. Overload sensors.
10. Phase protection.
11. Soft Start Electronic Starting
12. Emergency Power.
13. Locking Service Panel in Car Operating Panel.
14. Pressure Switch.
15. Remote Monitoring Capable.
16. Telephone (ADA compliant).

2.03 ELEVATOR MATERIALS

A. Finish:
1. Stainless Steel and Bronze: #4 satin or #8 mirror finish.
2. Baked Enamel Colors: Manufacturer/installer's standard color selections.
3. Exposed Aluminum Frames in Suspended Ceilings: Anodized.

B. Plastic Laminates:
1. Type: General purpose.
2. Flame Spread Ratings: As required by code.
3. Pattern: Select from elevator manufacturer/installer’s standard selection.

C. UL or CSA Approved: Motors, pumps, valves, fluid tank, hydraulic fluid, microprocessor controller, controls, pushbuttons, and wiring.

D. Spring Buffers, Attachment Brackets, and Anchors: Design and size according to building code with safety factors.

E. Pump: Positive displacement screw type, design for steady discharge with minimal pulsations.

F. Muffler: Reduce noise transmission.

G. Telescopic Hole-less Jack System:
1. Jack Cylinder: Two jacks, one located at each side of the car and mounted to the elevator car structure.

2. Synchronization of Jack Stages: Direct mechanical means to ensure elevator moves at steady speed and provides smooth ride.

2.04 ELEVATOR CABS

A. Height: 8' 0" from finished floor to underside of canopy.

B. Elevator Car Enclosure Wall Sections:
   1. Cab Wall: Steel - Painted Finish.

C. Base, Frieze, and Reveals: None.

D. Ceiling:
   1. Suspended with exposed frame with aluminum egg crate lay-in panels.
   2. Lighting: Fluorescent Lighting.

E. Cab Returns: Integral construction.
   1. Finish: #4 Stainless Steel.

F. Transoms:
   1. Run full width of cab.
   2. Finish: #4 Stainless Steel.

G. Cab Doors:
   1. Flush design both sides.
   2. Rib construction.
   3. Finish: #4 Stainless Steel.

H. Exhaust Fan:
   1. Single speed.
   2. Mount in cab transom or canopy.

I. Handrail:
   1. 1/2" X 2" Flat In #4 Stainless Steel.
   2. Mount on Rear Wall.

J. Threshold: Aluminum.

K. Cab Finish Flooring: As specified in Section _____.

L. Furnish one (1) set of quilted, soil resistant and fire-retardant pads with appropriate fasteners.

2.05 HOISTWAY ENTRANCES

A. Hoistway Doors and Frames:
   1. UL rated with required fire rating.
   2. Doors: Rigid flush panel construction with sound-deadening material.
   3. Frames: Securely fasten at corners to form unit frame. Frames shall be bolted.

B. Exposed Areas of Corridor Frames: #4 Stainless Steel - All Floors

C. Doors: SS#4 Stainless Steel - All Floors

D. Sills: Aluminum

2.06 CAB FIXTURES

A. Main Car Operating Panel:
   1. Mount in return.
   2. Comply with handicap requirements.
   3. Include pushbuttons and illuminating indications for each floor served.
   4. Emergency Buttons and Switches: Provide in accordance with code.
   5. Switches for car light and accessories.

B. Cab Fixtures:
   1. Car Lantern(s).
   2. Digital Car Position Indicator.
   3. Locking Service Panel in Car Operating Panel.
   4. Telephone (ADA compliant).

2.07 HALL FIXTURES

A. Pushbuttons:
   1. Up button and down button at intermediate floors.
   2. Single button at each terminal floor.
   3. Height: Comply with handicap requirements.

B. Hall Fixture Finish: Black Lexan®.

C. Fixture Cover Plates: Mount with tamper-resistant screws in same finish as fixture.

2.08 AUXILIARY OPERATIONS: IN ADDITION TO PRIMARY OPERATION SYSTEM FEATURES, PROVIDE THE FOLLOWING OPERATIONAL FEATURES FOR ELEVATORS WHERE INDICATED:

A. Single-Car Battery-Powered Lowering: When power fails, car is lowered to the lowest floor, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.

B. Pit ladder for a 4’-0” elevator pit provided by elevator contractor.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine hoistways, hoistway openings, pits, and machine rooms before starting elevator installation.

B. Verify hoistway, pit, machine room, and openings are of correct size, within tolerances, and are ready for work of this section.

C. Verify walls and sill supports are plumb, where openings occur.

D. Verify hoistway is clear and plumb, with maximum variation of 1/2" at any point.

E. Verify minimum 2-hour fire-resistance rating of hatch walls.

F. Notify Architect in writing of dimensional discrepancies or other conditions detrimental to proper installation or performance of elevators.

G. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to manufacturer/installer.

3.02 INSTALLATION

A. Install elevators in accordance with manufacturer/installer’s instructions and ANSI/ASME A17.1.

B. Set entrances in vertical alignment with car openings and aligned with plumb hoistway lines.

3.03 FIELD QUALITY CONTROL

A. Perform tests of elevator as required by ANSI/ASME A17.1 and governing codes.

3.04 ADJUSTING

A. Adjust elevators for proper operation in accordance with manufacturer/installer’s instructions.

B. Adjust elevators for smooth acceleration and deceleration of car so not to cause passenger discomfort.

C. Adjust doors to prevent opening of doors at landing on corridor side, unless car is at rest at that landing, or is in leveling zone and stopping at that landing.

D. Adjust automatic floor leveling feature at each floor to within 1/4 inch of landing.

E. Repair minor damages to finish in accordance with manufacturer/installer’s instructions and as approved by Architect.

F. Remove and replace damaged components that cannot be successfully repaired as determined by Architect.

3.05 CLEANING

A. Clean elevators promptly after installation in accordance with manufacturer/installer’s instructions.

B. Do not use harsh cleaning materials or methods that could damage finish.

3.06 PROTECTION

A. Protect installed elevators from damage during construction.

END OF SECTION 142423

DIVISION 21
TABLE OF CONTENTS

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SECTION 210010 – FIRE SUPPRESSION PROVISIONS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. All contract documents including drawings, alternates, addenda and modifications and general provisions of the Contract, including General and Supplementary Conditions and all other Division Specification Sections, apply to work of this section. All preceding and following sections of this specification division are applicable to the Sprinkler Contractor, all sub-contractors, and all material suppliers.

1.2. SCOPE OF WORK

A. This DIVISION requires the furnishing and installing of complete functioning Sprinkler systems, and each element thereof, as specified or indicated on Drawings or reasonably inferred, including every article, device or accessory reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the Work include materials, labor, supervision, supplies, equipment, transportation, and utilities.
B. In case of an inconsistency between the Drawings and Specifications or within either document, the better quality or the greater quantity of work shall be provided in accordance with the Architect or Engineer’s interpretation.
C. Refer to Architectural, Structural, Mechanical, Electrical and Plumbing Drawings and all other contract documents and to relevant equipment drawings and shop drawings to determine the extent of clear spaces and make all offsets required to clear equipment, beams and other structural members to facilitate concealing piping in the manner anticipated in the design.

1.3. SPECIFICATION FORM AND DEFINITIONS

A. The Engineer indicated in these specifications is Pearson Kent McKinley Raaf Engineers LLC. 13300 W 98th Street, Lenexa, KS 66215, PHONE 913-492-2400, EMAIL admin@pkmreng.com.
B. Contractor, wherever used in these specifications, shall mean the Company that enters into contract with the Owner to perform this section of work.
C. When a word, such as “proper”, “satisfactory”, “equivalent”, and “as directed”, is used, it requires the Architect-Engineer’s review.
D. "PROVIDE" means to supply, purchase, transport, place, erect, connect, test, and turn over to Owner, complete and ready for regular operation, the particular Work referred to.
E. "INSTALL" means to join, unite, fasten, link, attach, set up, or otherwise connect together before testing and turning over to Owner, complete and ready for regular operation, the particular Work referred to.
F. "FURNISH" means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories, and all other items customarily required for the proper and complete application for the particular Work referred to.
G. "WIRING" means the inclusion of all raceways, fittings, conductors, connectors, tape, junction and outlet boxes, connections, splices, and all other items necessary and/or required in connection with such Work.
H. "CONDUIT" means the inclusion of all fittings, hangers, supports, sleeves, etc.
I. "AS DIRECTED" means as directed by the Architect/Engineer, or his representative.
J. "CONCEALED" means embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed above hung ceilings.

1.4. QUALIFICATIONS

A. The contractors responsible for work under this section shall have completed a job of similar scope and magnitude within the last 3 years. The contractors shall employ an experienced, competent and adequate work force licensed in their specific trade and properly supervised at all times. Unlicensed workers and general laborers shall be adequately supervised to insure competent and quality work and workmanship required by this contract and all other regulations, codes and practices. At all times the contractors shall comply with all applicable local, state and federal guidelines, practices and regulations. Contractor may be required to submit a statement of qualifications upon request before any final approval and selection. Failure to be able to comply with these requirements is suitable reason for rejection of a bid.

1.5. LOCAL CONDITIONS

A. The contractor shall visit the site and determine the existing local conditions affecting the work required. Failure to determine site conditions or nature of existing or new construction will not be considered a basis for granting additional compensation.

1.6. CONTRACT CHANGES

A. Changes or deviations from the contract documents; including those for extra or additional work must be submitted in writing for review of Architect-Engineer. No verbal change orders will be recognized.

1.7. LOCATIONS AND INTERFERENCES

A. Locations of equipment, piping and other sprinkler work are indicated diagrammatically by the drawings. The Contractor shall determine the exact locations on site, subject to structural conditions, work of other Contractors, and access requirements for installation and maintenance to approval of Architect-Engineer. Provide additional piping and ductwork offsets as required at no additional cost.
B. Study and become familiar with the contract drawings of other trades and in particular the general construction plans and details in order to obtain necessary information for figuring installation. Cooperate with other contractors and install work in such a way as to avoid interference with their work. Minor deviations, not affecting design characteristics, performance or space limitation may be permitted if reviewed prior to installation by Architect-Engineer.
C. Any pipe, ductwork, equipment, apparatus, appliance or other item interfering with proper placement of other work as indicated on drawings, specified, or required, shall be removed, relocated and reconnected without extra cost. Damage to other work caused by this Contractor, the Subcontractor, or workers shall be restored as specified for new work.
D. Do not scale drawings for dimensions. Contractor shall accurately layout work from the dimensions indicted on the Architectural drawings unless they are found to be in error.

1.8. PERFORMANCE

A. Final acceptance of work shall be subject to the condition that all systems, equipment, apparatus and appliances operate satisfactorily as designed and intended. Work shall include required adjustment of systems and control equipment installed under this specification division.
B. The Contractor warrants to the Owner and Architect-Engineer the quality of materials, equipment, workmanship and operation of equipment provided under this specification division for a period of one year from and after completion of building and acceptance of sprinkler systems by Owner.

1.9. WARRANTY

A. The Contractor warrants to the Owner and Architect-Engineer that upon notice from them within a one year warranty period following date of acceptance, that all defects that have appeared in materials and/or workmanship, will be promptly corrected to original condition required by contract documents at Contractor's expense.
B. The above warranty shall not supersede any separately stated warranty or other requirements required by law or by these specifications.

1.10. ALTERNATES

A. Refer to General Requirements for descriptions of any alternates that may be included.

1.11. MATERIALS, EQUIPMENT AND SUBSTITUTIONS

A. The intent of these specifications is to allow ample opportunity for Contractor to use his ingenuity and abilities to perform the work to his and the Owner's best advantage, and to permit maximum competition in bidding on standards of materials and equipment required.
B. Material and equipment installed under this contract shall be first class quality, new, unused and without damage.
C. In general, these specifications identify required materials and equipment by naming one or more manufacturer's brand, model, catalog number and/or other identification. The first named manufacturer or product is used as the basis for design; other manufacturers named must furnish products consistent with specifications of first named product as determined by Engineer. Base bid proposal shall be based only on materials and equipment by manufacturers named, except as hereinafter provided.
D. Where materials or equipment are described but not named, provide required items of first quality, adequate in every respect for intended use. Such items shall be submitted to Architect-Engineer for review prior to procurement.
E. Materials and equipment proposed for substitutions shall be equal to or superior to that specified in construction, efficiency, utility, aesthetic design, and color as determined by Architect-Engineer whose decision shall be final and without further recourse. Physical size of substitute brand shall be no larger than space provided including allowances for access for installation and maintenance. Requests must be accompanied by two copies of complete descriptive and technical data including manufacturer's name, model and catalog number, photographs or cuts, physical dimensions, operating characteristics and any other information needed for comparison.
F. If the Contractor wishes to incorporate products other than those named in the Base Bid Specifications they shall submit a request for approval of equivalency in writing no later than (10) ten calendar days prior to bid date. Substitutions after this may be refused at Engineers option. Equivalents will ONLY be considered approved when listed by addendum.
G. In proposing a substitution prior to or subsequent to receipt of bids, include in such bid the cost of altering other elements of this project, including adjustments in sprinkler or electrical service requirements necessary

to accommodate such substitution.

H. Within 10 working days after bids are received, the apparent low bidder shall submit to the Architect-Engineer for approval, three copies of a list of all major items of equipment they intend to provide. Within 30 working days after award of Contract, Contractor shall submit shop drawings for equipment and materials to be incorporated in work, for Architect-Engineer review. Where 30-day limit is insufficient for preparation of detailed shop drawings on major equipment or assemblies, Contractor shall submit manufacturer's descriptive catalog data and indicate date such detailed shop drawings will be submitted along with manufacturer's certification that order was placed within 30 working day limit.

1.12. ELECTRONIC PLAN FILES

A. Electronic files of the contract documents may be available from the Engineer to successful bidders and manufacturers for a fee of $50 per sheet, $100 minimum and $25 email/shipping charge. A release of liability form will be required along with payment prior to release of files.

1.13. OPENINGS, ACCESS PANELS AND SLEEVES

A. This Contractor shall include the installation of all boxes, access panels and sleeves for openings required to install this work, except structural openings incorporated in the structural drawings. Sleeves shall be installed for all pipes passing through structural slabs and walls. Contractor shall set and verify the location of sleeves that pass through beams, as shown on structural plans. All floor and wall penetrations shall be sealed to meet fire-rating requirements.

B. All penetrations through interior or exterior and rated or non-rated walls and floors shall be appropriately sealed prevent entry and movement of rodents and insects. Contractor shall coordinate their work with all other trades.

1.14. ARCHITECTURAL VERIFICATION AND RELATED DOCUMENTS

A. Contractor shall consult all Architectural Drawings and specifications in their entirety incorporating and certifying all millwork, furniture, and equipment rough-in including utility characteristics such as voltage, phase, amperage, pipe sizes, duct sizes, including height, location and orientation. Shop drawings incorporating these requirements should be submitted to the Architect for approval prior to installation or rough in.

1.15. EXTENT OF CONTRACT WORK

A. Provide sprinkler systems indicated on drawings, specified or reasonably implied. Provide every device and accessory necessary for proper operation, code compliance and completion of sprinkler systems. In no case will claims for "Extra Work" be allowed for work about which Contractor could have been informed before bids were taken.

B. Contractor shall become familiar with equipment provided by other contractors that require sprinkler connections and controls.

C. Electrical work required to install, monitor and control sprinkler systems and equipment, which is not shown on plans or specified under Division 26, shall be included in Contractor's base bid proposal.

D. The cost of larger wiring, conduit, control and protective devices resulting from installation of equipment which was not used for basis of design as outlined in specifications shall be paid for by Sprinkler Contractor at no cost to Owner or Architect-Engineer.

E. Contractor shall be responsible for providing supervision to Electrical Contractor to insure that required connections, interlocking and interconnection of sprinkler and electrical equipment are made to attain intended control sequences and system operation.

F. Furnish four complete sets of electrical wiring diagrams to Architect-Engineer to be included in the maintenance manuals and three complete sets to Electrical Contractor. Diagrams shall show factory and field wiring of components and controls. Control devices and field wiring to be provided by Electrical Contractor shall be clearly indicated by notation and drawing symbols on wiring diagrams.

G. Contractor shall obtain complete electrical data on sprinkler shop drawings and shall list this data on an approved form that shall be presented monthly or on request, to Electrical Contractor. Data shall be complete with wiring diagrams received to date and shall contain necessary data on electrical components of sprinkler equipment such as HP, voltage, amperes, watts, locked rotor current to allow Electrical Contractor to order electrical equipment required in his contract.

1.16. WORK NOT INCLUDED IN CONTRACT

A. Consult Division 16 of specifications for work to be provided by Electrical Contractor in conjunction with installation of sprinkler equipment.

1.17. CODES, RULES AND REGULATIONS

A. Provide Work in accordance with applicable codes, rules and regulations of Local and State, Federal Governments and other authorities having lawful jurisdiction.

B. Conform to latest editions and supplements of following codes, standards or recommended practices.
C. BUILDING CODES:

1. International Codes (Latest adopted version of applicable codes)

D. SAFETY CODES:

1. National Electrical Safety Code Handbook H30 - National Bureau of Standards.
2. Occupational Safety and Health Standard (OSHA) - Department of Labor.

E. NATIONAL FIRE CODES:

1. NFPA No. 13 Standard for the installation of Sprinkler Systems
2. NFPA No. 14 Standard for the installation of Standpipe and Hose Systems
3. NFPA No. 70 National Electrical Code
4. NFPA No. 101 Life Safety Code

F. UNDERWRITERS LABORATORIES INC:

1. All materials, equipment and component parts of equipment shall bear UL labels whenever such devices are listed by UL.

G. MISCELLANEOUS CODES:

1. ANSI A117.1 - Handicapped Accessibility
2. Americans with Disabilities Act (ADA)

1.18. STANDARDS

A. Drawings and specifications indicate minimum construction standard. Should any work indicated be sub-standard to any ordinances, laws, codes, rules or regulations bearing on work, Contractor shall promptly notify Architect-Engineer in writing before proceeding with work so that necessary changes can be made. However, if the Contractor proceeds with work knowing it to be contrary to any ordinances, laws, rules, and regulations, Contractor shall thereby have assumed full responsibility for and shall bear all costs required to correct non-complying work.

1.19. PERMITS/FEES

A. The Contractor shall secure and pay for necessary permits and certificates of inspection required by governmental ordinances, laws, rules or regulations. Keep a written record of all permits and inspection certificates and submit two copies to Architect-Engineer with request for final inspection.
B. The Contractor shall include in their base bid any fees or charges by the local utility providers to establish new services to the structure. Coordinate with the utility suppliers to verify exactly which part of the work required for the new utility service, is to be performed by the contractor and which part will be supplied by the utility company.

PART 2 - PRODUCTS

2.1. Not Used

PART 3 - EXECUTION

3.1. SUBMITTALS

A. Contractor shall furnish submittals of all materials and equipment required by the specifications. Refer to each specification section for the submittals (if any) required for that section.
B. Submittal format shall be as indicated below. Submittals not meeting these requirements will be returned without action for re-submittal.

1. Submittals shall be furnished in an Adobe PDF format.
2. Submittals shall be per individual submittal section, as listed in the table of contents. All required submittals within that section shall be grouped together in a single submittal.

   a. Furnishing submittals by division or by individual item may result in delayed reviewing of the submittal(s) due to additional administrative time required to process the large size and/or quantity of files.

3. Submittals shall have a cover page containing the following information: The project name, the applicable specification section and paragraph, the submittal date, and the Contractor's stamp (see below for requirements).
4. Mark each submitted item as applicable with scheduled mark, name, etc. corresponding to the plans.
5. Where generic catalog cuts are submitted for review, conspicuously mark or provide schedule of equipment, capacities, controls, fitting sizes, etc. that are to be provided. Each catalog sheet shall

bear the equipment manufacturer's name and address.

6. Where equipment submitted does not appear in base specifications or specified equivalent, mark submittals with applicable alternate numbers, change order number or letters of authorization.
7. All submittals on materials and equipment listed by UL shall indicate UL approval on submittal.

C. Contractor review:

1. Contractor shall check all submittals to verify that they meet specifications and/or drawings requirements before forwarding submittals to the Architect-Engineer for their review. All submittals submitted to Architect-Engineer shall bear contractor's approval stamp that shall indicate that Contractor has reviewed submittals and that they meet specification and/or drawing requirements. Contractor's submittal review shall specifically check for but not be limited to the following: equipment capacities, physical size in relation to space allowed; electrical characteristics, provisions for supply, return and drainage connections to building systems. All submittals not meeting Contractor's approval shall be returned to their supplier for re-submittal.
2. No submittals will be considered for review by the Architect-Engineer without Contractor's approval stamp, or that have extensive changes made on the original submittal as a result of the Contractor's review.
3. Before submitting shop drawings and material lists, verify that all equipment submitted is mutually compatible and suitable for the intended use. Verify that all equipment will fit the available space and allow ample room for maintenance. If the size of equipment furnished makes necessary any change in location, or configuration, submit a shop drawing showing the proposed layout.

D. Review Schedule:

1. The shop drawing / submittal dates shall be at least as early as required to support the project schedule and shall also allow for two weeks Architect-Engineer review time plus a duplication of this time for re-submittal if required.
2. Submittal of all shop drawings as soon as possible after permitting approval but before construction starts is preferred.
3. Approval of shop drawings submitted prior to receipt of a permit for that respective scope of work should be considered conditional pending review/approval of the construction documents by the AHJ. Changes required to the submittal as a result of permitting comments received after architect's/engineer's review shall not be a justification for a change in price.
4. Any time delay caused by correcting and re-submitting submittals/shop drawings will be the Contractor's responsibility.

E. The Architect's-Engineer's checking and subsequent review of such drawings, schedules, literature, or illustrations shall not relieve the Contractor from responsibility for deviations from Drawings or Specifications unless he has, in writing, called the Architect's-Engineer's attention to such deviations at the time of submission, and secured their written approval; nor shall it relieve the contractor from responsibility for errors in dimensions, details, size of members, or omissions of components for fittings; or for coordinating items with actual building conditions and adjacent work.

F. Any corrections or modifications made by the Architect-Engineer shall be deemed acceptable to the Contractor at no change in price unless written notice is received by the Architect-Engineer prior to the performance of any work incorporating such corrections or modifications.

G. Submittals that require re-submission shall have the items that were revised "flagged" or in some other manner marked to call attention to what has been changed.

H. Coordination

1. After shop drawings have been reviewed and approved by all parties, transmit a set of submittals to each other trade (eg Plumbing, Mechanical, Electrical, Controls, etc) that will interface with installation. Each other contractor shall review the submittal for coordination and return a stamped submittal indicating they have reviewed the submittal for coordination purposes.

3.2. SHOP DRAWINGS

A. Shop drawings shall meet all of the above requirements for submittals.

B. Contractor shall submit Adobe PDF sets of all fabrication drawings. Cost of drawing preparation, printing and distribution shall be paid for by the contractor and included in his base bid.

C. No work shall be fabricated until Architect-Engineer's review has been obtained.

D. Sprinkler shop drawings for main entrance and detailed areas shall be a minimum of 1/4" scale. Drawings shall show details of the following: Plans, elevations above finished floor, sections, components, and attachments to other work. Sprinkler layout indicating sizes on plans, fittings, penetrations through fire-rated and other partitions, hangers and supports, including methods for building attachment, vibration isolation, and any required seismic restraints.

3.3. OPERATING AND MAINTENANCE INSTRUCTIONS (O & M MANUALS)

A. Submit with shop drawings of equipment, four copies of installation, operating, maintenance instructions, and parts lists for equipment provided. Equipment manufacturer shall prepare instructions.
B. Keep in safe place, keys and wrenches furnished with the equipment provided under this contract. Present to the Owner and obtain a receipt for them upon completion of project.
C. Prepare a complete brochure, covering systems and equipment provided and installed under this contract. Submit brochures to Architect-Engineer for review before delivery to Owner. Brochures shall contain following:

1. Certified equipment drawings/or catalog data with equipment provided clearly marked as outlined above.
2. Record copy of all submittals indicating actual equipment installed indicating options, characteristics. Copies of submittals shall bear the stamps of all parties that reviewed submittals.
3. Complete installation, operating, maintenance instructions and parts lists for each item of equipment.
4. Special emergency operating instructions with a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to various parts of sprinkler system.

D. Provide brochure bound in black vinyl three-ring binders with metal hinge. Reinforce binding edge of each sheet of loose-leaf type brochure to prevent tearing from continued usage. Clearly print on label insert of each brochure:

1. Project name and address.
2. Section of work covered by brochure, i.e., Fire Suppression.

3.4. RECORD DOCUMENTS

A. During construction, keep an accurate record of all deviations between the work as shown on Drawings and that which is actually installed. Keep this record set of prints at the job site for review by the Architect/Engineer.
B. Upon completion of the installation and acceptance by the owner, transfer all record drawing information to one neat and legible set of prints. Then deliver them to the Architect/Engineer for transmittal to the Owner.
C. Provide one copy of on high quality heavy weight presentation type paper. Blueprints or other media which fade shall not be used.
D. Provide one electronic scanned version of record documents in Adobe PDF format – PDFs may be submitted on electronic media (DVD, USB) or via an FTP or other file sharing site. Provide electronic copies in conjunction with hard copy documents.

3.5. CLEANING UP

A. Contractor shall take care to avoid accumulation of debris, boxes, crates, etc., resulting from the installation of his work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean.
B. Contractor shall clean up all ductwork and equipment at the completion of the project.
C. All equipment, cabinets and enclosures shall be thoroughly vacuumed clean prior to energizing equipment and at the completion of the project. Equipment shall be opened for observation by the Architect/Engineer as required.

3.6. WATERPROOFING

A. Avoid, if possible, the penetration of any waterproof membranes such as roofs, machine room floors, basement walls, and the like. If such penetration is necessary, perform it prior to the waterproofing and furnish all sleeves or pitch-pockets required. Advise the Architect/Engineer and obtain written permission before penetrating any waterproof membrane, even where such penetration is shown on the Drawings.
B. If Contractor penetrates any walls or surfaces after they have been waterproofed, he shall restore the waterproof integrity of that surface as directed by the Architect/Engineer at his own expense

3.7. CUTTING AND PATCHING

A. Contractor shall do cutting and patching of building materials required for installation of work herein specified. Do not cut or drill through structural members including wall, floors, roofs, and supporting structure, without the Architect's and Structural Engineer's approval and in a manner approved by them.
B. Make openings in concrete with concrete hole saw or concrete drill. Use of star drill or air hammer for this work will not be permitted.
C. Patching shall be by the contractors of the particular trade involved and shall meet approval of Architect-Engineer. Damage to building finishes, caused by installation of sprinkler work shall be repaired at Sprinkler Contractor's expense to approval of Architect-Engineer.

3.8. SETTING, ADJUSTMENT AND EQUIPMENT SUPPORTS

A. Work shall include mounting, alignment and adjustment of systems and equipment. Set equipment level on adequate foundation and provide proper anchor bolts and isolation as shown, specified or required by manufacturers in installation instructions. Level, shim and grout equipment bases as recommended by manufacturer. Mount motors, align and adjust drive shafts and belts according to manufacturer's instructions.
B. Equipment failures resulting from improper installation or field alignment shall be repaired or replaced by Contractor at no cost to Owner.
C. Floor or pad mounted equipment shall not be held in place solely by its own dead weight. Include anchor fastening in all cases.
D. Provide floor or slab mounted equipment with 3-1/2” high concrete bases unless specified otherwise. Sprinkler contractor shall form all pads; General contractor shall provide and place all concrete and reinforcing for said pads. Individual concrete pad shall be no less than 4” wider and 4” longer than equipment, and shall extend no less than 2” from each side of equipment.
E. Provide each piece of equipment or apparatus suspended from ceiling or mounted above floor level with suitable structural support, platform or carrier in accordance with best-recognized practice. Verify that structural members of buildings are adequate to support equipment and unless otherwise indicated on plans or specified, arrange for their inclusion and attachment to building structure. Provide hangers with vibration isolators.
F. Submit details of hangers, platforms and supports together with total weights of mounted equipment to Architect-Engineer for review before proceeding with fabrication or installation.

3.9. START-UP, CHANGEOVER, TRAINING AND OPERATIONAL CHECK

A. Contractor shall perform the initial start-up of the systems and equipment and shall provide necessary supervision and labor to make the first seasonal changeover of systems. Personnel qualified to start-up and service this equipment, including manufacturer's technicians, and the Owner’s operating personnel shall be present during these operations.
B. Contractor shall be responsible for training Owner’s operating personnel to operate and maintain the systems and equipment installed. Keep a record of training provided to Owner’s personnel listing the date, subject covered, instructors name, names of Owner’s personnel attending and total hours of instruction given each individual.
C. All owner-training sessions shall be orderly and well organized and shall be video recorded digitally. At the end of the owner training, the “training” session recording shall be transmitted to the owner via DVD and shall become property of the owner.

3.10. FINAL CONSTRUCTION REVIEW

A. At final construction review, each respective Contractor and major subcontractors shall be present or shall be represented by a person of authority. Each Contractor shall demonstrate, as directed by the Architect-Engineer, that the work complies with the purpose and intent of the contract documents. Respective Contractor shall provide labor, services, instruments or tools necessary for such demonstrations and tests.

END OF SECTION 210010

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SECTION 210011 – BASIC FIRE SUPPRESSION MATERIALS AND METHODS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 210010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS

2.1. MOTORS

A. Motors shall be installed in strict accordance with rules set forth by NEC and equipment manufacturer.
B. ELECTRIC MOTORS (Less than ½ HP)

1. Motors 1/3 horsepower and smaller shall be selected by manufacturer of driven equipment with motor speed and torque characteristics best suited for application.
2. Motors shall have a minimum service factor of 1.15 for open dripproof enclosure and 1.00 for totally enclosed motors. Wherever applicable provide motors with cushion bases. Motor enclosure shall be proper type required for operating environment.
3. Motors shall have a plus or minus 10% voltage tolerance and plus or minus 5% frequency tolerance. Motors shall operate satisfactorily in ambient temperature range of 0 degrees C (32°F) to 140°C (104°F) at altitudes below 3300 feet.
4. Provide motors with built-in thermal overload protection. Motors readily accessible to operating personnel shall have manual reset protector. All other shall have automatic reset protectors.
5. Motors shall have AFBMA standard double-shielded ball bearings sized for average life of at least 100,000 hours under normal loading conditions. Bearings housing shall have provisions for adding new lubricant without major disassembly and shall have seals to prevent entrance of foreign matter and leakage of bearing lubricant.
6. Motor bolts, screws and other external hardware shall be treated with corrosion resistant plating and motor enclosure prime painted with corrosion resistant metal primer finished with a durable machinery enamel.
7. Unless indicated otherwise motors shall be rated for continuous operation at 115, 200, or 277 volt single phase 60 hertz. Where equipment manufacturer offers a choice provide permanent split capacitor motors in lieu of shaded pole motors.
8. Motor leads shall be marked throughout entire length for easy identification and terminate with brass or copper terminal lugs. Motor shall have permanently attached nameplate with electrical characteristics and wiring connection diagram.

C. ELECTRIC MOTORS (1/2 HP and Larger)

1. Provide equipment requiring electric motors with NEMA Standard motors. Shop drawings, submitted and equipment provided with electric motors shall include motor manufacturer, horsepower, voltage, full load amperes, NEMA design type, insulation class, shaft bearing type, mounting base type, and enclosure type. To greatest extent possible motors for this project shall be by one manufacturer.
2. Motors shall conform to current NEMA Standard MG1. Motor shall operate successfully without derating under the following conditions.
3. 40 degrees C (104°F) maximum ambient temperature, 3,300 Ft. maximum altitude, voltage variations of plus or minus 10% of nameplate rating, frequency variations of plus or minus 5% of nameplate rating, combined voltage and frequency variation of plus or minus 10% total as long as frequency does not exceed plus or minus 5%.
4. Motors shall meet or exceed locked rotor (Starting) and breakdown (maximum) torques specified for the NEMA design rating. Lock rotor currents shall not exceed NEMA maximum values for motor NEMA design rating.
5. Motor service factors shall be 1.15 for open dripproof motors and 1.00 for totally enclosed motors.
6. Unless indicated otherwise, motor insulation may be manufacturers standard for Class A, B or F provided that maximum permissible temperature for insulation is not exceeded when motor is operating at its service factor load in a 40 Degrees C (104°F) ambient.
7. Motor frame/HP relationship shall conform to current NEMA Standard for “T” frames. Motors shall have antifriction ball or roller bearings sized for average life of at least 100,000 hours under normal v-belt loading conditions. Bearings shall be AFBMA Standard and shield mounted ball bearings of ample capacity for motor rating. Bearing housing shall have provisions for adding new lubricant and draining out old lubricant without major motor disassembly. Bearing housing shall have seals to protect bearing from entrance of foreign matter and to prevent leakage of bearing lubricant.

8. Conduit box mounting shall rotate to allow conduit entrance from top, bottom or either side. Conduit holes shall conform to NEC Standards.
9. Motor leads shall have same insulation class as motor windings. Leads shall be marked throughout entire length for easy identification and terminated with brass or copper terminal lugs. Motor shall have permanently attached nameplate with electrical characteristics and wiring connection diagram.
10. Motor bolts, screws and other external hardware shall be treated with a corrosion resistant plating. Motor enclosure shall be prime painted with corrosion resisting metal primer and finished with a durable machinery enamel paint.
11. Unless indicted otherwise motors shall be rated for continuous operation at rated voltage, three phase, 60 hertz. Motors shall be T-frame squirrel cage induction. Type NEMA design B with Class B insulation. Motors shall be dripproof totally enclosed or explosion-proof as required by motor environment.

PART 3 - EXECUTION

3.1. TESTING PROCEDURES FOR PIPING SYSTEMS

A. Test all lines and systems before they are insulated, painted or concealed by construction or backfilling. Provide fuel, water, electricity, materials, labor and equipment required for tests.
B. Where entire system cannot be tested before concealment, test system in sections. Verify that system components are rated for maximum test pressures to be applied. Where specified test pressures exceed component ratings, remove or isolate components from system during tests. Upon completion, each system shall be tested as an entire system.
C. Repair or replace defects, leaks and material failures revealed by tests and then retest until satisfactory. Make repairs with new materials.
D. All systems shall hold scheduled test pressures for specified time without loss of initial test pressure.
E. Upon completion of testing submit five copies of a typewritten report to A/E. Report shall list systems tested, test methods, test pressures, holding time and all failures with corrective action taken.
F. For test pressure schedules see Section 15100 of this specification.

3.2. TEST METHODS AND PRESSURES

A. Test methods and pressures shall be as follows:

1. Hydrostatic Test (Closed Systems):

   a. Hydrostatic test shall be performed using clean unused domestic water. Test pressures shall be as scheduled for system or 150% of operating pressure where not specified.

2. Hydrostatic Test (Open System):

   a. Test entire system with 10-foot head of water. Where system is tested in sections each joint in building except uppermost 10 feet of system shall be submitted to at least 10-foot head of water. Water shall be held in system for 15 minutes before inspection starts. System shall hold test pressure without leaks.

3. Pneumatic Test:

   a. Test entire system with compressed air. Systems operating above 25 PSI shall be tested at 75 PSI or 15% of operating pressure or whichever is greater.
   b. Allow at least 1 hour after test pressure has been applied before making initial test.
   c. Curing test, completely isolate entire system from compressor or other sources of air pressure.

4. Pressure Relief and Safety Valve:

   a. Before installation, test pressure temperature, and safety relief valves to confirm relief settings comply with specifications.
   b. Tag items that pass test with date of test, observed relief pressure setting and inspector’s signature.
   c. Items installed in systems without test tag attached will be rejected.

3.3. CLEANING OF SYSTEMS AND EQUIPMENT

A. After pressure testing of systems and equipment and before operational test thoroughly clean interiors of piping and equipment. Clean equipment as recommended by equipment manufacturers. Where specific instructions are not provided clean equipment systems as follows:

3.4. MAINTENANCE OF SYSTEMS

A. Contractor shall be responsible for operation, maintenance and lubrication of equipment installed under this contract.
B. Keep a complete record of equipment maintenance and lubrication and submit two copies with request for final construction review.
C. Records shall indicate types of lubricants used and date or time when next maintenance or lubrication will need to be performed by Owner. Where special lubricants are required, Contractor shall provide Owner with a one year supply as determine by Equipment Manufacturer's recommendations.

3.5. PAINTING OF MATERIALS AND EQUIPMENT

A. Touch-up painting and refinishing of factory applied finishes shall be by Sprinkler Contractor. Contractor shall be responsible for obtaining proper type of painting materials and color from equipment manufacturer.
B. Unless specified otherwise factory built equipment shall be factory painted. Paint shall be applied over surfaces only after they have been properly cleaned and coated with a corrosion resistant primer.
C. After installation, damage to painted surfaces shall be properly prepared and primed with primers equal to factory materials. Finish coating shall be same color and type as factory finish.
D. Where extensive refinishing is required equipment shall be completely repainted.

3.6. PIPING IDENTIFICATION

A. Provide pipe markers at 10'-0" maximum spacing to identify piping in sprinkler rooms and 20'-0" maximum spacing in all other areas with Seaton Setmark pipe markers with letters and flow direction arrows.
B. Colors and wording shall be of standard pipe markers as available from Seaton or equal. Submit for approval list of colors and wording prior to purchase of pipe markers.
C. Pipe marker nomenclature/colors shall meet applicable ANSI Standard and OSHA requirements.

3.7. VALVE IDENTIFICATION

A. Mark all valves with Seton No. 300-BL brass identification tags with system legend, valve number and size stamped on tag. Lettering shall be black ½" high. Tags shall be minimum 2" in diameter and attached to valve with Seton No. 16 brass jack chain.
B. Prepare four copies of typewritten list of valve tags. List shall be typed in upper case and contain tag number, valve size, type, function and location. Frame one list under glass and mount near operating instruction in main equipment rooms.

3.8. EXCAVATION AND BACKFILL

A. Perform necessary excavation to receive Work. Provide necessary sheathing, shoring, cribbing, tarpaulins, etc. for this operation, and remove it at completion of work. Perform excavation in accordance with appropriate section of these specifications, and in compliance with OSHA Safety Standards.
B. Excavate trenches of sufficient width to allow ample working space, and no deeper than necessary for installation work.
C. Conduct excavations so no walls or footings are disturbed or injured. Backfill excavations made under or adjacent to footing with selected earth or sand and tamp to compaction required by Architect-Engineer. Mechanically tamp backfill under concrete and pavings in six inch layers to 95% standard density, Reference Division 2.
D. Backfill trenches and excavations to required heights with allowance made for settlement. Tamp fill material thoroughly and moistened as required for specified compaction density. Dispose of excess earth, rubble and debris as directed by Architect.
E. When available, refer to test hole information on Architectural or Civil drawings or specifications for types of soil to be encountered in excavations.

3.9. FIRE BARRIERS

A. Provide sleeves through all fire-rated walls and fill voids surrounding sleeves and interior to sleeves around piping with Nelson "Flameseal" fire stop putty with U.L. listed 3 hour rating installed as per manufacturers recommendations.

    1. Equivalent by Dow, Chemelex, 3M.

B. All holes or voids created by the sprinkler contractor to extend piping or ductwork through fire rated floors and walls shall be sealed with an intumescent material capable of expanding up to 8 to 10 times when exposed to temperatures of 250 degrees F. It shall have ICBO, BOCAI and SBCCI (NRB 243) approved ratings to 3 hours per ASTM E-814 (UL 1479). Acceptable Material: 3M Fire Barrier Caulk, Putty, Strip and sheet forms.

3.10. EQUIPMENT ANCHORS

A. Provide floor or foundation mounted equipment such as pumps, boilers, air handling units, etc. with Decatur Engineering Company concrete anchors.
B. Where equipment anchors cannot be installed during forming of floors or foundations anchor equipment with McCulloch Kwik-Bolt concrete anchors.
C. Anchors shall be proper type and size recommended by manufacturer for equipment to be anchored.

3.11. WELDING

A. Contractor shall be responsible for quality of welding and suitability of welding procedures. All welding shall be in accordance with American Welding Society Standard B3.0 and ANSI Standard B31.1.
B. Welded pipe joints shall be made by certified welding procedures and welders. Welding electrodes shall be type and material recommended by electrode manufacturer for materials to be welded. All pipe and fittings ends shall be beveled a minimum of 30 degrees prior to welding.
C. Only welders who have successfully passed welder qualifications tests in previous 12 months for type of welding required shall do welding. Each welder shall identify his work with a code marking before starting any welded pipe fabrication. Contractor shall submit three copies of a list of welders who will work on project listing welders' code, date and types of latest qualification test passed by each welder.
D. Welded joints shall be fusion welded in accordance with Level AR3 of American Welding Society Standard AWS D10.9 "Standard for Qualification of Welding Procedures and Welders for Pipe and Tubing". Welders qualified under National Certified Pipe Welding Bureau will be acceptable.
E. Bevel all piping and fittings in accordance with recognized standards by flame cutting or mechanical means. Align and position parts so that branches and fittings are set true. Make changes in direction of piping systems with factory made welding fittings. Make branch connections with welding tees or forged weldolets.

END OF SECTION 210011

SECTION 210013 – PROJECT COORDINATION

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2. SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination Drawings.
2. Administrative and supervisory personnel.
3. Project meetings.
4. Requests for Interpretation (RFIs).

B. Each related sub-contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

1.3. COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Delivery and processing of submittals.
2. Progress meetings.
3. Preinstallation conferences.
4. Project closeout activities.
5. Startup and adjustment of systems.

1.4. SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:

   a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
   b. Indicate required installation sequences.
   c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 40 inches. Format shall be PDF or other electronic format to facilitate multiple user commenting and sharing easily.

3. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including project managers, superintendent and other personnel in attendance at Project site to the General Contractor and other major subcontractors. Identify individuals and their duties and responsibilities; list email addresses and telephone numbers. Update the list as required during the project if personnel change.

1.5. COORDINATION

A. Certain materials will be provided by other trades. Examine the Contract Documents and reviewed record Submittals to ascertain these general requirements. Contract Documents reflect a basis of design and may not reflect actual equipment or items being utilized.
B. Carefully check space requirements with other trades and the physical confines of the area to insure that all material can be installed in the spaces allotted thereto including finished suspended ceilings and the spaces within the existing building. Make modifications thereto as required and approved.
C. Transmit to other trades all information required for work to be provided under their respective Sections in ample time for installation.
D. Wherever work interconnects with work of other trades, coordinate with other trades to insure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items of work that require access so that the ceiling trade will know where to install access doors and panels.
E. Obtain equipment submittal information for all pieces of equipment to be connected to from other trades that clearly indicates all connection requirements, locations, sizes, and similar requirements. Obtain this information in ample time to coordinate other trade submittals and equipment coordination. Where requirements differ from that on plans or differs from provisions made in the work, immediately notify the Architect/Engineer. Do not proceed with work that is incompatible with equipment provided.
F. Coordinate, project and schedule work with other trades in accordance with the construction sequence.
G. Coordinate with the local Utility Companies to their requirements for service connections and provide all necessary materials, labor and testing.
H. Coordinate with contractors for work under other Divisions of this specification for all work necessary to accomplish this contractor's work.
I. Conduct a coordination meeting after reviewing all other trade coordination drawings with other relevant trades. This meeting shall be held to prevent conflicts during construction. Each major relevant subcontractor shall attend this meeting. Report any potential conflicts or clearance problems to Architect/Engineer after meeting.
J. Adjust location of piping, ductwork, conduit, wiring, etc. to prevent interferences, both anticipated and encountered. Determine the exact route and location of each item prior to fabrication.

1. Right-of-Way:

a. Lines that pitch have the right-of-way over those that do not pitch. For example: steam, condensate, and plumbing drains normally have right-of way. Lines whose elevations cannot be changed to have right-of-way over lines whose elevations can be changed.
b. Make offsets, transitions and changes in direction in raceways as required to maintain proper headroom in pitch of sloping lines whether or not indicated on the Drawings.

1.6. DRAWINGS AND FILES.

A. The Drawings show only the general run of MEP systems, equipment, fixtures, piping and ductwork and other components as well as approximate location of items such as outlets, switches, diffusers, lights, and equipment connections, etc. Coordinate all exact locations of items with other trades, architectural elevations, equipment requirements, owner requirements, ceilings, access, serviceability, etc. All such modifications and coordination shall be made without additional cost to the Owner. Any significant changes in location of items necessary in order to meet field conditions shall be brought to the immediate attention of the Architect/Engineer and receive his approval before such alterations are made
B. Wherever the work is of sufficient complexity, additional Detail Drawings to scale similar to that of the bidding Drawings, prepared on tracing medium of the same size as Contract Drawings. With these layouts, coordinate the work with the work of other trades. Such detailed work to be clearly identified on the Drawings as to the area to which it applies. Submit for review Drawings clearly showing the work and its relation to the work of other trades before commencing shop fabrication or erection in the field. Attend meetings with other trades to review all documents.
C. When directed by the General Contractor for areas of necessary coordination provide 3D building modelling coordination files and documents with other trades. Transmit information electronically and attend meetings as directed by the G/C as well as take part in coordination activities and documentation. Contractor shall be required to generate their own electronic files for this process.

1.7. PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. The Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Possible conflicts.
i. Compatibility problems.
j. Time schedules.
k. Manufacturer's written recommendations.
l. Warranty requirements.
m. Compatibility of materials.
n. Space and access limitations.
o. Regulations of authorities having jurisdiction.
p. Testing and inspecting requirements.
q. Installation procedures.
r. Coordination with other work.
s. Required performance results.
t. Protection of adjacent work.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

C. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contractor is on time, ahead or behind schedule, in relation to Construction Schedule. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time. Discuss impact of various contractor schedules upon other contractors and how to remedy impacts.
b. Review present and future needs of each contractor present, including the following:

i. Interface requirements.

ii. Sequence of operations.
iii. Status of submittals.
iv. Deliveries.
v. Off-site fabrication.
vi. Access.
vii. Quality and work standards.
viii. Change Orders.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.8. REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI.

1. Submit Contractor's suggested solution(s) to RFI. If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
2. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 210013

SECTION 211314 – WET PIPE FIRE PROTECTION SYSTEM (NFPA 13R)

PART 1 – GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 210010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. DEFINITIONS

A. High-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure higher than standard 175 psig (1200 kPa), but not higher than [250 psig (1725 kPa)] [300 psig (2070 kPa)].
B. Standard-Pressure Sprinkler Piping: Wet-pipe sprinkler system piping designed to operate at working pressure of 175 psig (1200 kPa) maximum.

1.3. SYSTEM DESCRIPTIONS

A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

1.4. PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.
B. High-Pressure Piping System Component: Listed for 250-psig minimum working pressure.
C. Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.5. SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
B. Shop Drawings: For wet-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work.

    1. Wiring Diagrams: For power, signal, and control wiring.

C. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
D. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

    1. Domestic water piping.
    2. Compressed air piping.
    3. HVAC hydronic piping.
    4. Items penetrating finished ceiling include the following:

        a. Lighting fixtures.
        b. Air outlets and inlets.
        c. HVLS or other types of Ceiling Fans

E. Qualification Data: For qualified Installer and professional engineer.
F. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13R, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.
G. Welding certificates.
H. Fire-hydrant flow test report.
I. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13R. Include “Contractor’s Material and Test Certificate for Aboveground Piping.”
J. Field quality-control reports.
K. Operation and Maintenance Data: For sprinkler specialties to include in emergency, operation, and maintenance manuals.

1.6. QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

    a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
D. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13R – "Standard for the Installation of Sprinkler Systems in Low-Rise Residential Occupancies." Comply with latest version or version as adopted by AHJ, whichever is more stringent.

1.7. PROJECT CONDITIONS

A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:
B. Notify Owner no fewer than two days in advance of proposed interruption of sprinkler service.
C. Do not proceed with interruption of sprinkler service without Owner's written permission.

1.8. COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

1.9. EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
B. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover, and with space for minimum of six spare sprinklers plus sprinkler wrench. Include number of sprinklers required by NFPA 13R and sprinkler wrench. Include separate cabinet with sprinklers and wrench for each type of sprinkler used on Project.

1.10. AUTOMATIC SPRINKLER SYSTEM

A. Provide wet or combination wet/dry sprinkler system as required, complete with alarm valves, drain valves, mains, risers, branches, sprinkler heads, test pipes, gauges, and dialers as hereinafter specified or shown on plans.
B. An approved automatic sprinkler subcontractor shall perform all work under this heading. The system shall be installed in strict accordance with the NFPA requirments and all local and state authorities having jurisdiction. The sprinkler system shall be certified. Contractor shall retain certification until such time as Contractor turns copies of certificates and permits over to Owner.
C. Sprinkler system shall be installed using hydraulically designed system by Contractor's option. Sprinkler system design shall be approved by authorities having jurisdiction.

1. Margin of Safety for Available Water Flow and Pressure: 15 percent, including losses through water-service piping, valves, and backflow preventers.

D. Design of sprinkler system shall coordinate main and branch lines with structure, ceilings, piping, ductwork and light fixtures.
E. Entire building shall be sprinkled.

PART 2 – PRODUCTS

2.1. SERVICE RISER

A. Provide a double check detector backflow preventer listed for fire service duty. Omit detector portion of assembly where allowed by local jurisdiction.

2.2. SPRINKLER HEADS

A. Provide as required by NFPA 13R sprinkler heads as manufactured by Viking, Reliable, Tyco and Victaulic. Sprinkler heads shall be semi-recessed chrome plated brass where exposed. Rough brass where concealed and where exposed in mechanical rooms and shall be provided with all necessary hardware for mounting into gypsum board ceiling or acoustical ceilings. The fire protection contractor shall be responsible to reference the architectural drawings for ceiling types and locations. Where no ceilings occur, provide standard brass

upright or pendant as required by construction.

B. Sprinkler heads shall be Underwriters-approved, automatic spray type. Temperature rating of heads shall be 165 degrees F., except furnish 212 degrees F. heads where required.

C. Heads shall be of the following types:

1. Areas without ceilings: Standard bronze upright type.
2. Areas with lay in ceilings: Bronze flush pendent type with satin chrome finish, with satin chrome semi recessed escutcheon.
3. Areas with hard ceilings: Concealed pendent with finish to match ceiling color or finish.
4. Sidewall: Bronze sidewall type with satin chrome finish.

D. Location of sprinkler heads is not shown on drawings but nevertheless shall be furnished and installed to meet the requirements of these specifications and NFPA 13R. General scheme of head spacing shall be so as to clear ducts, beams, pipes, air units, lights and conduits. Exact location of heads shall be approved by the Architect.

E. Install sprinkler heads located in center of ceiling tiles or ceiling panels or as otherwise directed by architect.

F. Provide head guards where required by NFPA.

G. Furnish spare heads for each type of head mounted in metal cases where directed by Architect and as required by NFPA. Cases shall include wrenches for each type of head.

2.3. PIPE, FITTINGS, AND HANGERS

A. Provide pipe material and schedule as required by NFPA 13R.

1. Submit detailed pipe material submittals indicating thickness and joining methods.
2. Pipe 2” and smaller shall be threaded connected Schedule 40 black steel pipe or thicker with cast iron fittings. Pipe 2-1/2” and larger may be roll grooved or welded connected Schedule 10 black steel pipe or thicker.
3. Steel pipe with wall thicknesses less than Schedule 40 shall not be joined by threaded fittings.
4. In wood framed structure, CPVC piping shall be acceptable in concealed locations where allowed by NFPA. No plastic shall be located in exposed locations except in mechanical and utility spaces not viewable by residents or public.
5. All Dry systems shall be galvanized.

B. Pipe shall be scale free, round, straight and true to size, free from weld flaws and other defects. Steel pipe shall be as manufactured by U.S. Steel, Sawhill, Wheatland, LTV, Laclede or approved equal. All piping shall be U.L. listed and F.M. approved. All fire service piping below grade shall be ductile iron pipe of the thickness Class 52 complete with all accessories conforming to ANSI A21.51; ASTME A536, Grade 60-42-10. The joints shall be of the push-on type conforming to ANSI A21.11 except gaskets shall be neoprene or other synthetic rubber. Natural rubber will not be acceptable. The pipe shall be cement-mortar lined conforming to ANSI A21.4 and shall be coated inside and out with a coal-tar enamel. Fittings shall be ductile iron or cast iron fittings complete with accessories and shall be ASTM A536, Grade 80-60-03 conforming to ANSI A21.10, 150 p.s.i. pressure rating. The joints shall be of standard mechanical joint type or of the push-on type conforming to ANSI A21.11. All fittings shall be cement-mortar lined conforming to ANSI A21.4 and shall be coated inside and out with a coal-tar enamel.

C. All fittings inside building shall be sprinkler fittings approved by Underwriters’ Laboratories and meeting approval of Factory Mutual. Flanges, of the same pressure rating as the fittings above specified, shall be installed in piping 8” and over, and elsewhere where required.

D. Pipe hangers shall be of type and spacing required to support pipes from building construction and meet the approval of the Underwriters’ Laboratories. Note: Do not support piping from pipes, ducts or conduits. Furnish structural steel headers bolted to concrete and bolted or welded to steel joists as required. Do not support pipes from bulb tees or steel roof decks. Support exposed risers in stairs from structure below. Do not support risers in stairs from pipe clamps set on floor exposed to view and traffic.

E. Contractor, at their option, may install fire protection piping using Victaulic couplings with gaskets, reducing couplings and gaskets, outlet couplings, flanges with gaskets, fittings, reducers, adapter nipples, flange adapters, bolts, nuts and miscellaneous material required to install fire protection piping system to meet NFPA approval in lieu of screwed and flanged fittings specified above. The piping system shall be grooved, assembled, installed and supported as covered in Victaulic Piping and Installation Manual.

2.4. PIPE SLEEVES AND COLLARS

A. Pipes passing through walls and partitions shall be run through not less than No. 12 gauge steel pipe sleeves finishing flush with the finished wall surfaces. Where covered pipes pass through the walls or partitions, same shall be centered in steel pipe sleeves. All sleeves or thimbles shall be independent of the pipes they enclose and centered in sleeves to insure free movement of the pipes without injury to wall or other finish. Caulk around all pipes and pipe sleeves passing through walls, floors or ceilings with untarred jute and make airtight

and soundproof.

B. Covered and uncovered pipes passing through fire and smoke walls and partitions shall be run through Proset Proseal fire rated wall sleeves, or approved equal wall sleeving system, consisting of PVC sleeves in masonry walls, 20 Ga. Galvanized iron split wall sleeves in gypsum walls, ceramic fiber firefill to fill the void between the pipe and the interior wall of the sleeve, and PVC or neoprene rubber Proseal plug on each end of sleeve.
C. Pipe passing through floors shall be run through Proset Proseal or approved equal fire rated floor sleeve assemblies, consisting of PVC couplings, ceramic fiber firefill to fill the void between the pipe and the interior wall of the sleeve, and PVC or neoprene rubber Proseal plug on each end of sleeve. Sleeves shall be watertight and fireproof.
D. Pipe sleeves through outside walls shall be Schedule 40 steel pipe sleeves with 1-1/2” collar welded to center of sleeve and cast in wall. Caulk between sleeves and pipes and make watertight.

2.5. MAIN CUTOFF VALVES

A. Furnish and install 150 p.s.i. Underwriter’s approved OS&Y or butterfly flanged type cutoff valves in piping for each standpipe, sprinkler mains, ahead of each flow switch and at all other points shown on drawings or required by NFPA. Cutoff valves in fire service piping below grade shall be 150 p.s.i. U.L. and F.M. approved type for underground service. Provide cast iron curb box to grade, with key, for main shut off valve at point of connecting to water main and fire hydrant.

2.6. CHECK VALVES

A. Furnish and install 175 p.s.i. Underwriter’s approved flanged type check valves in fire service, at Fire Department connection, and where required by NFPA. Check valve at Fire Department connection shall be installed with automatic ball drip with drain pipe extended and turned down over floor drain.

2.7. VALVES

A. Drain valves and test valves shall be similar and equal to Stockham B-22 screwed globe of Fig. B-222 screwed angle, bronze body 150 lb., screw over bonnet and renewable disc.
B. Gauge control valves shall be bronze body needle type with inspector’s test connections and plug.
C. Gate valves 2” and smaller shall be UL approved for 175 lb. WWP, bronze gate, solid wedge, screw in bonnet, outside screw and yoke, rising stem, Stockham B-122 or approved equal.
D. Gate valves 2-1/2” and larger shall be UL approved for 175 lb. WWP, iron body, bronze mounted, solid wedge, outside screw and yoke, rising stem, Stockham Fig. G-634 or approved equal.
E. Check valves 2-1/2” and larger shall be UL approved 175 lb. WWP iron body, bronze mounted, Stockham G-939 or approved equal.

2.8. INDICATOR POST

A. Furnish and install Underwriters’ approved indicator post at fire service cutoff valve where shown on drawings or as required by AHJ.
B. Bolt indicator post to cutoff valve.
C. Indicator post shall be installed absolutely vertical.

2.9. VANE TYPE WATER FLOW DETECTORS

A. Furnish and install Notifier WFD Series or approved equal vane type, U.L. approved, water flow detector switches full size of piping served. Detectors shall be installed at each sprinkler zone and where indicated on drawings. Switches shall be designed for 150 p.s.i. working pressure and shall make contact with flow in one direction only.
B. Each detector shall include a vane-operated, retard switch assembly mounted on an aluminum base plate, a cast aluminum pipe saddle to which the base plate is attached, a steel “U” bolt to clamp saddle to the sprinkler piping, and a steel cover enclosure to enclose the switch assembly consisting of two (2) SPDT circuit switches rated 10 amperes, 125 volt A.C., for actuating the fire alarm system.

2.10. TAMPER SWITCHES

A. Furnish and install U.L. and F.M. approved tamper switches for indicator post and for each gate or butterfly type cutoff valve for pipes 2” and above in sprinkler and standpipe systems. Furnish and install tamper switches on certain valves under 2” as indicated or required. Switches shall be similar and at least equal to Notifier tamper switches for connecting to alarm system. Omit tamper switches on drain valves.

2.11. SIGHT GLASSES

A. Furnish and install at each inspector’s test valve where test pipe does not terminate where it can be readily observed an approved sight test connection containing a smooth bore orifice giving a flow equivalent to one sprinkler head.

2.12. FIRE PROTECTION PIPING

A. Size of fire service piping is shown on drawings. All other fire protection piping shall be sized according to hydraulic calculations to provide the prescribed densities hereinbefore specified.
B. Conceal mains back or above the construction in finished areas.
C. Pipes shall have ends reamed to full bore.
D. Piping shall clear lighting fixtures, construction, conduits, air outlets, air ducts and miscellaneous service pipes. Piping shall be designed to provide maximum head room in all areas.
E. Piping shall not pierce ductwork.
F. Sprinkler piping shall be divided into zones as required by NFPA area limitations.
G. Pitch all dry pipe sprinkler piping to drain according to NFPA requirements, without exception and without traps. Wet pipe sprinkler systems may be pitched to drain or run level, but piping must be installed straight and true, without traps.
H. Furnish and install suitable drain valves and inspector test valves as necessary to drain the system and meet the requirements of NFPA. Furnish and install cutoff valve, vane type flow detector, test valve, drain valve, sight glass and tamper switch in each sprinkler zone, of type hereinbefore specified.
I. No sprinkler piping shall be installed below a ceiling, (exposed) unless the contractor has specific approval from the Architect.

2.13. UNDERGROUND FIRE SERVICE PIPING

A. Pipe and fittings for underground fire service and for connections for fire hydrant shall be as hereinbefore specified. Connect fire service piping to water main with tapping sleeve.
B. Provide Underwriter's approved waterproof pipe connection at point where pipe pierces wall of building and connects to steel pipe. Pipe connections shall be complete with bridle rods and clamps as required to prevent blowouts and to meet Underwriters' requirements. Support pipe outside building concrete piers resting on rock or undisturbed soil, and provide waterproof sleeves and caulking as specified for water services under Plumbing Section.
C. Pour concrete anchor blocks for underground pipes as required by the authorities having jurisdiction to prevent blowouts. Provide bridle rods and clamps where cast iron pipe changes to steel pipe, and anchor piping to concrete blocks as required to prevent blowouts. Anchor blocks shall be sized as per NFPA requirements.
D. Underground piping shall have 48" cover minimum.

2.14. FIRE DEPARTMENT CONNECTION

A. Furnish and install Potter-Roemer 5100 Series, equivalent Croker Standard or Guardian, U.L. and F.M. approved, 2-way flush wall type Fire Department connections, complete with check valve and ball drip. Fire Department connection shall have 4" inlet and two (2) 2-1/2" outlets, each complete with cap and chain. Verify requirements and connections with flow requirements and local Fire Department requirements.
B. Hose connection shall have threads that will meet standards of the local Fire Department.
C. Fire Department connections shall be polished brass. The Fire Department connection shall have words per NFPA requirements cast in plate as to service.
D. Provide wall template for Fire Department connection and turn over to General Contractor for forming openings in wall. Anchor Fire Department connection to wall and caulk around wall connection with silicone base caulking compound and make watertight. Extend piping to inside building and connect to system with check valve and ball drip.

2.15. FIRE SPRINKLER MONITORING PANEL

A. In facility without fire alarm system provide a noncoded system, dedicated to monitoring of fire suppression system in building. Provide all wiring, components, dialers, detectors, flow switches, tamper switches, indicating devices as required for NFPA compliance and local jurisdictional and code requirements. Include all power and low voltage wiring required as well as coordination of all monitoring services and startup, checkout, etc.

PART 3 – EXECUTION

3.1. GENERAL

A. All modifications and additions shall be performed without hampering the proper operation of the remaining system. Shop drawing submittals shall indicate by calculation total system compliance.
B. Provide installation of water flow switches and tamper switches on bypass lines and shut-off valves. Wiring by Electrical Contractor. Coordinate with early warning fire detection system.
C. Submit drawings and calculations to the State Fire Marshall, owner's insurance company and local building officials for approval.

3.2. PREPARATION

A. Perform fire-hydrant flow test according to NFPA 13R and NFPA 291. Use results for system design calculations required in "Quality Assurance" Article.
B. Report test results promptly and in writing.

3.3. SERVICE-ENTRANCE PIPING

A. Connect sprinkler piping to utility water-service piping for service entrance to building. Comply with requirements for exterior piping in Division 2 Section "Facility Fire-Suppression Water-Service Piping."
B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated and required by NFPA and specifically as required by local utility and fire marshal and/or fire department at connection to water-service piping.
C. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.4. PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

1. Install seismic restraints on piping. Comply with requirements for seismic-restraint device materials and installation in NFPA 13R.
2. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
3. Install unions adjacent to each valve in pipes NPS 2 (DN 50) and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 (DN 65) and larger end connections.
D. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13R.
E. Install sprinkler piping with drains for complete system drainage.
F. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
G. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.
H. Install alarm devices in piping systems.
I. Install hangers and supports for sprinkler system piping according to NFPA 13R. Comply with requirements for hanger materials in NFPA 13R.
J. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal and install where they will not be subject to freezing.
K. Pressurize and check pre-action sprinkler system piping and air-pressure maintenance devices.
L. Fill sprinkler system piping with water.
M. Sprinkler piping in areas subject to freezing shall be installed with glycol systems in accordance with NFPA installation requirements. Electric cables or insulation shall not be considered and adequate means of freeze protection.

3.5. JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
B. Install unions adjacent to each valve in pipes NPS 2 and smaller.
C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and

valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.
I. Steel-Piping, Pressure-Sealed Joints: Join lightwall steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.
J. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

K. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
L. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
M. Steel-Piping, Pressure-Sealed Joints: Join Schedule 5 steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.
N. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.
O. Plastic-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.

P. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.

3.6. INSTALLATION OF COVER SYSTEM FOR SPRINKLER PIPING

A. Install cover system, brackets, and cover components for sprinkler piping according to manufacturer's "Installation Manual" and with NFPA 13R for supports.

3.7. VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13R and authorities having jurisdiction.
B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
D. Specialty Valves:

1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
2. Alarm Valves: Include bypass check valve and retarding chamber drain-line connection.
3. Deluge Valves: Install in vertical position, in proper direction of flow, and in main supply to deluge system. Install trim sets for drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment.

3.8. EXCESS-PRESSURE PUMP INSTALLATION

A. Assemble components and mount on wood backing. Comply with requirements in Division 6 Section "Rough Carpentry" for wood backing material and installation.
B. Install excess-pressure pumps, controls, devices, and supports for sprinkler piping application.
C. Mounting: Install attached to water-supply pipe.

3.9. SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of[narrow dimension of] acoustical ceiling panels.
B. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.
C. Install sprinklers into flexible, sprinkler hose fittings and install hose into bracket on ceiling grid.

3.10. FIRE-DEPARTMENT CONNECTION INSTALLATION

A. Install wall-type, fire-department connections.
B. Install yard-type, fire-department connections in concrete slab support. Comply with requirements for concrete in Division 3 Section "Cast-in-Place Concrete."

1. Install protective pipe bollards around each fire-department connection. Paint as directed by architect.

C. Install automatic (ball drip) drain valve at each check valve for fire-department connection.
D. Fire Department connections shall be in accordance with local fire department requirements and configurations.

3.11. ESCUTCHEON INSTALLATION

A. Install escutcheons for penetrations of walls, ceilings, and floors.

3.12. SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.
B. Sleeves are not required for core-drilled holes.
C. Permanent sleeves are not required for holes formed by removable PE sleeves.
D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.
E. Install sleeves in new partitions, slabs, and walls as they are built.
F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 7 Section "Joint Sealants."
G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements for joint sealants in Division 7 Section "Joint Sealants."
H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals.
I. Seal space outside of sleeves in concrete slabs and walls with grout.
J. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.

1. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestop materials and installations in Division 7 Section "Through-Penetration Firestop Systems."

3.13. SLEEVE SEAL INSTALLATION

A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.
B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.14. IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13R.
B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 16 Section "Electrical Identification."

3.15. FIELD QUALITY CONTROL

A. Perform tests and inspections.
B. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Flush, test, and inspect sprinkler systems according to NFPA 13R, "Systems Acceptance" Chapter.
D. Energize circuits to electrical equipment and devices.
E. Start and run excess-pressure pumps.
F. Coordinate with fire-alarm tests. Operate as required.
G. Coordinate with fire-pump tests. Operate as required.
H. Verify that equipment hose threads are same as local fire-department equipment.
I. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
J. Prepare test and inspection reports.

3.16. CLEANING

A. Clean dirt and debris from sprinklers.
B. Remove and replace sprinklers with paint other than factory finish.

3.17. DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain specialty valves and pressure-maintenance pumps.

3.18. TESTS

A. All piping shall be tested and made tight to meet requirements of NFPA Pamphlets No. 13 and 14 before joints are covered. Such tests shall be witnessed by the Owner’s Representative and the Architect. Provide three (3) copies of test certificates to Architect-Engineer.
B. Furnish all gauges, pumps, compressors and equipment required to perform tests.

3.19. PAINTING

A. Paint all pipes and valves not in furred walls or ceilings with one (1) metal surface rust inhibiting prime coat and one (1) coat of approved equal enamel, in color and finish as directed by architect.

END OF SECTION 211314

END OF DIVISION 210000

DIVISION 22
TABLE OF CONTENTS

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SECTION 220010 – PLUMBING PROVISIONS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. All contract documents including drawings, alternates, addenda and modifications and general provisions of the Contract, including General and Supplementary Conditions and all other Division Specification Sections, apply to work of this section. All preceding and following sections of this specification division are applicable to the Plumbing Contractor, all sub-contractors, and all material suppliers.

1.2. SCOPE OF WORK

A. This DIVISION requires the furnishing and installing of complete functioning Plumbing systems, and each element thereof, as specified or indicated on Drawings or reasonably inferred, including every article, device or accessory reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the Work include materials, labor, supervision, supplies, equipment, transportation, and utilities.
B. In case of an inconsistency between the Drawings and Specifications or within either document, the better quality or the greater quantity of work shall be provided in accordance with the Architect or Engineer's interpretation.
C. Refer to Architectural, Structural and Electrical Drawings and all other contract documents and to relevant equipment drawings and shop drawings to determine the extent of clear spaces and make all offsets required to clear equipment, beams and other structural members to facilitate concealing piping and ductwork in the manner anticipated in the design.

1.3. SPECIFICATION FORM AND DEFINITIONS

A. The Engineer indicated in these specifications is Pearson Kent McKinley Raaf Engineers LLC. 13300 W 98th Street, Lenexa, KS 66215, PHONE 913-492-2400, EMAIL admin@pkmreng.com.
B. Contractor, wherever used in these specifications, shall mean the Company that enters into contract with the Owner to perform this section of work.
C. When a word, such as "proper", "satisfactory", "equivalent", and "as directed", is used, it requires the Architect-Engineer's review.
D. "PROVIDE" means to supply, purchase, transport, place, erect, connect, test, and turn over to Owner, complete and ready for regular operation, the particular Work referred to.
E. "INSTALL" means to join, unite, fasten, link, attach, set up, or otherwise connect together before testing and turning over to Owner, complete and ready for regular operation, the particular Work referred to.
F. "FURNISH" means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories, and all other items customarily required for the proper and complete application for the particular Work referred to.
G. "WIRING" means the inclusion of all raceways, fittings, conductors, connectors, tape, junction and outlet boxes, connections, splices, and all other items necessary and/or required in connection with such Work.
H. "CONDUIT" means the inclusion of all fittings, hangers, supports, sleeves, etc.
I. "AS DIRECTED" means as directed by the Architect/Engineer, or his representative.
J. "CONCEALED" means embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed above hung ceilings.

1.4. QUALIFICATIONS

A. The contractors responsible for work under this section shall have completed a job of similar scope and magnitude within the last 3 years. The contractors shall employ an experienced, competent and adequate work force licensed in their specific trade and properly supervised at all times. Unlicensed workers and general laborers shall be adequately supervised to insure competent and quality work and workmanship required by this contract and all other regulations, codes and practices. At all times the contractors shall comply with all applicable local, state and federal guidelines, practices and regulations. Contractor may be required to submit a statement of qualifications upon request before any final approval and selection. Failure to be able to comply with these requirements is suitable reason for rejection of a bid.

1.5. LOCAL CONDITIONS

A. The contractor shall visit the site and determine the existing local conditions affecting the work required. Failure to determine site conditions or nature of existing or new construction will not be considered a basis for granting additional compensation.

1.6. CONTRACT CHANGES

A. Changes or deviations from the contract documents; including those for extra or additional work must be submitted in writing for review of Architect-Engineer. No verbal change orders will be recognized.

1.7. LOCATIONS AND INTERFERENCES

A. Locations of equipment, piping and other plumbing work are indicated diagrammatically by the plumbing drawings. The Contractor shall determine the exact locations on site, subject to structural conditions, work of other Contractors, and access requirements for installation and maintenance to approval of Architect-Engineer. Provide additional piping and ductwork offsets as required at no additional cost.
B. Study and become familiar with the contract drawings of other trades and in particular the general construction plans and details in order to obtain necessary information for figuring installation. Cooperate with other contractors and install work in such a way as to avoid interference with their work. Minor deviations, not affecting design characteristics, performance or space limitation may be permitted if reviewed prior to installation by Architect-Engineer.
C. Any pipe, ductwork, equipment, apparatus, appliance or other item interfering with proper placement of other work as indicated on drawings, specified, or required, shall be removed, relocated and reconnected without extra cost. Damage to other work caused by this Contractor, the Subcontractor, or workers shall be restored as specified for new work.
D. Do not scale mechanical, plumbing and electrical drawings for dimensions. Contractor shall accurately layout work from the dimensions indicted on the Architectural drawings unless they are found to be in error.

1.8. PERFORMANCE

A. Final acceptance of work shall be subject to the condition that all systems, equipment, apparatus and appliances operate satisfactorily as designed and intended. Work shall include required adjustment of systems and control equipment installed under this specification division.
B. The Contractor warrants to the Owner and Architect-Engineer the quality of materials, equipment, workmanship and operation of equipment provided under this specification division for a period of one year from and after completion of building and acceptance of plumbing systems by Owner.

1.9. WARRANTY

A. The Contractor warrants to the Owner and Architect-Engineer that upon notice from them within a one year warranty period following date of acceptance, that all defects that have appeared in materials and/or workmanship, will be promptly corrected to original condition required by contract documents at Contractor's expense.
B. The above warranty shall not supersede any separately stated warranty or other requirements required by law or by these specifications.

1.10. ALTERNATES

A. Refer to General Requirements for descriptions of any alternates that may be included.

1.11. MATERIALS, EQUIPMENT AND SUBSTITUTIONS

A. The intent of these specifications is to allow ample opportunity for Contractor to use his ingenuity and abilities to perform the work to his and the Owner's best advantage, and to permit maximum competition in bidding on standards of materials and equipment required.
B. Material and equipment installed under this contract shall be first class quality, new, unused and without damage.
C. In general, these specifications identify required materials and equipment by naming one or more manufacturer's brand, model, catalog number and/or other identification. The first named manufacturer or product is used as the basis for design; other manufacturers named must furnish products consistent with specifications of first named product as determined by Engineer. Base bid proposal shall be based only on materials and equipment by manufacturers named, except as hereinafter provided.
D. Where materials or equipment are described but not named, provide required items of first quality, adequate in every respect for intended use. Such items shall be submitted to Architect-Engineer for review prior to procurement.
E. Materials and equipment proposed for substitutions shall be equal to or superior to that specified in construction, efficiency, utility, aesthetic design, and color as determined by Architect-Engineer whose decision shall be final and without further recourse. Physical size of substitute brand shall be no larger than space provided including allowances for access for installation and maintenance. Requests must be accompanied by two copies of complete descriptive and technical data including manufacturer's name, model and catalog number, photographs or cuts, physical dimensions, operating characteristics and any other information needed for comparison.
F. If the Contractor wishes to incorporate products other than those named in the Base Bid Specifications they shall submit a request for approval of equivalency in writing no later than (10) ten calendar days prior to bid date. Substitutions after this may be refused at Engineers option. Equivalents will ONLY be considered approved when listed by addendum.
G. In proposing a substitution prior to or subsequent to receipt of bids, include in such bid the cost of altering other elements of this project, including adjustments in plumbing or electrical service requirements necessary

to accommodate such substitution.

H. Within 10 working days after bids are received, the apparent low bidder shall submit to the Architect-Engineer for approval, three copies of a list of all major items of equipment they intend to provide. Within 30 working days after award of Contract, Contractor shall submit shop drawings for equipment and materials to be incorporated in work, for Architect-Engineer review. Where 30-day limit is insufficient for preparation of detailed shop drawings on major equipment or assemblies, Contractor shall submit manufacturer's descriptive catalog data and indicate date such detailed shop drawings will be submitted along with manufacturer's certification that order was placed within 30 working day limit.

1.12. ELECTRONIC PLAN FILES

A. Electronic files of the contract documents may be available from the Engineer to successful bidders and manufacturers for a fee of $50 per sheet, $100 minimum and $25 email/shipping charge. A release of liability form will be required along with payment prior to release of files.

1.13. OPENINGS, ACCESS PANELS AND SLEEVES

A. This Contractor shall include the installation of all boxes, access panels and sleeves for openings required to install this work, except structural openings incorporated in the structural drawings. Sleeves shall be installed for all pipes passing through structural slabs and walls. Contractor shall set and verify the location of sleeves that pass through beams, as shown on structural plans. All floor and wall penetrations shall be sealed to meet fire-rating requirements.

B. All penetrations through interior or exterior and rated or non-rated walls and floors shall be appropriately sealed prevent entry and movement of rodents and insects. Contractor shall coordinate their work with all other trades.

1.14. ARCHITECTURAL VERIFICATION AND RELATED DOCUMENTS

A. Contractor shall consult all Architectural Drawings and specifications in their entirety incorporating and certifying all millwork, furniture, and equipment rough-in including utility characteristics such as voltage, phase, amperage, pipe sizes, duct sizes, including height, location and orientation. Shop drawings incorporating these requirements should be submitted to the Architect for approval prior to installation or rough in.

1.15. EXTENT OF CONTRACT WORK

A. Provide plumbing systems indicated on drawings, specified or reasonably implied. Provide every device and accessory necessary for proper operation and completion of plumbing systems. In no case will claims for "Extra Work" be allowed for work about which Contractor could have been informed before bids were taken.

B. Contractor shall become familiar with equipment provided by other contractors that require plumbing connections and controls.

C. Electrical work required to install and control plumbing equipment, which is not shown on plans or specified under Division 26, shall be included in Contractor's base bid proposal.

D. All automatic temperature control devices shall be mounted as indicated in automatic temperature control section of specifications.

E. The cost of larger wiring, conduit, control and protective devices resulting from installation of equipment which was not used for basis of design as outlined in specifications shall be paid for by Plumbing Contractor at no cost to Owner or Architect-Engineer.

F. Contractor shall be responsible for providing supervision to Electrical Contractor to insure that required connections, interlocking and interconnection of plumbing and electrical equipment are made to attain intended control sequences and system operation.

G. Furnish four complete sets of electrical wiring diagrams to Architect-Engineer to be included in the maintenance manuals and three complete sets to Electrical Contractor. Diagrams shall show factory and field wiring of components and controls. Control devices and field wiring to be provided by Electrical Contractor shall be clearly indicated by notation and drawing symbols on wiring diagrams.

H. Contractor shall obtain complete electrical data on plumbing shop drawings and shall list this data on an approved form that shall be presented monthly or on request, to Electrical Contractor. Data shall be complete with wiring diagrams received to date and shall contain necessary data on electrical components of plumbing equipment such as HP, voltage, amperes, watts, locked rotor current to allow Electrical Contractor to order electrical equipment required in his contract.

1.16. WORK NOT INCLUDED IN CONTRACT

A. Consult Division 21, 23, and 26 of specifications for work to be provided by Electrical Contractor in conjunction with installation of plumbing equipment.

1.17. CODES, RULES AND REGULATIONS

A. Provide Work in accordance with applicable codes, rules and regulations of Local and State, Federal Governments and other authorities having lawful jurisdiction.

B. Conform to latest editions and supplements of following codes, standards or recommended practices.
C. BUILDING CODES:

1. International Codes (Latest adopted version of applicable codes)

D. SAFETY CODES:

1. National Electrical Safety Code Handbook H30 - National Bureau of Standards.
2. Occupational Safety and Health Standard (OSHA) - Department of Labor.

E. NATIONAL FIRE CODES:

1. NFPA No. 54 Gas Appliance & Gas Piping Installation
2. NFPA No. 70 National Electrical Code
3. NFPA No. 89M Clearances, Heat Producing Appliances
4. NFPA No. 204 Smoke & Heating Vent Guide

F. UNDERWRITERS LABORATORIES INC:

1. All materials, equipment and component parts of equipment shall bear UL labels whenever such devices are listed by UL.

G. MISCELLANEOUS CODES:

1. ANSI A117.1 - Handicapped Accessibility
2. Applicable State Boiler Codes
3. Americans with Disabilities Act (ADA)

H. ENERGY EFFICIENCY REQUIREMENTS:

1. All plumbing systems and components shall be manufactured and installed in compliance with ASHRAE 90.1 – 2007 and latest adopted version of IECC.

1.18. STANDARDS

A. Drawings and specifications indicate minimum construction standard. Should any work indicated be sub-standard to any ordinances, laws, codes, rules or regulations bearing on work, Contractor shall promptly notify Architect-Engineer in writing before proceeding with work so that necessary changes can be made. However, if the Contractor proceeds with work knowing it to be contrary to any ordinances, laws, rules, and regulations, Contractor shall thereby have assumed full responsibility for and shall bear all costs required to correct non-complying work.

1.19. PERMITS/FEES

A. The Contractor shall secure and pay for necessary permits and certificates of inspection required by governmental ordinances, laws, rules or regulations. Keep a written record of all permits and inspection certificates and submit two copies to Architect-Engineer with request for final inspection.
B. The Contractor shall include in their base bid any fees or charges by the local utility providers to establish new services to the structure. Coordinate with the utility suppliers to verify exactly which part of the work required for the new utility service, is to be performed by the contractor and which part will be supplied by the utility company.

PART 2 - PRODUCTS

2.1. Not Used

PART 3 - EXECUTION

3.1. SUBMITTALS

A. Contractor shall furnish submittals of all materials and equipment required by the specifications. Refer to each specification section for the submittals (if any) required for that section.
B. Submittal format shall be as indicated below. Submittals not meeting these requirements will be returned without action for re-submittal.

1. Submittals shall be furnished in an Adobe PDF format.
2. Submittals shall be per individual submittal section, as listed in the table of contents. All required submittals within that section shall be grouped together in a single submittal.

a. Furnishing submittals by division or by individual item may result in delayed reviewing of the submittal(s) due to additional administrative time required to process the large size and/or quantity of files.

3. Submittals shall have a cover page containing the following information: The project name, the applicable specification section and paragraph, the submittal date, and the Contractor's stamp (see below for requirements).
4. Mark each submitted item as applicable with scheduled mark, name, etc. corresponding to the plans.
5. Where generic catalog cuts are submitted for review, conspicuously mark or provide schedule of equipment, capacities, controls, fitting sizes, etc. that are to be provided. Each catalog sheet shall bear the equipment manufacturer's name and address.
6. Where equipment submitted does not appear in base specifications or specified equivalent, mark submittals with applicable alternate numbers, change order number or letters of authorization.
7. All submittals on materials and equipment listed by UL shall indicate UL approval on submittal.

C. Contractor review:

1. Contractor shall check all submittals to verify that they meet specifications and/or drawings requirements before forwarding submittals to the Architect-Engineer for their review. All submittals submitted to Architect-Engineer shall bear contractor's approval stamp that shall indicate that Contractor has reviewed submittals and that they meet specification and/or drawing requirements. Contractor's submittal review shall specifically check for but not be limited to the following: equipment capacities, physical size in relation to space allowed; electrical characteristics, provisions for supply, return and drainage connections to building systems. All submittals not meeting Contractor's approval shall be returned to their supplier for re-submittal.
2. No submittals will be considered for review by the Architect-Engineer without Contractor's approval stamp, or that have extensive changes made on the original submittal as a result of the Contractor's review.
3. Before submitting shop drawings and material lists, verify that all equipment submitted is mutually compatible and suitable for the intended use. Verify that all equipment will fit the available space and allow ample room for maintenance. If the size of equipment furnished makes necessary any change in location, or configuration, submit a shop drawing showing the proposed layout.

D. Review Schedule:

1. The shop drawing / submittal dates shall be at least as early as required to support the project schedule and shall also allow for two weeks Architect-Engineer review time plus a duplication of this time for re-submittal if required.
2. Submittal of all shop drawings as soon as possible after permitting approval but before construction starts is preferred.
3. Approval of shop drawings submitted prior to receipt of a permit for that respective scope of work should be considered conditional pending review/approval of the construction documents by the AHJ. Changes required to the submittal as a result of permitting comments received after architect's/engineer's review shall not be a justification for a change in price.
4. Any time delay caused by correcting and re-submitting submittals/shop drawings will be the Contractor's responsibility.

E. The Architect's-Engineer's checking and subsequent review of such drawings, schedules, literature, or illustrations shall not relieve the Contractor from responsibility for deviations from Drawings or Specifications unless he has, in writing, called the Architect's-Engineer's attention to such deviations at the time of submission, and secured their written approval; nor shall it relieve the contractor from responsibility for errors in dimensions, details, size of members, or omissions of components for fittings; or for coordinating items with actual building conditions and adjacent work.
F. Any corrections or modifications made by the Architect-Engineer shall be deemed acceptable to the Contractor at no change in price unless written notice is received by the Architect-Engineer prior to the performance of any work incorporating such corrections or modifications.
G. Submittals that require re-submission shall have the items that were revised "flagged" or in some other manner marked to call attention to what has been changed.
H. Coordination

1. After shop drawings have been reviewed and approved by all parties, transmit a set of submittals to each other trade (eg Plumbing, Mechanical, Electrical, Controls, etc) that will interface with installation. Each other contractor shall review the submittal for coordination and return a stamped submittal indicating they have reviewed the submittal for coordination purposes.

3.2. SHOP DRAWINGS

A. Shop drawings shall meet all of the above requirements for submittals.
B. Contractor shall submit Adobe PDF sets of all fabrication drawings. Cost of drawing preparation, printing and distribution shall be paid for by the contractor and included in his base bid.
C. No work shall be fabricated until Architect-Engineer's review has been obtained.

D. Plumbing shop drawings for pipe fabrication shall be a minimum of 1/4" scale. Provide drawings where the complexity of the system or confines of the space require coordination with construction and other trades. Plumbing shop drawings shall not be a reproduction of the contract document and shall show details of the following: Plans, elevations above finished floor, sections, components, insulation and attachments to other work. Plumbing layout indicating sizes on plans, fittings, insulation, clearances, penetrations through fire-rated and other partitions, hangers and supports, including methods for building attachment, vibration isolation, seismic restraints, and attachment.

3.3. OPERATING AND MAINTENANCE INSTRUCTIONS (O & M MANUALS)

A. Submit with shop drawings of equipment, four copies of installation, operating, maintenance instructions, and parts lists for equipment provided. Equipment manufacturer shall prepare instructions.
B. Keep in safe place, keys and wrenches furnished with the equipment provided under this contract. Present to the Owner and obtain a receipt for them upon completion of project.
C. Prepare a complete brochure, covering systems and equipment provided and installed under this contract. Submit brochures to Architect-Engineer for review before delivery to Owner. Brochures shall contain following:

1. Certified equipment drawings/or catalog data with equipment provided clearly marked as outlined above.
2. Record copy of all submittals indicating actual equipment installed indicating options, characteristics. Copies of submittals shall bear the stamps of all parties that reviewed submittals.
3. Complete installation, operating, maintenance instructions and parts lists for each item of equipment.
4. Special emergency operating instructions with a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to various parts of plumbing system.

D. Provide brochures bound in three-ring binders with metal hinge. Reinforce binding edge of each sheet of loose-leaf type brochure to prevent tearing from continued usage. Clearly print on label insert of each brochure:

1. Project name and address.
2. Section of work covered by brochure, i.e., "Plumbing", etc.

3.4. RECORD DOCUMENTS

A. During construction, keep an accurate record of all deviations between the work as shown on Drawings and that which is actually installed. Keep this record set of prints at the job site for review by the Architect/Engineer.
B. Upon completion of the installation and acceptance by the owner, transfer all record drawing information to one neat and legible set of prints. Then deliver them to the Architect/Engineer for transmittal to the Owner.
C. Provide one copy of on high quality heavy weight presentation type paper. Media which fade shall not be used.
D. Provide one electronic version of record documents in Adobe PDF format on a DVD or otherwise electronically transmitted. Transmit electronic copies in conjunction with hard copy documents.

3.5. CLEANING UP

A. Contractor shall take care to avoid accumulation of debris, boxes, crates, etc., resulting from the installation of his work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean.
B. Contractor shall clean up all ductwork and equipment at the completion of the project.
C. All equipment, cabinets and enclosures shall be thoroughly vacuumed clean prior to energizing equipment and at the completion of the project. Equipment shall be opened for observation by the Architect/Engineer as required.

3.6. WATERPROOFING

A. Avoid, if possible, the penetration of any waterproof membranes such as roofs, machine room floors, basement walls, and the like. If such penetration is necessary, perform it prior to the waterproofing and furnish all sleeves or pitch-pockets required. Advise the Architect/Engineer and obtain written permission before penetrating any waterproof membrane, even where such penetration is shown on the Drawings.
B. If Contractor penetrates any walls or surfaces after they have been waterproofed, he shall restore the waterproof integrity of that surface as directed by the Architect/Engineer at his own expense

3.7. CUTTING AND PATCHING

A. Contractor shall do cutting and patching of building materials required for installation of work herein specified. Remove walls, ceilings and floors (or portions thereof) necessary to accomplish scope of work. Do not cut or drill through structural members including wall, floors, roofs, and supporting structure, without the Architect's

and Structural Engineer's approval and in a manner approved by them.

B. Make openings in concrete with concrete hole saw or concrete drill. Use of star drill or air hammer for this work will not be permitted.

C. Patching shall be by the contractors of the particular trade involved, shall match the existing construction type, quality, finish and texture, and shall meet approval of Architect-Engineer. Damage to building finishes, caused by installation of plumbing work shall be repaired at Contractor's expense to approval of Architect-Engineer.

3.8. SETTING, ADJUSTMENT AND EQUIPMENT SUPPORTS

A. Work shall include mounting, alignment and adjustment of systems and equipment. Set equipment level on adequate foundation and provide proper anchor bolts and isolation as shown, specified or required by manufacturers in installation instructions. Level, shim and grout equipment bases as recommended by manufacturer. Mount motors, align and adjust drive shafts and belts according to manufacturer's instructions.

B. Equipment failures resulting from improper installation or field alignment shall be repaired or replaced by Contractor at no cost to Owner.

C. Floor or pad mounted equipment shall not be held in place solely by its own dead weight. Include anchor fastening in all cases.

D. Provide floor or slab mounted equipment with 3-1/2" high concrete bases unless specified otherwise. Plumbing contractor shall form all pads; General contractor shall provide and place all concrete and reinforcing for said pads. Individual concrete pad shall be no less than 4" wider and 4" longer than equipment, and shall extend no less than 2" from each side of equipment.

E. Provide each piece of equipment or apparatus suspended from ceiling or mounted above floor level with suitable structural support, platform or carrier in accordance with best-recognized practice. Verify that structural members of buildings are adequate to support equipment and unless otherwise indicated on plans or specified, arrange for their inclusion and attachment to building structure. Provide hangers with vibration isolators.

F. Submit details of hangers, platforms and supports together with total weights of mounted equipment to Architect-Engineer for review before proceeding with fabrication or installation.

3.9. START-UP, CHANGEOVER, TRAINING AND OPERATIONAL CHECK

A. Contractor shall perform the initial start-up of the systems and equipment and shall provide necessary supervision and labor to make the first seasonal changeover of systems. Personnel qualified to start-up and service this equipment, including manufacturer's technicians, and the Owner's operating personnel shall be present during these operations.

B. Contractor shall be responsible for training Owner's operating personnel to operate and maintain the systems and equipment installed. Keep a record of training provided to Owner's personnel listing the date, subject covered, instructors name, names of Owner's personnel attending and total hours of instruction given each individual.

C. All owner-training sessions shall be orderly and well organized and shall be video recorded digitally. At the end of the owner training, the "training" session recording shall be transmitted to the owner via DVD and shall become property of the owner.

3.10. FINAL CONSTRUCTION REVIEW

A. At final construction review, each respective Contractor and major subcontractors shall be present or shall be represented by a person of authority. Each Contractor shall demonstrate, as directed by the Architect-Engineer, that the work complies with the purpose and intent of the contract documents. Respective Contractor shall provide labor, services, instruments or tools necessary for such demonstrations and tests.

END OF SECTION 220010

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SECTION 220011 – BASIC PLUMBING MATERIALS AND METHODS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 220010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Provide documentation of all completed tests described herein and their results.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1. TESTING PROCEDURES FOR PIPING SYSTEMS

A. Test all lines and systems before they are insulated, painted or concealed by construction or backfilling. Provide fuel, water, electricity, materials, labor and equipment required for tests.
B. Where entire system cannot be tested before concealment, test system in sections. Verify that system components are rated for maximum test pressures to be applied. Where specified test pressures exceed component ratings, remove or isolate components from system during tests. Upon completion, each system shall be tested as an entire system.
C. Repair or replace defects, leaks and material failures revealed by tests and then retest until satisfactory. Make repairs with new materials.
D. All systems shall hold scheduled test pressures for specified time without loss of initial test pressure.
E. Upon completion of testing submit five copies of a typewritten report to A/E. Report shall list systems tested, test methods, test pressures, holding time and all failures with corrective action taken.
F. For test pressure schedules see Section 221100 of this specification.

3.2. TEST METHODS AND PRESSURES

A. Test methods and pressures shall be as follows:

1. Hydrostatic Test (Closed Systems):

   a. Hydrostatic test shall be performed using clean unused domestic water. Test pressures shall be as scheduled for system or 150% of operating pressure where not specified.

2. Hydrostatic Test (Open System):

   a. Test entire system with 10-foot head of water. Where system is tested in sections each joint in building except uppermost 10 feet of system shall be submitted to at least 10-foot head of water. Water shall be held in system for 15 minutes before inspection starts. System shall hold test pressure without leaks.

3. Pneumatic Test:

   a. Test entire system with compressed air. Systems operating above 25 PSI shall be tested at 75 PSI or 15% of operating pressure or whichever is greater.
   b. Allow at least 1 hour after test pressure has been applied before making initial test.
   c. Curing test, completely isolate entire system from compressor or other sources of air pressure.

4. Pressure Relief and Safety Valve:

   a. Before installation, test pressure temperature, and safety relief valves to confirm relief settings comply with specifications.
   b. Tag items that pass test with date of test, observed relief pressure setting and inspector’s signature.
   c. Items installed in systems without test tag attached will be rejected.

3.3. STERILIZATION OF DOMESTIC WATER SYSTEMS

A. After final pressure testing of distribution system thoroughly flush entire system with water until free of dirt and construction debris. Fill system with solution of liquid chlorine or hypochlorite of not less that 50 PPM. Retain treated water in system until test indicates non-spore-forming bacteria have been destroyed or for 24 hours whichever is greater.

B. All points in systems shall have at least 10 PPM of solution at end of retention period. Open and close each valve at least six times in system during sterilization process to sterilize valve parts.
C. When time and concentration conditions have been met, drain system and flush with fresh domestic water until residual cleaning solution is less than 1.0 PPM. Open and close each valve in system six times during flushing operation.
D. Test samples taken from several points in system shall indicate absence of pollution for two full days. Repeat sterilization as required. Acceptance of system will not be given until satisfactory bacteriological results are obtained.

3.4. CLEANING OF SYSTEMS AND EQUIPMENT

A. After pressure testing of systems and equipment and before operational test thoroughly clean interiors of piping and equipment. Clean equipment as recommended by equipment manufacturers. Where specific instructions are not provided clean equipment systems as follows:

3.5. MAINTENANCE OF SYSTEMS

A. Contractor shall be responsible for operation, maintenance and lubrication of equipment installed under this contract.
B. Keep a complete record of equipment maintenance and lubrication and submit two copies with request for final construction review.
C. Records shall indicate types of lubricants used and date or time when next maintenance or lubrication will need to be performed by Owner. Where special lubricants are required, Contractor shall provide Owner with a one year supply as determine by Equipment Manufacturer's recommendations.

3.6. PAINTING OF MATERIALS AND EQUIPMENT

A. Paint all exterior piping with (2) two coats of an enamel rust inhibiting exterior paint in a color selected by architect.
B. Touch-up painting and refinishing of factory applied finishes shall be by Plumbing Contractor. Contractor shall be responsible for obtaining proper type of painting materials and color from equipment manufacturer.
C. Unless specified otherwise factory built equipment shall be factory painted. Paint shall be applied over surfaces only after they have been properly cleaned and coated with a corrosion resistant primer.
D. After installation, damage to painted surfaces shall be properly prepared and primed with primers equal to factory materials. Finish coating shall be same color and type as factory finish.
E. Where extensive refinishing is required equipment shall be completely repainted.

3.7. PIPING IDENTIFICATION

A. Provide pipe markers at 10'-0" maximum spacing to identify piping in mechanical rooms and 20'-0" maximum spacing in all other areas with Seaton Setmark pipe markers with letters and flow direction arrows.
B. Colors and wording shall be of standard pipe markers as available from Seaton or equal. Submit for approval list of colors and wording prior to purchase of pipe markers.
C. Pipe marker nomenclature/colors shall meet applicable ANSI Standard and OSHA requirements.

3.8. VALVE IDENTIFICATION

A. Mark all valves with Seton No. 300-BL brass identification tags with system legend, valve number and size stamped on tag. Lettering shall be black ½" high. Tags shall be minimum 2" in diameter and attached to valve with Seton No. 16 brass jack chain.
B. Prepare four copies of typewritten list of valve tags. List shall be typed in upper case and contain tag number, valve size, type, function and location. Frame one list under glass and mount near operating instruction in main equipment rooms.

3.9. EQUIPMENT LABELS:

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware. Black letters on white background.
B. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
C. Minimum Letter Size: 1/4 inchfor name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
D. Fasteners: Stainless-steel rivets or self-tapping screws.
E. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
F. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

3.10. EXCAVATION AND BACKFILL

A. Perform necessary excavation to receive Work. Provide necessary sheathing, shoring, cribbing, tarpaulins, etc. for this operation, and remove it at completion of work. Perform excavation in accordance with appropriate section of these specifications, and in compliance with OSHA Safety Standards.
B. Excavate trenches of sufficient width to allow ample working space, and no deeper than necessary for installation work.
C. Conduct excavations so no walls or footings are disturbed or injured. Backfill excavations made under or adjacent to footing with selected earth or sand and tamp to compaction required by Architect-Engineer. Mechanically tamp backfill under concrete and pavings in six inch layers to 95% standard density, Reference Division 2.
D. Backfill trenches and excavations to required heights with allowance made for settlement. Tamp fill material thoroughly and moistened as required for specified compaction density. Dispose of excess earth, rubble and debris as directed by Architect.
E. When available, refer to test hole information on Architectural or Civil drawings or specifications for types of soil to be encountered in excavations.

3.11. FIRE BARRIERS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
B. SUBMITTALS

1. Product Data: For each type of product indicated.
2. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.

    a. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
    b. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

3. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:

    a. Types of penetrating items.
    b. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
    c. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.

C. Product Certificates: For through-penetration firestop system products, signed by product manufacturer.
D. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
E. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
F. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by building inspector, if required by authorities having jurisdiction.
G. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.
H. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
I. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.
J. Provide sleeves through all fire-rated walls and fill voids surrounding sleeves and interior to sleeves around piping with Nelson “Flameseal” fire stop putty with U.L. listed 3 hour rating installed as per manufacturers

recommendations.

1. Equivalent by Hilti, Inc., Johns Manville, Nelson Firestop Products, NUCO Inc., RectorSeal Corporation, Specified Technologies Inc., 3M, Tremco, USG, Dow, Chemelex.

3.12. EQUIPMENT ANCHORS

A. Provide floor or foundation mounted equipment such as pumps, boilers, air handling units, etc. with Decatur Engineering Company concrete anchors.
B. Where equipment anchors cannot be installed during forming of floors or foundations anchor equipment with McCulloch Kwik-Bolt concrete anchors.
C. Anchors shall be proper type and size recommended by manufacturer for equipment to be anchored.

3.13. WELDING

A. Contractor shall be responsible for quality of welding and suitability of welding procedures. All welding shall be in accordance with American Welding Society Standard B3.0 and ANSI Standard B31.1.
B. Welded pipe joints shall be made by certified welding procedures and welders. Welding electrodes shall be type and material recommended by electrode manufacturer for materials to be welded. All pipe and fittings ends shall be beveled a minimum of 30 degrees prior to welding.
C. Only welders who have successfully passed welder qualifications tests in previous 12 months for type of welding required shall do welding. Each welder shall identify his work with a code marking before starting any welded pipe fabrication. Contractor shall submit three copies of a list of welders who will work on project listing welders' code, date and types of latest qualification test passed by each welder.
D. Welded joints shall be fusion welded in accordance with Level AR3 of American Welding Society Standard AWS D10.9 "Standard for Qualification of Welding Procedures and Welders for Pipe and Tubing". Welders qualified under National Certified Pipe Welding Bureau will be acceptable.
E. Bevel all piping and fittings in accordance with recognized standards by flame cutting or mechanical means. Align and position parts so that branches and fittings are set true. Make changes in direction of piping systems with factory made welding fittings. Make branch connections with welding tees or forged weldolets.

END OF SECTION 220011

SECTION 220013 – PROJECT COORDINATION

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2. SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination Drawings.
2. Administrative and supervisory personnel.
3. Project meetings.
4. Requests for Interpretation (RFIs).

B. Each related sub-contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

1.3. COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Delivery and processing of submittals.
2. Progress meetings.
3. Preinstallation conferences.
4. Project closeout activities.
5. Startup and adjustment of systems.

1.4. SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:

a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
b. Indicate required installation sequences.
c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 40 inches. Format shall be PDF or other electronic format to facilitate multiple user commenting and sharing easily.

3. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including project managers, superintendent and other personnel in attendance at Project site to the General Contractor and other major subcontractors. Identify individuals and their duties and responsibilities; list email addresses and telephone numbers. Update the list as required during the project if personnel change.

1.5. COORDINATION

A. Certain materials will be provided by other trades. Examine the Contract Documents and reviewed record Submittals to ascertain these general requirements. Contract Documents reflect a basis of design and may not reflect actual equipment or items being utilized.
B. Carefully check space requirements with other trades and the physical confines of the area to insure that all material can be installed in the spaces allotted thereto including finished suspended ceilings and the spaces within the existing building. Make modifications thereto as required and approved.
C. Transmit to other trades all information required for work to be provided under their respective Sections in ample time for installation.
D. Wherever work interconnects with work of other trades, coordinate with other trades to insure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items of work that require access so that the ceiling trade will know where to install access doors and panels.
E. Obtain equipment submittal information for all pieces of equipment to be connected to from other trades that clearly indicates all connection requirements, locations, sizes, and similar requirements. Obtain this information in ample time to coordinate other trade submittals and equipment coordination. Where requirements differ from that on plans or differs from provisions made in the work, immediately notify the Architect/Engineer. Do not proceed with work that is incompatible with equipment provided.
F. Coordinate, project and schedule work with other trades in accordance with the construction sequence.
G. Coordinate with the local Utility Companies to their requirements for service connections and provide all necessary materials, labor and testing.
H. Coordinate with contractors for work under other Divisions of this specification for all work necessary to accomplish this contractor's work.
I. Conduct a coordination meeting after reviewing all other trade coordination drawings with other relevant trades. This meeting shall be held to prevent conflicts during construction. Each major relevant subcontractor shall attend this meeting. Report any potential conflicts or clearance problems to Architect/Engineer after meeting.
J. Adjust location of piping, ductwork, conduit, wiring, etc. to prevent interferences, both anticipated and encountered. Determine the exact route and location of each item prior to fabrication.

1. Right-of-Way:

a. Lines that pitch have the right-of-way over those that do not pitch. For example: steam, condensate, and plumbing drains normally have right-of way. Lines whose elevations cannot be changed to have right-of-way over lines whose elevations can be changed.
b. Make offsets, transitions and changes in direction in raceways as required to maintain proper headroom in pitch of sloping lines whether or not indicated on the Drawings.

1.6. DRAWINGS AND FILES.

A. The Drawings show only the general run of MEP systems, equipment, fixtures, piping and ductwork and other components as well as approximate location of items such as outlets, switches, diffusers, lights, and equipment connections, etc. Coordinate all exact locations of items with other trades, architectural elevations, equipment requirements, owner requirements, ceilings, access, serviceability, etc. All such modifications and coordination shall be made without additional cost to the Owner. Any significant changes in location of items necessary in order to meet field conditions shall be brought to the immediate attention of the Architect/Engineer and receive his approval before such alterations are made
B. Wherever the work is of sufficient complexity, additional Detail Drawings to scale similar to that of the bidding Drawings, prepared on tracing medium of the same size as Contract Drawings. With these layouts, coordinate the work with the work of other trades. Such detailed work to be clearly identified on the Drawings as to the area to which it applies. Submit for review Drawings clearly showing the work and its relation to the work of other trades before commencing shop fabrication or erection in the field. Attend meetings with other trades to review all documents.
C. When directed by the General Contractor for areas of necessary coordination provide 3D building modelling coordination files and documents with other trades. Transmit information electronically and attend meetings as directed by the G/C as well as take part in coordination activities and documentation. Contractor shall be required to generate their own electronic files for this process.

1.7. PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. The Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Possible conflicts.
i. Compatibility problems.
j. Time schedules.
k. Manufacturer's written recommendations.
l. Warranty requirements.
m. Compatibility of materials.
n. Space and access limitations.
o. Regulations of authorities having jurisdiction.
p. Testing and inspecting requirements.
q. Installation procedures.
r. Coordination with other work.
s. Required performance results.
t. Protection of adjacent work.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

C. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contractor is on time, ahead or behind schedule, in relation to Construction Schedule. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time. Discuss impact of various contractor schedules upon other contractors and how to remedy impacts.
b. Review present and future needs of each contractor present, including the following:

i. Interface requirements.

ii. Sequence of operations.
iii. Status of submittals.
iv. Deliveries.
v. Off-site fabrication.
vi. Access.
vii. Quality and work standards.
viii. Change Orders.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.8. REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI.

1. Submit Contractor's suggested solution(s) to RFI. If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
2. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

3.1. EQUIPMENT FURNISHED BY OTHERS

A. Description:

1. Items furnished by other trades (electrical contractor, etc.) such as disconnect switches, etc.
2. Kitchen Equipment (may be furnished by owner, owner’s vendor, or separate sub-contractor)
3. Equipment furnished by general contractor
4. Equipment furnished by owner

B. General

1. Fully review manufacturer’s installation instructions for equipment. Installation of all related plumbing items shall be per same.

a. Plumbing contractor shall obtain same from others if not readily available.

END OF SECTION 220013

SECTION 220523 – VALVES

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 220010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. EQUIVALENTS

A. Equivalent valves shall be used only from the following specified valve manufacturers and listed on current comparison charts by Apollo, Hammond, Hays, Milwaukee, Muessco, Nibco, Rockwell-Nordstrom, Stockham, and Watts.

1.3. SUBMITTALS

A. Product Data: For each type of valve indicated.

1.4. QUALITY ASSURANCE

A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
B. NSF Compliance: NSF 61 for valve materials for potable-water service and NSF 372 for lead content.

PART 2 - PRODUCTS

2.1. GENERAL REQUIREMENTS FOR VALVES

A. Plumbing valve applications specified in this Section are limited to NPS 12 (DN 300).
B. Refer to valve schedule articles for applications of valves.
C. Caution: Revise pressure ratings and insert temperature ratings in valve articles if valves with higher ratings are required.
D. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
E. Valve Sizes: Same as upstream piping unless otherwise indicated.
F. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 and smaller[except plug valves.
4. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

G. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Butterfly Valves: With extended neck.

H. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.
4. Grooved: With grooved ends to copper-tube dimensions or similar to AWWA C606.

2.2. VALVES

A. BALL VALVES

1. Ball valves shall be scheduled as type “BLV” valves. Valve specifications by type number shall be as follows:
2. Provide ball handle with extension or offset as required to clear piping insulation.

a. BLV-1: 2-1/2” valves and smaller, Hammond #8501 (screwed) or 8511 (solder) series bronze two piece large port ball valve 600 PSI-WOG/150 PSI-WSP reinforced TFE seats, chrome plate brass ball (tunnel or drilled design), silicon bronze stem vinyl-covered steel lever handle. Stainless steel ball and stem shall be provided for steam applications.
b. BLV-2: Ball valve shall be flexible lip seat to assure positive shut off (in both directions) and self compensates for wear. Material - fiberglass reinforced teflon, single piece. Self-

adjusting, low friction teflon box ring stem seals pre-loaded by Belleville washers. Two-piece carbon steel body. Four bolt design with locking fasteners for vibration resistance and joint integrity, one piece teflon body seal. Valve shall be rated for 250 PSI steam service. 316 stainless steel ball and stem. Provide with insulated handle. Neles Jamesbury Model 21-2236MT. Equivalent by Worchester. MCF Series 56-HT.

B. GLOBE VALVES

1. Globe valves shall be scheduled as type “GLV” valves. Valve specifications by type number shall be as follows:

   a. GLV-1: 2-1/2” valves and smaller, Hammond #IB413T (screwed) or IB423 (solder) bronze globe valve, 300 PSI-WOG/150 PSI-WSP union bonnet, Teflon disc, malleable iron handwheel.

C. PLUG VALVES

1. Plug valves shall be scheduled as type “PLV” valves. Valve specifications by type number shall be as follows:

   a. PLV-1: 1” valves and smaller Hays 7400 series iron body gas cock, 175 PSI-WOG bronze plug washer and nut, screwed ends.
   b. PLV-2: 1-1/4” through 4” valves, Rockwell-Nordstrom Fig. 142, semi-steel lubricated plug valve, 175 PSI-WOG coated plug, two bolt cover, and short pattern screwed ends. Provide complete with standard pattern cast handle.

D. GATE VALVES

1. Gate valves shall be scheduled as type “GTV” valves. Valve specifications by type number shall be as follows:

   a. GTV-1: 2” and smaller Hammond #IB640 (screwed) or IB635 (solder) ASTM B 62 bronze body and bonnet with malleable iron handwheel, 200 PSI-WOG/125 PSI-WSP.
   b. GTV-2: 2 ½” and larger Hammond #IR1140 HI, flanged, bolted bonnet, O.S. & Y., ASTM 126 iron body, bronze trimmed, 200 PSI-WOG/125 PSI-WSP.

E. CHECK VALVES

1. Check valves shall be scheduled as type “SCV” valves. Valve specifications by type number shall be as follows:

   a. SCV-1: 2” valves and smaller Hammond #IB940 (screwed) or IB912 (solder) bronze check valve, 200 PSI-WOG/125 PSI-WSP, Teflon or bronze disc and seat ring.
   b. SCV-2: 2-1/2” and larger Hammond #IR1124 HI flanged, ASTM 126 iron body, bronze trimmed, 200PSI-WOG/125 PSI-WSP.

F. BUTTERFLY VALVES

1. Butterfly valves shall be scheduled as Type “BFV” valves. Valve specifications by type number shall be as follows:

   a. BFV-1: Size 3” and larger Hammond #6211-01 (lever) or 6211-03 (gear) ASTM A 126 cast iron drilled and tapped full lug body, 200 PSI-WOG 12” and smaller, 150 PSI-WOG 14” and larger, extended neck, bronze disc, stainless steel stem, field-replaceable EPDM or (buna for oil or lubricated service) sleeve and stem seals.
   b. BFV-2: Size 3” and larger Victaulic Series 608N (lever or gear), brass cast body to UNS C87850, copper-tube dimensioned grooved ends, 300 PSI CWP, aluminum-bronze disc, stainless steel stem, and pressure responsive fluoroelastomer seat. (Stem shall be offset from the disc centerline to provide complete 360-degree circumferential seating.)

2. UL classified in accordance with NSF-61 for potable water service. The system shall meet the low-lead requirements of NSF-372.

2.3. VALVE SCHEDULE

SYSTEM	SIZE	STOP	CHECK	BALANCE
Domestic Water	½”-2-1/2”	BLV-1	SCV-1	BAV-1
Domestic Water	3” and up	BFV-1 or 2	SCV-2	BAV-1

PART 3 – EXECUTION

3.1. VALVE INSTALLATION

A. Install valves with unions, grooved joint couplings, or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
B. Locate valves for easy access and provide separate support where necessary.
C. Install valves in horizontal piping with stem at or above center of pipe.
D. Install valves in position to allow full stem movement.
E. Install swing check valves for proper direction of flow and in horizontal position with hinge pin level.

3.2. INSTALLATION

A. Install necessary valves within piping systems to provide required flow control, to allow isolation for inspection, maintenance and repair of each piece of equipment or fixture, and on each main and branch service loop.
B. Each valve shall be installed so that it is easily accessible for operation, visual inspection, and maintenance and wherever possible, gate, check and ball valves shall be installed on a horizontal run with the handle upright and within 15 degrees of vertical. Butterfly valves shall be installed with the stem in the horizontal position and the handle at 90 degrees from vertical.
C. Valves installed in piping systems shall be compatible with system maximum test pressure, pipe materials, pipe joining method, and fluid or gas conveyed in system.
D. Valves 2-1/2” and smaller shall have soldered, grooved, or screwed end connections as required by piping materials unless otherwise specified or shown on drawings. Install union connection in the line within two feet of each screw end valve unless valve can be otherwise easily removed from line. Valves 3” and over shall have flange or grooved end connections.
E. Non-rising stem valves shall not be installed at any point in the piping systems. With permission of Architect-Engineer non-rising stem valve may be installed at particular points where space is restricted.
F. Provide butterfly valves 6” and smaller with 10 position lever handle for on-off application and infinite position handle for throttling applications. Provide butterfly valves 8” and up with fully enclosed all weather gear operators.
G. Install globe valves with pressure on top of disc except that must be completely drained for inspection, maintenance or to prevent freezing shall be installed with stem in horizontal position to insure complete drainage of pipelines.
H. Gate valves shall not be installed in pipelines where intended for throttling service or where piping is subject to vibration as part of normal operating conditions.
I. Valves shall be designed for repacking under pressure when fully opened and backseated.
J. Balancing valves installed by means of sweating or soldering shall have their interiors removed before installation and reinstalled upon dissipation of the heat associated with installation. Using a wet rag in lieu of removing the valve interior as a means of heat dissipation during installation is not acceptable.

3.3. ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION 220523

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SECTION 220700 – PLUMBING INSULATION

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 220010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUMMARY

A. Section Includes:

1. Insulation Materials:

a. Flexible elastomeric.
b. Mineral fiber.

2. Insulating cements.
3. Adhesives.
4. Mastics.
5. Sealants.
6. Factory-applied jackets.
7. Field-applied jackets.
8. Tapes.

B. SUBMITTALS

1. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).
2. Shop Drawings:

a. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
b. Detail attachment and covering of heat tracing inside insulation.
c. Detail insulation application at pipe expansion joints for each type of insulation.
d. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
e. Detail removable insulation at piping specialties, equipment connections, and access panels.
f. Detail application of field-applied jackets.
g. Detail application at linkages of control devices.
h. Detail field application for each equipment type.

3. Qualification Data: For qualified Installer.
4. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. QUALITY ASSURANCE

1. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
2. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

a. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
b. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.3. DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.4. COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
B. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
C. Coordinate installation and testing of heat tracing.

1.5. SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 PRODUCTS

2.1. INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

2.2. PIPING AND EQUIPMENT INSULATION

A. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Aeroflex USA Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

B. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Corp.; Duct Wrap.
b. Johns Manville; Microlite.
c. Knauf Insulation; Duct Wrap.
d. Manson Insulation Inc.; Alley Wrap.
e. Owens Corning; All-Service Duct Wrap.

C. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000(Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

D. Plenum Fire Wrap:

1. Installation shall be in strict accordance with manufacturer’s written instructions, as shown on the approved shop drawings.
2. 3M™ Fire Barrier Plenum Wrap 5A+ shall be a high-temperature fiber blanket thermal insulation encapsulated in a fiberglass-reinforced aluminized foil.

3. Plenum Wrap density shall be nominal 6 pcf (96 kg/m3) and have a nominal 1/2 inch (12.7 mm) thickness.
4. The fiber blanket shall have a continuous use limit in excess of 1832°F (1000°C). Flame Spread Index and Smoke Developed Index of the foil encapsulated blanket shall be <25/<50.

2.3. INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

2.4. ADHESIVES

A. Military Specification referenced in this article is the only standard available when this Section was updated. MIL-A-3316C was last updated in October 1987.
B. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

1. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5. MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.
B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F.
3. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
4. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
2. Service Temperature Range: Minus 20 to plus 200 deg F.
3. Solids Content: 63 percent by volume and 73 percent by weight.
4. Color: White.

2.6. SEALANTS

A. Joint Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 deg F.
4. Color: White or gray.
5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. FSK and Metal Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.
5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: White.
5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7. FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. PVDC Jacket for Indoor Applications: 4-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

2.8. FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. inch, in a Leno weave, for equipment and pipe.

2.9. FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
B. Although other thicknesses for PVC jackets are available, a flame-spread index of 25 and a smoke-developed index of 50 apply only to thicknesses of 30 mils (0.8 mm) and less.
C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. See Division 01 Section "Product Requirements."
2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
5. Factory-fabricated tank heads and tank side panels.

2.10. TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Width: 3 inches.
2. Thickness: 11.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Width: 3 inches.
2. Thickness: 6.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.

1. Width: 2 inches.
2. Thickness: 6 mils.
3. Adhesion: 64 ounces force/inch in width.
4. Elongation: 500 percent.
5. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Width: 2 inches.
2. Thickness: 3.7 mils.
3. Adhesion: 100 ounces force/inch in width.
4. Elongation: 5 percent.
5. Tensile Strength: 34 lbf/inch in width.

E. PVDC Tape: White vapor-retarder PVDC tape with acrylic adhesive.

1. Width: 3 inches.
2. Film Thickness: 6 mils.
3. Adhesive Thickness: 1.5 mils.
4. Elongation at Break: 145 percent.
5. Tensile Strength: 55 lbf/inch in width.

2.11. SECUREMENTS

A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing or closed seal.
B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

2.12. INSULATION SCHEDULE

A. See plans for piping and insulation schedule. Other insulation requirements are scheduled below:

INSULATION SERVICE	SIZE	TYPE	THICKNESS	JACKET
Drinking Fount. Drain	All Sizes	FE	1”	ASJ-SSL
Condensate Drain	All Sizes	FE	½”	ASJ-SSL
Roof Drain Bodies	All Sizes	FE	½”	ASJ-SSL
MF - Mineral-Fiber	CG - Cellular Glass	FE - Flexible Elastomeric		

2.13. LAVATORIES AND SINK INSULATION

A. Insulate all exposed hot, cold and waste piping associated with lavatories and sinks with Truebro “Handi Lav-Guard” insulation kit model no. 102. Equivalent by Brocar Products Inc. or Proto P-trap and valve covers.

PART 3 – EXECUTION

3.1. EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3. GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids

throughout the length of equipment and piping including fittings, valves, and specialties.

B. All portions of piping shall be insulated, including inside walls, chases and other concealed spaced.
C. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.
D. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
E. Install insulation with longitudinal seams at top and bottom of horizontal runs.
F. Install multiple layers of insulation with longitudinal and end seams staggered.
G. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
H. Keep insulation materials dry during application and finishing.
I. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
J. Install insulation with least number of joints practical.
K. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

L. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
M. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

N. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
O. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
P. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
Q. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

R. Undamaged insulation systems on cold surface piping and equipment shall perform their intended functions as vapor barriers and thermal insulation without premature deterioration of insulation or vapor barrier. Contractor shall take every reasonable precaution to provide insulation systems with continuous unbroken vapor barriers.

3.4. PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Penetration Firestopping and fire-resistive joint sealers.

C. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Penetration Firestopping."

3.5. GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth

finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6. PLENUM WRAP INSTALLATION

A. Where piping or materials that are not plenum rated are found to existing in existing building conditions that will remain in a return air plenum as a part of the construction fire rated plenum wrap shall be utilized.
B. When piping materials that are not rated for installation in a plenum are installed in a plenum, in lieu of replacing the piping, fire rated plenum wrap shall be applied at no additional cost.
C. Application shall be in strict accordance with manufacturers recommendation and listing requirements.
D. The surface of any wrapped items should be cleaned. The following additional items/materials are required for product installation: min. 3/4 in. (19 mm) wide Scotch® Filament Tape 898 (or equivalent), 3M™ FSK Facing Tape 3320 (or equivalent),min. 1/2 in.(12.7mm)wide x min. 0.015 in.(0.38mm) thick carbon steel or stainless steel banding material with steel banding clips or 16 gauge steel tie wire as alternate for banding, banding tensioner, crimping tool, and banding cutter.

3.7. FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8. MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.9. FINISHES

A. Equipment and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
D. Do not field paint aluminum or stainless-steel jackets.

3.10. FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
B. Perform tests and inspections.
C. Tests and Inspections:

1. Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
2. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.
E. Insulation failing to meet workmanship and appearance standards shall be replaced with an acceptable installation before final acceptance of project will be given. Insulation failing to meet performance requirements of this specification for a period of one year after date of final acceptance or through one heating season and one cooling season, whichever is longer shall be replaced with an acceptable installation. All costs to correct insulation deficiencies and costs to repair damages to other work shall be at Plumbing Contractors expense at no cost to owner.

END OF SECTION 220700

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SECTION 221000 – PLUMBING PIPING

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 220010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Product Data: For each type of product to be used.

PART 2 - PRODUCTS

2.1. PIPING MATERIALS

A. Piping used throughout project shall conform to the following specifications. Piping shall be plainly marked with manufacturers name and weight. See piping material schedule at end of this Section for materials to be used for each piping system.

1. Cast Iron Bell and Spigot Soil Pipe

a. Pipe and fittings shall be gray cast iron bell and spigot conforming to ASTM A-74.
b. Seal joints with neoprene gaskets conforming to ASTM C-564.
c. Pipe and fittings shall be marked with the CISPI trademark or receive approval of engineer.
d. Pipe and fittings by AB&I, Charlotte, Star or Tyler

2. Hubless Cast Iron Soil Pipe

a. Pipe and fittings shall be gray cast iron conforming to CISPI 301.
b. Pipe joints shall be no-hub heavy duty couplings consisting of neoprene rubber sleeve conforming to ASTM C-564 and mfg. by Husky SD 4000, Clamp all-125 or MG. Equivalent Mission.Heavyweight, Ideal Clamp Product.
c. Pipe and fittings shall be marked with the CISPI trademark or receive approval of engineer.
d. Pipe and fittings by AB&I, Charlotte, Star or Tyler

3. Ductile Iron Pipe:

a. Pipe

i. Ductile iron shall be ANSI A21.51, AWWA C151. All pipe joints shall be mechanical unless otherwise indicated. Pipe shall be color coded by blotches of paint. The Contractor shall submit a “color class” schedule of the pipe as marked by the manufacturer.
ii. Inside coating shall be cement-mortar lining with seal coat of bituminous material in accordance with ANSI A21.4.
iii. American Water Works Associations (AWWA) Standards: C151-86 Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for water, or other liquids.
iv. American National Standards Institute (ANSI): A21.4-1985 Cement mortar lining for gray-iron and Ductile-Iron Pipe and Fittings for water. A21.10-1987 Gray-Iron and Ductile-Iron Fittings, 3 inch through 48 inch for water and other liquids. A21.11-1985 Rubber gasket joints for gray-iron and ductile-iron pressure pipe and fittings. A21.51-1986 Ductile-iron pipe centrifugally cast in metal molds for sand-lined molds for water or other liquids (AWWA C151-1981).

b. Ductile Iron Pipe Joints and Fittings:

i. Joints: Ductile iron shall be mechanical joints of the latest approved design of the manufacturer. Joints shall be so designed to guarantee a water-tight joint for the life of the pipeline.
ii. Fittings: Ductile iron shall be short body mechanical as shown on the drawings, or required of the same pressure design as the pipe. Dimensional control and joint design shall conform to ANSI Standard A21.10 and A21.11. All fittings shall be coated as specified for the pipe. Where rods or ties are shown or called for, fittings shall be provided with anchoring lugs.
iii. Joint Materials: Ductile Iron Joint: Mechanical joints, bolts, glands, retainer glands and gaskets, ANSI Standard A21.11.

4. Carbon Steel Pipe (1/8” thru 2”):

a. Pipe:

i. Provide seamless carbon steel conforming to ASTM specification A-106.
ii. Pipe joints shall be threaded conforming to ANSI Standard B2.1.

b. Carbon Steel Welding Fittings:

i. Provide carbon low alloy seamless steel welding fittings conforming to current ANSI Standard B16.9 and ASTM Specification A234.

c. Grooved Joint Fittings:

i. Provide ductile iron fittings conforming to ASTM A536, Grade 65-45-12; or factory-fabricated from ASTM A53 steel pipe.

d. Branch Connection Welding Fittings:

i. Provide carbon steel weldolet fittings conforming to ANSI Standards B16.9, B16.11, B31.1.0 and ASTM specification A105, Grade 11.

e. Branch Connection, Welding to Screwed Fitting:

i. Provide carbon steel threadolet fitting conforming to ANSI Standards B16.9, B16.11, B31.1, and ASTM Specification A105, Grade 11.

f. Carbon Steel Flanges:

i. Provide carbon steel flanges conforming to ASTM Specification A181, Grade 1, and ANSI Standard B16.5.

g. Malleable Iron Screwed Fittings:

i. Provide screwed malleable iron fittings conforming to ANSI Standard B16.3, and ASTM Specification A-47 grade 32510.

h. Cast Iron Screwed Fittings:

i. Provide screwed cast iron fittings conforming to ANSI Standard B16.4, B2.1, and ASTM Specification A-126, Class A.

i. Roll Grooved Pipe Couplings:

i. Provide Victaulic Installation-Ready Style 107N (rigid) couplings with Grade “EHP” gasket (EPDM compound) in mechanical areas. Provide Victaulic Installation-Ready Style #177 or approved equal style (flexible) couplings with Grade “EHP” or “E” gasket in other areas. Provide with ductile iron housing and nuts and bolts.
ii. UL classified in accordance with NSF-61 for potable water service. The system shall meet the low-lead requirements of NSF-372.

5. Carbon Steel Pipe (2-1/2” and above):

a. Pipe:

i. Provide electric resistance welded carbon steel pipe conforming to ASTM Specification A-53.
ii. Pipe ends shall be beveled for welding.

b. Carbon Steel Welding Fittings:

i. Provide carbon low alloy seamless steel welding fittings conforming to current ANSI Standard B16.9 and ASTM Specification A234.

c. Branch Connection Welding Fittings:

i. Provide carbon steel weldolet fittings conforming to ANSI Standards B16.9, B16.11, B31.1.0 and ASTM specification A105, Grade 11.

d. Branch Connection, Welding to Screwed Fitting:

i. Provide carbon steel threadolet fitting conforming to ANSI Standards B16.9, B16.11, B31.1, and ASTM Specification A105, Grade 11.

e. Carbon Steel Flanges:

i. Provide carbon steel flanges conforming to ASTM Specification A181, Grade 1, and ANSI Standard B16.5.

f. Malleable Iron Screwed Fittings:

i. Provide screwed malleable iron fittings conforming to ANSI Standard B16.3, and ASTM Specification A-47 grade 32510.

g. Cast Iron Screwed Fittings:

i. Provide screwed cast iron fittings conforming to ANSI Standard B16.4, B2.1, and ASTM Specification A-126, Class A.

h. Grooved Joint Fittings:

i. Provide ductile iron fittings conforming to ASTM A536, Grade 65-45-12; or factory-fabricated from ASTM A53 steel pipe.

i. Pipe Flange Gaskets:

i. Provide 1/16" thick asbestos free gaskets full face or ring type as required. Gaskets shall be factory cut.
ii. Gaskets by Durable Mfg. Co. or Garlock Company.

j. Roll Grooved Pipe Couplings:

i. Provide Victaulic Installation-Ready Style 107N couplings with Grade "EHP" gasket (EPDM compound) in mechanical areas. Provide Victaulic Installation-Ready Style #177 or approved equal style (flexible) couplings with Grade "EHP" or "E" gasket in other areas. Provide with ductile iron housing and nuts and bolts.
ii. UL classified in accordance with NSF-61 for potable water service. The system shall meet the low-lead requirements of NSF-372.

6. Copper Tube:

a. Tube/Pipe:

i. Provide hard temper copper water tube conforming to requirements of current ASTM Specification B-88. Tubing shall be Type K, L, or M as listed in schedule. Tubing joints shall be soldered, brazed or Viega Pro-Press style fittings. See schedule for joining method to be used.
ii. Pipe by Anaconda, Cerro, Chase, Mueller or Revere Copper.

b. Wrought Copper Fittings:

i. Provide wrought solder joint copper tube fitting conforming to ANSI Standard B16.22
ii. Fittings by Anaconda, Chase, Viega or Nibco.

c. Grooved Joint Fittings: ASME B16.22 wrought copper or cast bronze to ASME B16.18. Manufactured to copper-tube dimensions. (Flaring of tube or fitting ends to accommodate alternate sized couplings is not permitted.) Victaulic Copper Connection.

d. Provide Victaulic Installation-Ready Style 607H couplings with grade 'EHP' gasket. Copper-tube dimensions with offsetting, angle-pattern bolt pads.

7. Copper Tube Type ACR:

a. Pipe/Tube:

i. Provide hard temper nitrogenized copper refrigerant tube conforming to requirements of current ASTM B-88. Tubes shall be Type L or K as listed in schedule.
ii. Tubing joints shall be brazed.
iii. Pipe by Anaconda, Cerro, or Mueller.

b. Wrought Copper Fittings:

i. Provide wrought solder joint copper tube fitting conforming to ANSI Standard B16.22
ii. Fittings by Anaconda, Chase or Nibco.

8. Polyethylene Pipe Natural Gas Piping:

a. Provide polyethylene pipe for gas service conforming to ASTM D-1248. Pipe shall be UV stabilized.
b. SDR of 11.

c. Pipe by Driscopipe or equal.

9. Polyvinyl Chloride Drain Waste Pipe:

a. Pipe:

i. Provide Schedule 40 polyvinyl chloride solid core plastic drain waste and vent pipe conforming to ASTM D2665. Joints shall be properly cleaned, primed and glued where scheduled.
ii. Polyvinyl Chloride (PVC) Pipe & Fittings Cell Class 12454 B. ASTM D 2241 SDR-26
iii. Pipe by Charlotte, Genova, Crestline or equal.

b. PVC Fittings:

- PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe. PVC Non-pressure Piping Joints: Join piping according to ASTM D 2665.

- Joints shall be of a push-on type with a bell-end grooved to receive a synthetic rubber gasket when scheduled. Solvent welded joints are not allowed outside the building. The joint shall be made in accordance with ASTM D 3212.

ii. Equivalents: Spears, Lasco or equal.

10. Cross linked Polyethylene Pipe:

a. Tubing Standard: ViegaPEX High-Density Cross-linked polyethylene tubing shall be manufactured to the requirements of ASTM F876 and meet the standard grade hydrostatic pressure ratings from Plastic Pipe Institute in accordance with TR-4/03. The following three standard grade ratings are required.

i. 200 degrees F at 80 psig
ii. 180 degrees F at 100 psig
iii. 73.4 degrees F at 160 psig

b. Chlorine testing: According to ASTM F876 shall meet or exceed the following end use condition.

i. End use conditions of : 100% @ 140°F
ii. Per PEX 5006 (CL5) or NSF P171 (CLR)

c. Tubing Standard: FostaPEX High-Density Cross-linked polyethylene tubing shall be manufactured to the requirements of ASTM F876 and meet the standard grade hydrostatic pressure ratings from Plastic Pipe Institute in accordance with TR-4/03. The following three standard grade ratings are required.

i. 200 degrees F at 80 psig
ii. 180 degrees F at 100 psig
iii. 73.4 degrees F at 160 psig

d. Fitting Standard: PEX Press fittings shall be manufactured from UNS C83600, C87700 or C87710 Bronze and meet the requirements of ASTM F877 tested as a system with ViegaPEX tubing. The PEX Press sleeve shall be manufactured out of a 304 grade or better stainless steel and have one to three view holes incorporated in it to ensure proper PEX tubing insertion.

e. Equivalent system by Uponor

i. Pipe/Tube

- Material: Cross-linked polyethylene (PEX) manufactured by PEX-a or Engel method. Type: Wirsbo AQUAPEX. Material Standard: Manufactured in accordance with ASTM F876 and ASTM F877 and tested for compliance by an independent third party agency. Standard grade hydrostatic design and pressure ratings from PPI.

ii. Fittings

- Material: Fitting assembly shall be manufactured from material listed in paragraph 5.1 of ASTM F1960. Material Standard: Comply with ASTM F1960. Type: PEX-a cold expansion fitting. Assembly shall consist of the appropriate ProPEX insert with a corresponding ProPEX Ring.

11. HDPE Below Grade Polyethylene Water Piping:

a. Provide high density polyethylene pipe listed for use in underground water service applications. Pipe shall be UV stabilized.
b. DR 9, ASTM D3035, AWWA C901, NSF
c. PE3408/PE3608 material conforming to ASTM D3350 with the cell classification of 345464C/E and is listed with the Plastic Pipe Institute's (PPI) TR4. Formulated with carbon black and ultraviolet stabilizer for maximum protection against UV rays for added assurance.
d. Joints shall be fused.

PART 3 EXECUTION

3.1. PIPING INSTALLATION

A. Piping systems materials and installation shall conform to the following standards and codes.

1. System: Natural Gas Piping

a. Code: ANSI Standard B31.12 "Fuel Gas Piping"

B. Natural Gas piping and other fuel piping systems shall be installed per code. All fittings in chases, solid walls, floors, etc. shall be welded, fused or otherwise listed for installation in concealed locations. Other acceptable methods shall include providing ventilated casings for installation in these situations. Unions, elbows, bushings, etc shall not be installed in concealed locations and shall only be installed in accessible locations.
C. No piping containing water shall be located in areas subject to freezing temperatures, including: unheated attics, unheated plenums, chases wall spaces or cavities within exterior walls, under slabs, or in concrete.
D. Pipe sizes indicated on plans and as specified refer to nominal size in inches, unless otherwise indicated. Pipes are sized to nearest ½". In no case shall piping smaller than size specified be used.
E. Install drainage piping pitched down at a minimum slope of 1/4 inch per foot (2 percent) for piping 3 inch and smaller, and 1/8 inch per foot (1 percent) for piping 4 inch and larger. Install vent piping pitched to drain back by gravity to the sanitary drainage piping system.
F. Contractor shall provide and be responsible for proper location of pipe sleeves, hangers, supports, and inserts. Install hangers, supports, inserts, etc., as recommended by manufacturer and as specified and detailed on drawings.
G. Verify construction types and provide proper hangers, inserts and supports for construction used. Install inserts, hangers and supports in accordance with manufacturers load ratings and provide for thermal expansion of piping without exceeding allowable stress on piping or supports. Provide solid type hangers and supports where pipe travel exceeds manufacturer's recommendations for fixed hanger and supports.
H. Install piping parallel with building lines and parallel with other piping to obtain a neat and orderly appearance of piping system. Secure piping with approved anchors and provide guides where required to insure proper direction of piping expansion. Piping shall be installed so that allowable stress for piping, valves and fittings used are not exceeded during normal operation or testing of piping system.
I. Install piping so that systems can be completely drained. Provide piping systems with valve drain connections at all low pipe and ahead of all sectionalizing valves whether shown on plans or not. Drain lines shall be ¾".
J. Drain valves on closed piping systems such as chilled water system shall have lock shields and plugged or capped outlets to protect system from inadvertent drainage.
K. Pitch all piping and where possible make connections from horizontal piping so that air can be properly vented from system. Provide air vents as specified at all system high points and at drop in piping in direction of flow. Use eccentric reducers where necessary to avoid air pockets in horizontal piping.
L. Provide unions or flanged joints in each pipe line preceding connections to equipment to allow removal for repair or replacement. Provide all screwed and control valves with unions adjacent to each piping connection. Provide screwed end valves with union adjacent to valve unless valve can be otherwise easily removed from line.
M. Fittings pressures and temperature ratings shall be equal to or exceed maximum operating temperature and working pressure of piping system. No mitered or field fabricated pipe fittings will be permitted.
N. All pipe threads shall meet ANSI Standard B2.1 for taper pipe threads. Lubricate pipe threads with Teflon thread sealant and lubricating compound applied full strength. Powdered or made-up compound will not be permitted. Pipe thread compound shall be applied only to male pipe threads.
O. Brazed socket type joints shall be made with suitable brazing alloys. Minimum socket depth shall be sufficient for intended service. Brazing alloy shall be end fed into socket, and shall fill completely annular clearance between socket and pipe or tube. Brazed joints depending solely upon a fillet rather than a socket type joint will not be acceptable.
P. Soft soldered socket type joints shall be made with sill-floss or 95-5 tin-antimony solder as required by temperature and pressure rating of piping system. Soldered socket-type joints shall be limited to systems containing non-flammable and non-toxic fluids. Soldered socket-type joints shall not be used on piping systems subject to shock vibration. Soldered joints depending solely upon a fillet rather than a socket-type joint will not be acceptable.
Q. Make changes in piping size and direction with approved factory made fittings. Provide fittings suitable for at

least 125 PSI working pressure or of pressure rating required for maximum working pressure of system whichever is greater.

3.2. PIPING SUPPORTS, ANCHORS, SLEEVES AND SEALS

A. Furnish proper type and size pipe sleeves to General Contractor for installation in concrete or masonry walls or floors. Sleeves are not required for supply and waste piping through wall supporting plumbing fixtures or for cast iron soil pipe passing through concrete slab or grade except where penetrating a membrane waterproof floor.
B. Plumbing Contractor shall supervise installation of sleeves to insure proper location and installation.
C. Each sleeve shall be continuous through wall floor or roof and shall be cut flush on each side except where indicated otherwise. Sleeves shall not be installed in structural member except where indicated or approved.
D. Sleeves passing through above grade floors subject to flooding such as toilet rooms, bathrooms, equipment rooms and kitchens shall be cast iron with integral flanges and shall extend 1 inch above finished floor. Size sleeves for and seal space between pipe sleeve with Thunderline Link-Seal.
E. Provide steel pipe sleeves in bearing walls and masonry walls. Opening in non-bearing walls, floors and ceilings may be 20 gauge galvanized pipe sleeves or openings cut with concrete core drill.
F. Pipe insulation shall run continuous through pipe sleeves with ¼" minimum clearance between insulation and pipe sleeve. Provide metal jackets over insulated pipes passing through fire walls, floors and smoke partitions. Jacket shall be 0.018 stainless steel extending 12 inches on either side of barrier and secured to insulation with 3/8" wide band. Seal annular space between jacket and pipe sleeves with Thunderline High Temperature Link Seal.
G. Pipe wall penetrations exposed to view shall have tight fitting escutcheons or flanges to cover all voids around openings.
H. All below grade and exterior wall penetrations shall be installed in a pipe sleeve and sealed between the pipe and pipe sleeve with Thunderline High Temperature Link Seal.
I. Provide sleeves through all fire-rated walls and fill voids surrounding sleeves and interior to sleeves around cables with Nelson "Flameseal" fire stop putty with U.L. listed 3 hour rating installed as per manufacturers recommendations.

1. Equivalent by Hilti, Inc., Johns Manville, Nelson Firestop Products, NUCO Inc., RectorSeal Corporation, Specified Technologies Inc., 3M, Tremco, USG, Dow, Chemelex.

3.3. PIPE HANGERS AND SUPPORTS

A. Provide and be responsible for locations of piping hangers, supports and inserts, etc., required for installation of piping under this contract. Design of hangers and supports shall conform to current issue of Manufacturers Standardization Society Specification (MSS) SP-58.
B. Pipe hangers shall be capable of supporting piping in all conditions of operation. They shall allow free expansion and contraction of piping, and prevent excessive stress resulting from transferred weight being induced into pipe or connected equipment. Support horizontal or vertical pipes at locations of least vertical movement.
C. Where horizontal piping movements are such that hanger rod angularity from vertical is greater than 4 degrees from cold to hot position of pipe, offset hanger, pipe, and structural attachments to that rod is vertical in hot position.
D. Hangers shall not become disengaged by movements of supported pipe.
E. Provide sufficient hangers to adequately support piping system at specified spacing, at changes in piping direction and at concentrated loads. Hangers shall provide for vertical adjustment to maintain pitch required for proper drainage, and for longitudinal travel due to expansion and contraction of piping. Fasten hangers to building structural members wherever practicable.
F. Unless indicated otherwise on drawings support horizontal steel piping as follows:

PIPE SIZE	ROD DIAMETER	MAXIMUM SPACING
Up to 1-1/4"	3/8"	8 Ft.
1-1/2" to 2"	3/8"	10 Ft.
2-1/2" to 3-1/2"	½"	12 Ft.
4" and 5"	5/8"	15 Ft.

G. Unless indicated otherwise on drawings support horizontal copper tubing as follows:

NOM. TUBING SIZE	ROD DIAMETER	MAXIMUM SPACING

Up to 1”	3/8”	6 Ft.
1-1/4” to 1-1/2”	3/8”	8 Ft.
2”	3/8”	9 Ft.
2-1/2”	½”	9 Ft.
3” and 4”	½”	10 Ft.

H. Support horizontal cast iron soil pipe with two hangers for each section located close to each hub.
I. Support vertical cast iron soil pipe at every floor, steel and copper tubing at every other floor except where indicated otherwise on drawings.
J. Provide continuous threaded hanger rods wherever possible. No chain, wire, or perforated straps shall be used.
K. Hanger rods shall be subject to tensile loading only, where lateral or axial pipe movement occurs provide suitable linkage to permit swing. Provide pipe support channels with galvanized finish for concealed locations and painted finish for exposed locations. Submit design for multiple pipe supports indicating pipe sizes, service and support detail to Architect-Engineer for review prior to fabrication.
L. Provide Grinnell pipe hangers for vertical pipe risers as follows:

PIPE MATERIAL	PIPE SIZE	HANGER FIG. NO.
Copper	½” thru 4”	CT-121
Steel	¾” thru 20”	261

M. Provide Grinnell Fig. 194, 195 or 199 steel wall brackets for piping suspended or supported from walls. Brackets shall be prime coated carbon steel.
N. Mount hangers for insulated piping on outside of pipe insulation sized to allow for full thickness of pipe insulation.
O. Provide Grinnell Fig. 167 insulation protection shields sized so that line compressive load does not exceed one-third of insulation compressive strength. Shield shall be galvanized steel and support lower 180 degrees of pipe insulation on copper tubing. Provide calcium silicate blocking insulation at each pipe hanger in thickness of other adjacent insulation. Insulation vapor barrier jacket shall overlap to maintain vapor barrier continuous.

3.4. INSULATION MATERIALS AND APPLICATIONS METHODS (HANGERS, SUPPORTS, ANCHORS, GUIDES, EXPANSION JOINTS, ETC.)

A. Insulation materials and application methods for piping hangers supports, anchors, guides expansion joints, etc., shall be as follows:

1. Insulate hangers and supports from direct contact with cold or hot surfaces (-120ºF to 450ºF) with rigid calcium silicate insulation at suspension points to prevent crushing of insulation.
2. The length or thickness of the insulation support same as the pipe insulation thickness. Provide ASJ type discs or otherwise reestablish vapor barrier.

B. Structural attachments for pipe hangers shall be as follows:
C. Concrete Structure: Provide Grinnell Fig. No. 285 cast in concrete insert for loads up to 400 lbs. and Grinnell Fig. 281 wedge cast in type concrete insert for loads up to 1200 lbs.
D. Provide Grinnell pipe hangers for horizontal single pipe runs as follows:

PIPE MATERIALS	PIPE SIZE	HANGER FIG. NO.
Copper	½” thru 4”	CT-65
Steel	3/8” thru 4”	65
Steel	5” thru 30”	260

E. Provide Fee and Mason Fig. 600 channel trapeze pipe hangers for horizontal multiple pipe runs with pipe clamps or pipe rollers as follows:

PIPE MATERIALS	PIPE SIZE	CLAMP NO.	ROLLER NO.
Copper	3/8” thru 4”	8600 CP*	8010 CP*
Steel	3/8” thru 6”	8500	8010

*Copper Plated

F. Pipe supports for horizontal piping mounted on pipe racks or stanchions shall be Advanced Thermal Systems low friction graphite slide supports or equivalent by Elcen or Grinnell. Where racks and supports are not detailed on drawings submit detailed support drawings to Architect-Engineer for review prior to fabrication.
G. Provide Fee and Mason Fig. 404 vibration control hangers at locations where piping vibrations would be transmitted to building structure by conventional hangers. Apply hangers within their load supporting range.
H. Provide Elcen Fig. 50 pipe saddle with adjuster to support piping from floor. Provide complete with pedestal type floor stand.
I. Provide necessary structural steel and attachment accessories for installations of pipe hangers and supports. Where heavy piping loads are to be attached to building structure verify structural loading with Architect-Engineer prior to installations.
J. Equivalent hangers and supports by Auto-Grip, Basic Engineer, Bee Line, Elcen, Fee & Mason, Fluorocarbon Company, Unistrut or Super Strut Inc.
K. Provide premanufactured pipe support for piping located on flat roofs, unless otherwise indicated on drawings. Support will be of modular designs with roller bearings and guide saddles for straight piping runs longer than 50’ and Unistrut type clamp/support type for other shorter runs. Maximum pipe support spacing shall be 10’ for steel piping. Copper piping and refrigerant piping shall be supported at shorter distances. Piping near equipment connections shall be supported within 3’ of units. System supports shall be compatible with roofing materials and shall be provided with plates, pads, etc to spread weight and wear on roof surface. Provide pipe supports from Miro Industries, B-Line, or approved equivalent.

END OF SECTION 221000

SECTION 221119 – DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 220010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Product Data: For each type of product indicated.
B. Field quality-control test reports.
C. Operation and maintenance data.

1.3. QUALITY ASSURANCE

A. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1. INSULATING UNIONS AND FLANGES

A. Provide insulating unions and flanges conforming to following specifications and plainly and permanently marked with manufacturers name and pressure class rating. Unions and flanges shall be as follows:

1. Steel pipe to steel pipe screwed end:

a. Provide Stockham malleable iron No. 693-1/2 insulating union with high dielectric strength insulating sleeve and gasket.

2. Steel pipe to steel pipe flanged end:

a. Provide two weld neck flanges of proper pressure rating insulated on both sides with Central or Klingerit Flange Insulation Kit.

3. Iron or steel pipe to copper pipe:

a. Provide Epco Dielectric union or flange with screwed or solder joint as required. Union shall have 250 PSI rating and flange 175 PSI rating at 190 degrees F.
b. Dielectric Waterway Fitting: Copper-silicon casting conforming to UNS C87850, and UL classified in accordance with ANSI / NSF-61 for potable water service, with threaded or grooved ends. Victaulic Style 647 or equal.

2.2. UNIONS

A. Provide unions or flanged joint in each line preceding connections to equipment or valves requiring maintenance.

1. Unions or flanges for servicing and disconnect are not required in installations using grooved joint couplings.

B. Provide Stockham brass seat unions of material and pressure rating required by piping system.
C. Where piping systems of dissimilar materials are jointed together provide proper insulating union as specified under this specification.
D. Equivalent unions by Fairbanks or Grinnell.

2.3. STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. If retaining more than one screen size, indicate screen size on Drawings.
6. Perforation Size:

a. Strainers NPS 2 and Smaller: 0.062 inch
b. Strainers NPS 2-1/2 to NPS 4: 0.062 inch.
c. Strainers NPS 5 and Larger: 0.125 inch.

7. Drain: Factory-installed, hose-end drain valve.

B. Install strainers upstream from automatic control valves, water service backflow preventers and RPZ backflow preventers 1" and larger. Where strainers are an integral part of these items or incorporated in accessory equipment directly upstream, individual line strainers will not be required. Strainers shall be same size as piping. Provide strainers with proper isolation and blow down valves to allow basket removal for cleaning.
C. Install strainer so that basket contains debris by gravity at no flow conditions to allow removal of large debris not able to be passed by blow down.

2.4. HOSE BIBBS

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral or field-installation, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation: Wheel handle.
13. Include operating key with each operating-key hose bibb.
14. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.5. WALL HYDRANTS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Josam Company.
b. Prier Products, Inc.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.
f. Woodford Manufacturing Company.
g. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: NPS 3/4 or NPS 1.
7. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Box: Deep, flush mounting with locking cover.
9. Box and Cover Finish: Polished nickel bronze.
10. Outlet: Iintegral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
11. Nozzle and Wall-Plate Finish: Polished nickel bronze.
12. Operating Keys(s): One with each wall hydrant.

2.6. TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. MIFAB, Inc.
b. PPP Inc.
c. Sioux Chief Manufacturing Company, Inc.
d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
e. Watts Industries, Inc.; Water Products Div.

2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

2.7. BACKFLOW PREVENTERS

A. Provide where shown on plans the following types of backflow preventers. Provide isolation valve ahead of backflow preventers.
B. Equivalent backflow prevents by Watts, Febco, Lawler.

1. Reduced Pressure Zone Principle (1/4”-1/2”):
   a. Watts Series 009 reduced pressure backflow preventer complete with strainers and valves.
2. Reduced Pressure Zone Principle (3/4”-10”):
   a. Watts Series 909 reduced pressure backflow preventer complete with strainers and valves. Provide isolation valve ahead of backflow preventers. Provide with air gap fitting and pipe to floor drain.
3. Double Check Valve (1/2”-2”):
   a. Watts Series 007 double check valve assembly complete with ball type test cocks, full port ball valve shut offs and strainer.
4. Double Check Valve (2-1/2”-10”):
   a. Watts Series 709 double check valve assembly complete with ball type test cocks, OS&Y valve shut offs and strainer. Epoxy coated cast iron check valve bodies with bronze seats.
5. Pressure Vacuum Breakers (1/2”-2”):
   a. Watts Series 800M4QT pressure vacuum breaker with integral ball valve shut offs.
6. Pressure Vacuum Breakers (3/8”-1/2”):
   a. Watts Series 008QT pressure vacuum breaker for anti-spill applications, with integral ball valve shut offs.
7. Atmospheric Vacuum Breaker (1/4”-3”):
   a. Watts Series 288A atmospheric vacuum breaker in plain brass finish.
8. Hose Bibb Vacuum Breakers
   a. Vacuum Breakers for hose end connections shall be Watts Series 8 non removable type.

2.8. DOMESTIC HOT WATER EXPANSION TANKS

A. The expansion tank shall be welded steel, diaphragm type tank, and pre-charged to the minimum operating pressure. Tanks shall be suitable for domestic water service.
B. Provide expansion tanks as shown on plans by Amtrol, Bell and Gossett, Watts.

2.9. WATER PRESSURE-REDUCING VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cash Acme.
2. Conbraco Industries, Inc.
3. Honeywell Water Controls.
4. Victaulic Company.
5. Watts Industries, Inc.; Water Products Div.
6. Zurn Plumbing Products Group; Wilkins Div.

B. Standard: ASSE 1003.
C. Pressure Rating: Initial working pressure of 150 psig.
D. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.

1. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

2.10. WATER HAMMER ARRESTERS:

A. ASSE 1010 or PDI-WH 201, piston type with pressurized metal-tube cushioning chamber. Sizes indicated are based on ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F. Manufacturers: Amtrol, Josam, Sioux Chief, Watts, Zurn.

B. Provide water hammer arrestors for all plumbing banks with fixtures utilizing flush valves in any capacity. Locate arrester between the last two fixtures served on the branch line. Water Closet = 10FU, Urinals = 5FU, Lavatories = 1.5FU.

FIXTURE UNITS (FU)	UNIT SIZE
1-11	A
12-32	B
33-60	C
61-113	D
114-154	E
155-330	F

C. When no flush valves are installed on a branch of piping provide ¾”x12” air chambers at each hot and cold water supply connection to a plumbing fixture. Contractor may provide water hammer arresters above the ceiling before dropping into masonry construction in lieu of air chambers. Connections to other items such as washers, ice makers, or other equipment shall be provided with an appropriately sized water hammer arrester for each water connection.

2.11. RECIRCULATION PUMPS

A. The pump shall be of the horizontal, oil-lubricated type and of all bronze construction. Specifically designed and guaranteed for quiet operation. Suitable for 125# working pressure.

B. The pump shall have a ground and polished steel shaft with a hardened integral thrust collar. The shaft shall be supported by two horizontal sleeve bearings designed to circulate oil. The pump is to be equipped with a mechanical seal with carbon seal face rotating against a ceramic seat. The motor shall be non-overloading at any point on pump curve.

C. The motor shall be of the drip-proof, sleeve-bearing, quiet-operating, rubber-mounted construction. Motors shall have built-in thermal overload protectors.

D. Provide pump with aquastat or built in temperature control/timer system.

E. Mount pumps at approximately 6’ AFF in mechanical rooms for access and maintenance. Alternatively mount pumps adjacent to water heaters for access and maintenance where heaters are on mezzanine or otherwise elevated above floor.

F. Equivalents pumps by Grundfos, Armstrong, Bell & Gossett and Taco.

2.12. THERMOMETERS AND GAUGES

A. GENERAL

1. Provide thermometers and wells and pressure test plugs as hereinafter specified and shown on the plans so that proper testing and balancing and trouble shooting can be accomplished.

B. THERMOMETERS

1. Thermometers shall be red reading mercury type having scale length of not less than 9”, and scale divisions of 2 degrees F, or less similar and approved equal to Moeller Instrument Company, Inc., Style AJ. Range shall be as specified or as required for the duty. Thermometers and wells must be of at least the quality and design specified. If it complies with these specifications, equipment manufactured by one of the following manufacturers will be acceptable: Moeller, Trerice or Weksler.
2. Install thermometers at eye level (5’-0”) at easily readable locations.

C. GAUGES

1. Gauges shall be bourdon tube with minimum 4-1/2” dial and die cast aluminum case with black enamel finish. The movement shall be all stainless steel with Grade A phosphor bronze bourdon tube brazed at socket and tip. The accuracy of the gauge shall be within ½ percent of the scale range. The pointer shall be the micrometer adjustment type recalibrated from the front. Pressure, compound, and differential pressure gauges shall have suitable scale ranges, shall be submitted and are subject to the review of the Engineer. Graduations shall be one pound or less on all gauges where this is standard for the required range.
2. Gauges shall have ¼” IPS connections and shall be Moeller “Vantage” gauges with Case Style No. 2, or approved equal. If it complies with these specifications, equipment manufactured by one of the following manufacturers will be acceptable: Ashcroft, Marsh, Trerice, Moeller, Weksler, Taylor, Weiss,

or Midwest.

3. Install a Sisco ¼" or ½" NPT fitting (Test Plug) of solid brass at desired indicated locations. Test plug shall be capable of receiving either a pressure or temperature probe 1/8" o.d. Dual seal core shall be neoprene for temperature to 200°F and shall be rated zero leakage from vacuum to 1000 psig.
4. Install gauges vertically.

D. INSTALLATION

1. Thermometers shall be installed as hereinafter specified. Where thermometer is scheduled, a thermometer well shall be provided.
2. All thermometer wells shall be constructed of brass or stainless steel and where installed in insulated piping shall have at least 2-1/2" lagging extension. Gauges shall be installed as hereinafter specified.
3. Gauge cocks shall be polished brass A10 ¼" tee handle type with threaded ends. 125 psi rated.
4. Provide gauge cock with ¼" pipe nipple for connection to gauge cock.
5. Pressure temperature ratings of each well shall be suitable for the system in which it is installed in accordance with specifications and as indicated on the drawings. All wells shall be filled with Silicon and be complete with caps and chains.
6. Thermometers shall have the temperature ranges as required for the intended application and shall be installed as scheduled.

E. THERMOMETER & TEST GAUGE COCK INSTALLATION SCHEDULE

SERVICE	Thermometer & Well	Press Gauge & Gauge Cock
Water Service ahead of PRV		X
Water Service after PRV	X	X
Fire Water Service		X

PART 3 EXECUTION

3.1. INSTALLATION

A. Refer to other Division 22 Sections for piping joining materials, joint construction, and basic installation requirements.
B. Install backflow preventers in each water supply to plumbing equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
3. Do not install bypass piping around backflow preventers.

C. Install water regulators with inlet and outlet shutoff valves. Install pressure gages on inlet and outlet.
D. Install balancing valves in locations where they can easily be adjusted.
E. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet. Install at approximately 6' AFF for service and maintenance.

1. Install thermometers and water regulators if specified.
2. Install cabinet-type units recessed in or surface mounted on wall as specified.

F. Install Y-pattern strainers for water on supply side of each control valve, water pressure-reducing valve, solenoid valve, and pump.
G. Install water hammer arresters in water piping according to PDI-WH 201.
H. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
I. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.
J. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.2. FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.3. ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.
B. Set field-adjustable flow of balancing valves.
C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.
D. Prior to occupancy the contractor shall balance all components of the recirculation system to insure hot water is delivered throughout the building. This shall be done at times of low usage of the domestic system to insure systems functions during times of low/no use. Mark all valves, record settings of balance and provide documentation to owner at turnover.

END OF SECTION 221119

SECTION 221319 – SANITARY WASTE PIPING SPECIALTIES

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2. SUMMARY

A. This Section includes the following sanitary drainage piping specialties:

1. Backwater valves.
2. Cleanouts.
3. Floor drains.
4. Roof and Overflow Drains
5. Downspout Nozzles
6. Trench drains.
7. Channel drainage systems.
8. Air-admittance valves.
9. Miscellaneous sanitary drainage piping specialties.
10. Roof flashing assemblies.
11. Interceptors.

1.3. SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:

1. Cleanouts.
2. Drains (floor, roof, trench, etc.).

1.4. QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

PART 2 PRODUCTS

2.1. BACKWATER VALVES

A. Horizontal, Cast-Iron Backwater Valves

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Josam Company; Josam Div.
b. MIFAB, Inc.
c. Smith, Jay R. Mfr. Co.; Division of Smith Industries, Inc.
d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.14.1.
3. Size: Same as connected piping.
4. Body: Cast iron.
5. Cover: Cast iron with bolted or threaded access check valve.
6. End Connections: Hub and spigot or hubless.
7. Type Check Valve: Removable, bronze, swing check, factory assembled or field modified to hang open for airflow unless subject to backflow condition.
8. Extension: ASTM A 74, Service class; full-size, cast-iron, soil-pipe extension to field-installed cleanout at floor; replaces backwater valve cover.

2.2. CLEANOUTS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated below or a comparable product by one of the following:

1. Josam Company; Josam Div.

2. Sioux Chief Manufacturing Company, Inc.
3. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
4. Tyler Pipe; Wade Div.
5. Watts Drainage Products Inc.
6. Zurn Plumbing Products Group; Specification Drainage Operation.

B. Floor (Concrete Floor Finish):

1. Wade #W-6000-XS cast iron cleanout with square, heavy duty, scoriated nickel bronze top, adjustable above to finished floor.

C. Floor (Quarry Tile Floor Finish):

1. Same as concrete floor finish.

D. Floor (Tile Floor Finish):

1. Wade #W-6000-TS cast iron cleanout with square heavy duty nickel bronze top, recessed for tile and adjustable to finished floor.

E. Floor (Carpet Floor Finish):

1. Wade #W-6000-XS-72 cast iron cleanout with round, heavy duty nickel bronze top with carpet retainer and adjustable to finished floor after concrete has set.

F. Wall:

1. Wade #W-8450-C cleanout with dura-coated cast iron ferrule and cadmium plated cast iron counter-sunk plug complete with round smooth nickel bronze wall access cover and flush over-wall frame.

G. Verify floor materials used from Architectural plans and provide proper cleanout tops, where they occur in carpet, quarry tile, vinyl tile or ceramic tile.

2.3. FLOOR DRAINS

A. Cast-Iron Floor Drains:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

a. Josam Company.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.
d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group.

2. Standard: ASME A112.6.3.
3. Body Material: Gray iron.
4. Seepage Flange: Required for all elevated slabs.
5. Anchor Flange: Required.
6. Clamping Device: Required.
7. Outlet: Bottom.
8. Top or Strainer Material: Nickel bronze in public spaces or rough bronze in mechanical spaces unless otherwise scheduled.
9. Top of Body and Strainer Finish:
10. Top Shape: Square in tiled areas. All others shall be round.
11. Dimensions of Top or Strainer: As scheduled.
12. Trap Material: Cast iron.
13. Trap Pattern: Deep-seal P-trap.
14. Trap Features: Trap-seal primer valve drain connection where shown on plans.

2.4. ROOF AND OVERFLOW DRAINS

A. Drains shall be type and style listed below.

1. Equivalent drains by J.R. Smith, Zurn, Watts or Josam.

B. Roof Drain Type 1

1. Wade #W-3000 cast iron roof drain with flange, flashing ring with gravel stop and cast iron dome.

C. Overflow Roof Drain Type 1

1. Wade #W-3000 cast iron roof drain with flange, flashing ring with gravel stop and cast iron dome. Provide with 2” dam.

2.5. DOWNSPOUT NOZZLES

A. Provide Wade series 3940 cast bronze downspout nozzles with threaded outlet and flange to secure nozzle to wall.
B. Equivalent drains by J.R. Smith, Zurn, or Josam.

2.6. TRENCH DRAINS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Josam Company.
2. MIFAB, Inc.
3. Smith, Jay R. Mfg. Co.
4. Tyler Pipe; Wade Div.
5. Watts Drainage Products Inc.
6. Zurn Plumbing Products Group.
7. DuraTrench

B. Standard: ASME A112.6.3 for trench drains.
C. Material: Ductile or gray iron.
D. Flange: Anchor.
E. Clamping Device: Required.
F. Grate Material: Ductile iron>.
G. Grate Finish: Painted.
H. Top Loading Classification: Heavy Duty.
I. Trap Material: Cast iron.
J. Trap Pattern: Standard P-trap.

2.7. CHANNEL DRAINAGE SYSTEMS

A. Polymer-Concrete Channel Drainage Systems:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ABT, Inc.
b. Josam Company; Mea-Josam Div.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
d. Josam Company; Mea-Josam Div.
e. Strongwell Corporation; Lenoir City Division.
f. Zurn Plumbing Products Group; Flo-Thru Operation.
g. DuraTrench

2. Type: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.

a. Channel Sections: Narrow, interlocking-joint, sloped-invert, polymer-concrete modular units with end caps. Include rounded bottom, with built-in invert slope of 0.6 percent and with outlets in number, sizes, and locations indicated. Include extension sections necessary for required depth.

i. Dimensions: 4-inch (102-mm) inside width. Include number of units required to form total lengths indicated.
ii. Frame: Gray-iron or galvanized steel for grates.

b. Grates: Manufacturer's designation "heavy duty," with slots or perforations, and of width and thickness that fit recesses in channel sections.

i. Material: Ductile iron
ii. Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.

c. Covers: Solid ductile or gray iron, of width and thickness that fit recesses in channel sections, and of lengths indicated.
d. Supports, Anchors, and Setting Devices: Manufacturer's standard, unless otherwise indicated.

e. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

2.8. AIR-ADMITTANCE VALVES

A. Fixture Air-Admittance Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Ayrlett, LLC.
b. Durgo, Inc.
c. Oatey.
d. ProSet Systems Inc.
e. RectorSeal.
f. Studor, Inc.

2. Standard: ASSE 1051, Type A for single fixture or Type B for branch piping.
3. Housing: Plastic.
4. Operation: Mechanical sealing diaphragm.
5. Size: Same as connected fixture or branch vent piping.

B. Stack Air-Admittance Valves :

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Durgo, Inc.
b. Oatey.
c. Studor, Inc.

C. Standard: ASSE 1050 for vent stacks.
D. Housing: Plastic.
E. Operation: Mechanical sealing diaphragm.
F. Size: Same as connected stack vent or vent stack.

2.9. MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping with increaser fitting of size indicated.

B. Expansion Joints :

1. Standard: ASME A112.21.2M.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

2.10. FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.
3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.

B. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch (1.01-mm) minimum thickness, unless otherwise indicated. Include G90 (Z275) hot-dip galvanized, mill-phosphatized finish for painting if indicated.
C. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil (1.01-mm) minimum thickness.
D. Fasteners: Metal compatible with material and substrate being fastened.
E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.
F. Solder: ASTM B 32, lead-free alloy.
G. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

2.11. GREASE INTERCEPTORS

A. Grease Interceptors :

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a.
b. Josam Company; Josam Div.
c. MIFAB, Inc.
d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
e. Tyler Pipe; Wade Div.
f. Watts Drainage Products Inc.
g. Zurn Plumbing Products Group.

2. Standard: ASME A112.14.3 and PDI-G101, for intercepting and retaining fats, oils, and greases from food-preparation wastewater.
3. Plumbing and Drainage Institute Seal: Required.
4. Body Material: Cast iron or steel.
5. Interior Lining: Corrosion-resistant enamel.
6. Exterior Coating: Corrosion-resistant enamel.
7. Body Extension: As required.
8. Rate in subparagraph below is limited to 100 gpm (6.3 L/s).
9. Flow Rate: As scheduled.
10. Capacity in first subparagraph below is limited to 200 lb (90.7 kg).
11. Grease Retention Capacity: As scheduled
12. Flow-Control Fitting: Required.

2.12. OIL INTERCEPTORS

A. Oil Interceptors

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Josam Company; Josam Div.
b. MIFAB, Inc.
c. Rockford Sanitary Systems, Inc
d. Smith, Jay R. Mfg. Co.
e. Tyler Pipe; Wade Div.
f. Watts Drainage Products Inc.
g. Zurn Plumbing Products Group.

2. Type: Factory-fabricated interceptor for separating and removing light oil from wastewater.
3. Body Material: Cast iron or steel.
4. Flow-Control Fitting: Required.

PART 3 EXECUTION

3.1. INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.
B. Install backwater valves in building drain piping. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.
C. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
4. Locate at base of each vertical soil and waste stack.
5. Not all required cleanouts are shown on the plans in the interest of drawing clarity. Cleanout that are shown are shown are to be located as shown. Additional code required cleanouts shall be located to be along walls (not in middle of halls or large floor areas) and out of general sight lines where possible. Install cleanouts so they are accessible by extending them through walls, and floors, to outside of building, or to above grade as required.

D. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

E. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
F. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

   a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
   b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
   c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

G. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface, unless otherwise indicated.

H. Assemble and install ASME A112.3.1, stainless-steel channel drainage systems according to ASME A112.3.1. Install on support devices so that top will be flush with surface.
I. Assemble non-ASME A112.3.1, stainless-steel channel drainage system components according to manufacturer's written instructions. Install on support devices so that top will be flush with adjacent surface.
J. Assemble FRP channel drainage system components according to manufacturer's written instructions. Install on support devices so that top will be flush with adjacent surface.
K. Assemble plastic channel drainage system components according to manufacturer's written instructions. Install on support devices so that top will be flush with adjacent surface.

L. Install fixture air-admittance valves on fixture drain piping only when specifically shown or directed by Engineer.
M. Install stack air-admittance valves at top of stack vent and vent stack piping only when specifically shown or directed by Engineer.
N. Install air-admittance-valve wall boxes recessed in wall.

O. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.
P. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
Q. Install through-penetration firestop assemblies in plastic conductors and stacks at floor penetrations.
R. Install deep-seal traps on floor drains and other waste outlets..
S. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

T. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.
U. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.
V. Install vent caps on each vent pipe passing through roof.
W. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.
X. Install grease interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing.

1. Above-Floor Installation: Set unit with bottom resting on floor, unless otherwise indicated.
2. Flush with Floor Installation: Set unit and extension, if required, with cover flush with finished floor.
3. Recessed Floor Installation: Set unit in receiver housing having bottom or cradle supports, with receiver housing cover flush with finished floor.
4. Install cleanout immediately downstream from interceptors not having integral cleanout on outlet.

Y. Install grease removal devices on floor. Install trap, vent, and flow-control fitting according to authorities having jurisdiction. Install control panel adjacent to unit, unless otherwise indicated.
Z. Install oil interceptors, including trapping, venting, and flow-control fitting, according to authorities having jurisdiction and with clear space for servicing. Coordinate oil-interceptor storage tank and gravity drain with Division 23 Section "Facility Fuel-Oil Piping."
AA. Install solids interceptors with cleanout immediately downstream from interceptors that do not have integral cleanout on outlet. Install trap on interceptors that do not have integral trap and are connected to sanitary

drainage and vent systems.

BB. Install wood-blocking reinforcement for wall-mounting-type specialties.

CC. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

DD. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2. CONNECTIONS

A. Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.

B. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

C. Install piping adjacent to equipment to allow service and maintenance.

D. Grease Interceptors: Connect inlet and outlet to unit, and connect flow-control fitting and vent to unit inlet piping. Install valve on outlet of automatic drawoff-type unit.

E. Grease Removal Devices: Connect controls, electrical power, factory-furnished accessories, and inlet, outlet, and vent piping to unit.

F. Oil Interceptors: Connect inlet, outlet, vent, and gravity drawoff piping to unit; flow-control fitting and vent to unit inlet piping; and gravity drawoff and suction piping to oil storage tank.

G. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

H. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3. FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07 Section "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4. PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

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SECTION 221429 – SUMP PUMPS

PART 1 GENERAL

1.1. SUMMARY

A. This Section includes wet-pit-mounted, vertical and submersible sump pumps and accessories, inside the building, for building storm drainage systems.

1.2. SUBMITTALS

A. Product Data: For each type and size of sump pump specified. Include certified performance curves with operating points plotted on curves, and rated capacities of selected models, furnished specialties, and accessories.
B. Shop Drawings: Diagram power, signal, and control wiring.
C. Operation and maintenance data.

1.3. QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

B. WET-PIT-MOUNTED, VERTICAL SUMP PUMPS

1. Manufacturers:

a. Alyan Pump Company.
b. Weil Pump Company, Inc.
c. Zoeller
d. Armstrong

C. Description: Factory-assembled and -tested, single-stage, centrifugal, end-suction sump pumps complying with UL 778. Vertical, separately coupled, suspended pumps complying with HI 1.1-1.2 and HI 1.3 for wet-pit-volute sump pumps.

1. Pump Arrangement: Simplex or Duplex as scheduled.
2. Casing: Cast iron, with screened inlet and threaded connection for NPS 2 and smaller and flanged connection for NPS 2-1/2 and larger discharge piping.
3. Impeller: ASTM A 48/A 48M, Class No. 25 A or higher cast iron; statically and dynamically balanced nonclog design; overhung, single suction, keyed and secured to shaft.
4. Pump Shaft and Sleeve Bearings: Stainless-steel shaft with bronze sleeve bearings. Include oil-lubricated, intermediate sleeve bearings at 48-inch maximum intervals if basin depth is more than 48 inches, and grease-lubricated, ball-type thrust bearings.
5. Pump and Motor Shaft Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment.

D. Pump Discharge Piping: Manufacturer's standard galvanized-steel or bronze pipe.
E. Pit Cover: Cast iron or steel with bituminous coating and strong enough to support pumps, motors, and controls.
F. Cover Shaft Seal: Stuffing box, with graphite-impregnated braided-yarn rings and bronze packing gland.
G. Motor: Single speed; grease-lubricated ball bearings. Comply with requirements in Division 22 Section "Common Motor Requirements for Plumbing Equipment" with built-in thermal-overload protection appropriate for motor size and duty.

1. Mounting: On vertical, cast-iron pedestal.

H. Controls: NEMA 250, Type 1 enclosure, pedestal-mounted float switches; with floats, float rods, and rod buttons. Include automatic alternator to alternate operation of pump units on successive cycles and to operate multiple units if one pump cannot handle load.

1. Float Guide: Pipe or other restraint for floats and rods in basins of depth greater than 60 inches.
2. High-Water Alarm: Cover-mounted, micropressure-switch alarm, with electric bell; 120-V ac, with transformer and contacts for remote alarm bell.

2.2. SUBMERSIBLE SUMP PUMPS

A. Manufacturers:

1. ABS Pumps, Inc.
2. Goulds Pumps; ITT Industries.
3. Grundfos Pumps Corp.
4. Liberty Pumps.
5. Little Giant Pump Co.
6. Paco Pumps, Inc.
7. Stancor, Inc.
8. Weil Pump Company, Inc.
9. Zoeller Company.

B. Description: Factory-assembled and tested, simplex or duplex as scheduled, single-stage, centrifugal, end-suction, submersible, direct-connected sump pumps complying with UL 778 and HI 1.1-1.2 and HI 1.3 for submersible sump pumps.

C. Casing: Cast iron; with cast-iron inlet strainer, legs that elevate pump to permit flow into impeller, and vertical discharge with companion flange for piping connection.

D. Impeller: ASTM A 48/A 48M, Class No. 25 A or higher cast iron; statically and dynamically balanced, semiopen nonclog design, overhung, single suction, keyed and secured to shaft.

E. Casing and Impeller: Cast iron casing with metal inlet strainer and brass, bronze, or cast-iron impeller.

F. Casing and Impeller: Cast iron or plastic casing with inlet strainer and metal or plastic impeller.

G. Pump and Motor Shaft: Stainless steel with factory-sealed, grease-lubricated ball bearings and single-mechanical seals.

H. Motor: Hermetically sealed, capacitor-start type, with built-in overload protection; three-conductor waterproof power cable of length required, and with grounding plug and cable-sealing assembly for connection at pump. Comply with requirements in Division 22 Section "Common Motor Requirements for Plumbing Equipment"

I. Pump Discharge Piping: Factory or field fabricated, ASTM A 53/A 53M, Schedule 40, galvanized-steel pipe.

J. Basin Cover: Cast iron or steel with bituminous coating and strong enough to support controls.

K. Controls: NEMA 250, Type 1 enclosure, pedestal-mounted float switch; with float, float rod, and rod buttons. Include automatic alternator to alternate operation of pump units on successive cycles and to operate multiple units if one pump cannot handle load.

L. Controls: NEMA 250, Type 6, 120-V ac, float switch, mounted on discharge piping and alarm for simplex pumps.

2.3. SUBMERSIBLE SUMP PUMPS FOR USE IN ELEVATOR SUMPS

A. Provide submersible pump as specified above and provide control systems capable of pumping water while containing oil. The system shall function automatically and shall provide for an alarm in the event of (a) the presence of oil in the sump (b) high liquid in the sump or (c) high amps or a locked rotor condition. An alarm that sounds only in the event of a high liquid condition shall not be acceptable.

1. CONTROLS:

a. The control shall be approved to UL 508 standards and housed in a gasketed Nema 4X enclosure with stainless steel hinged hardware and 8-pin twist-lock electrical receptacle. The control shall include dual "Oil-Minder Relays" with variable sensitivity settings, magnetic contactor with separate over-current relay, self-cleaning stainless steel sensor probe, high decibel warning horn with illuminated red light and alarm silencing switch, dual floats, clearly marked terminal board and remote monitoring contact. A Nema 4X box with 8-pin twist-lock electrical receptacle and 25' (additional lengths available) of mating cable shall be provided. All cables between the pump and junction box shall be 16' long and the cable and plug from the control unit shall be 8' long. The control unit, pump, floats and sensor probe shall be factory assembled as a complete, ready to use system and shall be tested and approved by a nationally recognized testing laboratory such as ENTELA.

2.4. SUMP PUMP BASINS

A. Description: Factory fabricated basin with sump, pipe connections, and separate cover.

B. Sump: Fabricate watertight, with sidewall openings for pipe connections.

1. Material: Fiberglass.
2. Reinforcement: Mounting plates for pumps, fittings, and accessories.
3. Anchor Flange: Same material as or compatible with sump, cast in or attached to sump, in location and of size required to anchor basin in concrete slab.

C. Cover: Fabricate with openings having gaskets, seals, and bushings, for access to pumps, pump shafts, control rods, discharge piping, vent connections, and power cables.

1. Material: Cast iron or steel with bituminous coating.
2. Reinforcement: Steel or cast iron, capable of supporting foot traffic for basins installed in foot-traffic areas.

2.5. SUMP PUMP PITS

A. Description: Concrete pit with sump, pipe connections, curb frame, and separate cover.
B. Sump: Construct of watertight, cast-in-place, reinforced concrete with sidewall openings for pipe connections.
C. Curb Frame and Cover:

1. Curb Frame Material: Galvanized steel or steel with bituminous coating.

a. Pattern: Z-cross-section shape with raised outer rim of height matching cover, for recessed mounting having installed cover flush with top of floor slab.

2. Cover: Fabricate with openings having gaskets, seals, and bushings, for access to pumps, pump shafts, control rods, discharge piping, vent connections, and power cables.

a. Material: Cast iron or steel with bituminous coating.
b. Reinforcement: Steel or cast iron, capable of supporting foot traffic for pits installed in foot-traffic areas.

PART 3 EXECUTION

3.1. CONCRETE

A. Install concrete bases of dimensions indicated for pumps and controllers. Refer to Division 22 Section "Common Work Results for Plumbing."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.
2. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
3. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Cast-in-place concrete materials and placement requirements are specified in Division 03.

3.2. SUMP PUMP INSTALLATION

A. Install sump pumps according to applicable requirements in HI 1.4.
B. Install pumps and arrange to provide access for maintenance including removal of motors, impellers, couplings, and accessories.
C. Suspend wet-pit-mounted, vertical sump pumps from basin and pit covers. Make direct connections to storm drainage piping.
D. Set submersible sump pumps on basin or pit floor. Make direct connections to storm drainage piping.
E. Install sump pump basins and connect to drainage piping. Brace interior of basins according to manufacturer's written instructions to prevent distortion or collapse during concrete placement. Set basin cover and fasten to basin top flange. Install cover so top surface is flush with finished floor.
F. Construct sump pump pits and connect to drainage piping. Set pit curb frame recessed in and anchored to concrete. Fasten pit cover to pit curb flange. Install cover so top surface is flush with finished floor.
G. Support piping so weight of piping is not supported by pumps.
H. Install piping adjacent to sump pumps to allow service and maintenance.
I. Connect storm drainage piping to pumps.

1. Install flexible connectors adjacent to pumps in discharge piping.
2. Install check and shutoff valves on discharge piping from each pump. Install unions on pumps having threaded pipe connections. Install valves same size as connected piping.

J. Ground equipment according to Division 26.
K. Connect wiring according to Division 26.

END OF SECTION 221429

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SECTION 223300 – ELECTRIC WATER HEATERS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 220010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. ELECTRICAL WORK REQUIRED

A. Contractor shall provide electrical connections for any equipment that requires electrical connections for power or control. Electrical requirements and work shall be coordinated with Electrical Contractor.

1.3. SUBMITTALS

A. Product Data: For each type and size of water heater. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.
B. Shop Drawings: Detail water heater assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control systems. Differentiate between manufacturer-installed and field-installed wiring.

C. Product Certificates: Signed by manufacturers of water heaters certifying that products furnished comply with requirements.
D. Maintenance Data: For water heaters to include in maintenance manuals specified in Division 1.
E. Warranties: Special warranties specified in this Section.

1.4. QUALITY ASSURANCE

A. Source Limitations: Obtain same type of water heaters through one source from a single manufacturer.
B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction, and marked for intended use.
C. ASME Compliance: Fabricate and label water heater, hot-water storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.
D. ASHRAE Standards: Comply with performance efficiencies prescribed for the following:

1. ASHRAE 90.1, "Energy Efficient Design of New Buildings except Low-Rise Residential Buildings," for commercial water heaters.
2. ASHRAE 90.2, "Energy Efficient Design of New Low-Rise Residential Buildings," for household water heaters.

1.5. WARRANTY

A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
B. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of water heaters that fail in materials or workmanship within specified warranty period.
C. Warranty Period: From date of Substantial Completion:

1. Storage Tanks: 5 years.

PART 2 - PRODUCTS

A. POINT-OF-USE, STORAGE, ELECTRIC WATER HEATERS 30 GALLONS AND LESS

1. Provide water heaters as scheduled by State, Rheem, Eemax, A.O. Smith, Bosch. Refer to schedule for capacities and characteristics.
2. Storage Tank Construction: Steel with 150-psig working-pressure rating.
3. Tappings: Factory fabricated of materials compatible with tank for piping connections, relief valve, drain, anode rod, and controls as required. Attach tappings to tank before testing and labeling. Include ASME B1.20.1, pipe thread.
4. Interior Finish: Materials and thicknesses complying with NSF 61, barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.
5. Insulation: Comply with ASHRAE 90.1. Surround entire storage tank except connections and controls.
6. Jacket: Steel, with enameled finish.
7. Heating Elements: electric, screw-in, immersion type.
8. Temperature Control: Adjustable thermostat for each element.

9. Anode Rod: Factory installed, magnesium.
10. Drain Valve: ASSE 1005, factory installed.
11. Electrical characteristics as scheduled. Coordinate with electrician for wiring requirements.
12. Provide with 3 year warranty.
13. Where unit is suspended provide adequate supports and shelf. Mount above ceiling where ceiling is accessible. Mount all components for heater where suspended or wall mounted no lower than 6'-8" above finished floor.
14. Where unit is located in cabinetry or under sinks, take care to coordinate with other trades and piping to provide all adequate clearances and serviceability.

B. COMMERCIAL, POINT-OF-USE, STORAGE, ELECTRIC WATER HEATERS LARGER THAN 30 GALLONS

1. Provide water heaters as scheduled by State, Rheem, A.O. Smith, PVI. Refer to schedule for capacities and characteristics.
2. Description: Comply with UL 174 or UL 1453, and listed by manufacturer for commercial applications.
3. Storage Tank Construction: Non-ASME-code steel with 150-psig working-pressure rating.
    a. Tappings: Factory fabricated of materials compatible with tank for piping connections, relief valve, drain, anode rod, and controls as required. Attach tappings to tank before testing and labeling. Include ASME B1.20.1, pipe thread.
    b. Interior Finish: Materials and thicknesses complying with NSF 61, barrier materials for potable-water tank linings. Extend finish into and through tank fittings and outlets.
    c. Insulation: Comply with ASHRAE 90.1. Surround entire storage tank except connections and controls.
    d. Jacket: Steel, with enameled finish.
4. Heating Elements: Two, unless otherwise indicated; electric, screw-in, immersion type.
    a. Temperature Control: Adjustable thermostat.
5. Anode Rod: Factory installed, magnesium.
6. Drain Valve: ASSE 1005, corrosion-resistant metal, factory installed.
7. Special Requirement: NSF 5 construction.
8. Provide water heaters as scheduled by State, Rheem, National, or A.O. Smith. Refer to schedule for capacities and characteristics.
9. Units shall have a porcelainized glasslined tank, protected in the following ways:
    a. Against failure due to overheating caused by the buildup of scale, film and other sediment by a cold water inlet tube, which is an integral part of the heater, that churns and agitates particles of sand, silt or scale present in the water, so they are carried out of the water heater on successive hot water draws.
    b. Against electrolytic corrosion by conveniently located, easily replaceable magnesium anode rods.
10. Water heaters shall have the U.L. seal of certification, a working pressure rating of 160 psi, a factory installed Temperature and Pressure Relief Valve, and a full-size (4"x5") inspection port. Water heater shall also be equipped with N.S.F. construction.
11. Water heater tanks shall be covered by a 3 year limited warranty against failure due to metal fatigue and overheating caused by buildup of sand, sediment or sludge.

PART 3 - EXECUTION

3.1. WATER HEATER INSTALLATION

A. Install commercial water heaters on concrete bases.

1. Exception: Omit concrete bases for commercial water heaters if installation on stand, bracket, suspended platform, or direct on floor is indicated.

B. Install water heaters, level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
C. Anchor water heaters to substrate.
D. Install seismic restraints for water heaters where located in seismic zones. Anchor to substrate.
E. Install temperature and pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend relief valve outlet with water piping in continuous downward pitch and discharge onto closest floor drain.
F. Install pressure relief valves in water piping for water heaters without storage. Extend relief valve outlet with water piping in continuous downward pitch and discharge onto closest floor drain.

G. Install vacuum relief valves in cold-water-inlet piping.
H. Install vacuum relief valves in water heater storage tanks that have copper lining.
I. Install water heater drain piping as indirect waste to spill into open drains or over floor drains. Install hose-end drain valves at low points in water piping for water heaters that do not have tank drains. Refer to Division 22 Section "Plumbing Specialties" for drain valves.
J. Install thermometers on water heater inlet and outlet piping. Refer to Division 22 Section "Meters and Gages" for thermometers.

1. Exception: Omit thermometers for water heaters 30 gallons and less.

K. Assemble and install inlet and outlet piping manifold kits for multiple water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each water heater. Include shutoff valve, and thermometer in each water heater inlet and outlet, and throttling valve in each water heater outlet. Refer to Division 15 Section "Valves" for general-duty valves and Division 22 Section "Meters and Gages" for thermometers.
L. Arrange for insulation on equipment and piping not furnished with factory-applied insulation.
M. Install piping-type heat traps on inlet and outlet piping of water heater storage tanks without integral or fitting-type heat traps.
N. Fill water heaters with water.
O. Charge compression tanks with air.

3.2. ELEVATED TANKS

A. Elevated tanks shall be securely supported from structure and provided with drain pan.
B. Pipe drain pan to nearest floor drain or mop sink.
C. Install tank and support assembly at a minimum of 6’-6” above finished floor level. Install higher if structure allows, but no higher than 10’ above finish floor unless specifically indicated.

3.3. CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
B. Install piping adjacent to machine to allow service and maintenance.
C. Connect hot- and cold-water piping with shutoff valves and unions. Connect hot-water-circulating piping with shutoff valve, check valve, and union.
D. Make connections with dielectric fittings where piping is made of dissimilar metal.
E. Electrical Connections: Power wiring and disconnect switches are specified in Division 26 Sections. Arrange wiring to allow unit service.
F. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4. FIELD QUALITY CONTROL

A. Engage a factory-authorized service representative to perform startup service.
B. In addition to manufacturer's written installation and startup checks, perform the following:

1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment and retest until satisfactory results are achieved.
2. Verify that piping system tests are complete.
3. Check for piping connection leaks.
4. Check for clear relief valve inlets, outlets, and drain piping.
5. Check operation of circulators.
6. Test operation of safety controls, relief valves, and devices.
7. Energize electric circuits.
8. Adjust operating controls.
9. Adjust hot-water-outlet temperature settings. Do not set above 140 deg F unless piping system application requires higher temperature.
10. Balance water flow through manifolds of multiple-unit installations.

3.5. DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain water heaters.

1. Train Owner's maintenance personnel on procedures for starting and stopping troubleshooting, servicing, and maintaining equipment.
2. Review date in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."

3. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION 223300

SECTION 224000 – PLUMBING FIXTURES

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 220010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.
B. Shop Drawings: As applicable, provide dimensional data and diagram power, signal, and control wiring.
C. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.
D. Before submitting shop drawings and material lists, verify that all equipment submitted is mutually compatible and suitable for the intended use. Verify components properly fit in construction, cabinetry, chases, etc.

1.3. ELECTRICAL WORK REQUIRED

A. Contractor shall provide electrical connections for any equipment that requires electrical connections for power or control. Electrical requirements and work shall be coordinated with Electrical Contractor.

1.4. PIPING SYSTEMS

A. Refer to Section 221116 of this specification for piping material specifications and installation instructions. Specific piping materials and joining methods for systems installed under this section shall be as listed in schedule.

1.5. PIPING SYSTEMS VALVES

A. Refer to Section 22 “Valves” of this specification for valve type specifications and installation instructions.

1.6. PIPING SYSTEMS INSULATION

A. Refer to Section 22 “Insulation” insulation type specifications and installation instructions.

PART 2 - PRODUCTS

2.1. MANUFACTURERS

A. Equivalent fixtures and accessories by following manufacturers will be acceptable.

1. Fixtures: American Standard, Kohler, Crane, Zurn, Toto.
2. Institutional/Correctional: Bradley, or Acorn
3. Stainless Steel Fixtures: Elkay, Just, Moen Commercial
4. Fittings and Supports: Josam, Smith, Wade, Zurn, or Jonespec.
5. Seats: Church, Olsonite, Bemis or Beneke.
6. Drinking Fountains: Halsey Taylor, Elkay, Oasis, or Haws.
7. Lavatory & Sink Trim: Eljer, Chicago, Bradley, Sloan, Moen Commercial or American Standard.
8. Traps, Supplies and Stops: Dearborn, Brass Craft, Central D, Sanitary Dash or as specified under plumbing fixtures.

    a. Supplies and Stops: Dearborn Fig. No. 2700 CW ½” compression loose key stop and 3/8” O.D. risers in length required. Provide deep chrome plated brass escutcheons.
    b. Traps: Dearborn #FS510 (1-1/2”) and/or EFS507 (1-1/4”) cast brass body with clean-out and 17 gauge tube outlet “P” trap. Provide deep chrome plated brass escutcheon with set screw.

2.2. PLUMBING FIXTURES

A. Provide plumbing fixtures as shown on drawings and as specified complete including piping and connections. China fixtures shall be of best grade vitreous ware without pit holes or blemishes and outlines shall be generally true. Architect-Engineer reserves right to reject any piece, which in their opinion is faulty. Fixtures fitting against walls shall have ground backs. Exposed piping and fittings shall be chrome plated.
B. All wall mounted urinals and lavatories shall be furnished with concealed arm carriers. All wall-mounted water closets shall be furnished with concealed carriers.
C. Set fixtures true and level with all necessary supports for fixtures installed before wall finish is done. Nipples through wall to fixture connections shall be chrome plated brass. Provide silicone sealer around perimeter of lavatories, water closets, and urinals at connection to wall and/or floor.

2.3. LAVATORY FAUCETS:

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

1. American Standard Companies, Inc.
2. Bradley Corporation.
3. Chicago Faucets.
4. Delta Faucet Company.
5. Eljer.
6. Kohler Co.
7. Moen Commercial
8. Zurn Plumbing Products Group; Commercial Brass Operation.

B. Description: Single-control mixing, Single-control nonmixing, and Two-handle mixing as scheduled valve. Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.

1. Body Material: Commercial, solid brass
2. Finish: As Scheduled.
3. Maximum Flow Rate: 0.5 gpm (1.5 L/min.) for public lavatories. Private lavatories shall be a maximum of 2.2 gpm (8.3 L/min.)
4. Centers: As scheduled and coordinated with fixtures.
5. Valve Handle(s): ADA Compliant wrist blade, 4 inches (102 mm) unless otherwise scheduled.
6. Spout: Rigid in public locations. Coordinate gooseneck swing or rigid installation with architect prior to installation.
7. Spout Outlet: As scheduled.
8. Tempering Device: Provide thermostatic tempering device piped in supply for all public lavatories unless tempering is otherwise provided.
9. Where electronic fixtures are specified, provide will all transformers, cables, junction boxes, sensors and controls. All equipment and installation shall have neat and orderly appearance.

2.4. FLUSHOMETERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

1. Sloan.
2. Zurn.
3. Toto.

B. Description: Flushometers for urinal or water-closet-type fixture. Include brass body with corrosion-resistant internal components, non-hold-open feature, control stop with check valve, vacuum breaker, copper or brass tubing, and polished chrome-plated finish on exposed parts.

1. Internal Design: Diaphragm or piston operation as scheduled.
2. Style: Exposed or Concealed as scheduled.
3. Consumption: Low flow type coordinated with flow requirements of fixture served.
4. Tailpiece Size: Coordinated with spud of fixture and length as required for valve location to properly mounted fixture elevation.

C. Provide recessed vandal proof covers and boxes for all recessed/concealed style flush valves.
D. Provide all required junction boxes, power supplies and wiring for line voltage style flush valves when scheduled.
E. All exposed components shall be chrome finished or brushed nickel or similar durable finish.

2.5. PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Engineered Brass Co.
b. Insul-Tect Products Co.; a Subsidiary of MVG Molded Products.
c. McGuire Manufacturing Co., Inc.
d. Plumberex Specialty Products Inc.
e. TCI Products.
f. TRUEBRO, Inc.
g. Zurn Plumbing Products Group; Tubular Brass Plumbing Products Operation.

2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

PART 3 EXECUTION

3.1. GENERAL

A. All plumbing fixtures shall be cleaned and free of all construction debris.
B. Electric water cooler shall be protected during construction.
C. Any chrome trim with wrench marks shall be removed and new trim installed.
D. Architect-Engineer reserves the right to reject any plumbing fixture.
E. See plans for Plumbing Fixture Schedule.

3.2. INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.
B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.
D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.
E. Install floor mounted water closets and other fixtures with solid waste using only 45 degree and combination fittings. Do not use sanitary tees in horizontal applications.
F. Install wall-mounting fixtures with tubular waste piping attached to supports.
G. Install fixtures level and plumb according to roughing-in drawings.
H. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
I. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
J. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
K. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.
L. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.
M. Install toilet seats on water closets.
N. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
O. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.
P. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
Q. Install shower flow-control fittings with specified maximum flow rates in shower arms.
R. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

S. Install disposer in outlet of each sink indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.
T. Install dishwasher air-gap fitting at each sink indicated to have air-gap fitting. Install in sink deck where sink is stainless steel type or on countertop at sink where sink is integral or there is no deck for sink. Connect inlet hose to dishwasher and outlet hose to disposer.
U. Install hot-water dispensers in back top surface of sink or in countertop with spout over sink.
V. Install escutcheons at piping wall and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Basic Plumbing Materials and Methods."
W. Set bathtubs and showers in leveling bed of cement grout.
X. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color.

3.3. CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size

fittings required to match fixtures.

C. Ground equipment according to Division 26 Section "Grounding and Bonding."
D. Connect wiring according to Division 26 Section "Conductors and Cables."

3.4. FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.
B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.
C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.
D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.
E. Install fresh batteries in sensor-operated mechanisms.

3.5. PROTECTION

A. Provide protective covering for installed fixtures and fittings.
B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224000

END OF DIVISION

DIVISION 23
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SECTION 230010 – MECHANICAL PROVISIONS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. All contract documents including drawings, alternates, addenda and modifications and general provisions of the Contract, including General and Supplementary Conditions and all other Division Specification Sections, apply to work of this section. All preceding and following sections of this specification division are applicable to the Mechanical Contractor, all sub-contractors, and all material suppliers.

1.2. SCOPE OF WORK

A. This DIVISION requires the furnishing and installing of complete functioning Mechanical systems, and each element thereof, as specified or indicated on Drawings or reasonably inferred, including every article, device or accessory reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the Work include materials, labor, supervision, supplies, equipment, transportation, and utilities.
B. In case of an inconsistency between the Drawings and Specifications or within either document, the better quality or the greater quantity of work shall be provided in accordance with the Architect or Engineer's interpretation.
C. Refer to Architectural, Structural and Electrical Drawings and all other contract documents and to relevant equipment drawings and shop drawings to determine the extent of clear spaces and make all offsets required to clear equipment, beams and other structural members to facilitate concealing piping and ductwork in the manner anticipated in the design.

1.3. SPECIFICATION FORM AND DEFINITIONS

A. The Engineer indicated in these specifications is Pearson Kent McKinley Raaf Engineers LLC. 13300 W 98th Street, Lenexa, KS 66215, PHONE 913-492-2400, EMAIL admin@pkmreng.com.
B. Contractor, wherever used in these specifications, shall mean the Company that enters into contract with the Owner to perform this section of work.
C. When a word, such as "proper", "satisfactory", "equivalent", and "as directed", is used, it requires the Architect-Engineer's review.
D. "PROVIDE" means to supply, purchase, transport, place, erect, connect, test, and turn over to Owner, complete and ready for regular operation, the particular Work referred to.
E. "INSTALL" means to join, unite, fasten, link, attach, set up, or otherwise connect together before testing and turning over to Owner, complete and ready for regular operation, the particular Work referred to.
F. "FURNISH" means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories, and all other items customarily required for the proper and complete application for the particular Work referred to.
G. "WIRING" means the inclusion of all raceways, fittings, conductors, connectors, tape, junction and outlet boxes, connections, splices, and all other items necessary and/or required in connection with such Work.
H. "CONDUIT" means the inclusion of all fittings, hangers, supports, sleeves, etc.
I. "AS DIRECTED" means as directed by the Architect/Engineer, or his representative.
J. "CONCEALED" means embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed above hung ceilings.

1.4. QUALIFICATIONS

A. The contractors responsible for work under this section shall have completed a job of similar scope and magnitude within the last 3 years. The contractors shall employ an experienced, competent and adequate work force licensed in their specific trade and properly supervised at all times. Unlicensed workers and general laborers shall be adequately supervised to insure competent and quality work and workmanship required by this contract and all other regulations, codes and practices. At all times the contractors shall comply with all applicable local, state and federal guidelines, practices and regulations. Contractor may be required to submit a statement of qualifications upon request before any final approval and selection. Failure to be able to comply with these requirements is suitable reason for rejection of a bid.

1.5. LOCAL CONDITIONS

A. The contractor shall visit the site and determine the existing local conditions affecting the work required. Failure to determine site conditions or nature of existing or new construction will not be considered a basis for granting additional compensation.

1.6. CONTRACT CHANGES

A. Changes or deviations from the contract documents; including those for extra or additional work must be submitted in writing for review of Architect-Engineer. No verbal change orders will be recognized.

1.7. LOCATIONS AND INTERFERENCES

A. Locations of equipment, piping and other mechanical work are indicated diagrammatically by the mechanical drawings. The Contractor shall determine the exact locations on site, subject to structural conditions, work of other Contractors, and access requirements for installation and maintenance to approval of Architect-Engineer. Provide additional piping and ductwork offsets as required at no additional cost.
B. Study and become familiar with the contract drawings of other trades and in particular the general construction plans and details in order to obtain necessary information for figuring installation. Cooperate with other contractors and install work in such a way as to avoid interference with their work. Minor deviations, not affecting design characteristics, performance or space limitation may be permitted if reviewed prior to installation by Architect-Engineer.
C. Any pipe, ductwork, equipment, apparatus, appliance or other item interfering with proper placement of other work as indicated on drawings, specified, or required, shall be removed, relocated and reconnected without extra cost. Damage to other work caused by this Contractor, the Subcontractor, or workers shall be restored as specified for new work.
D. Do not scale mechanical and electrical drawings for dimensions. Contractor shall accurately layout work from the dimensions indicted on the Architectural drawings unless they are found to be in error.

1.8. PERFORMANCE

A. Final acceptance of work shall be subject to the condition that all systems, equipment, apparatus and appliances operate satisfactorily as designed and intended. Work shall include required adjustment of systems and control equipment installed under this specification division.
B. The Contractor warrants to the Owner and Architect-Engineer the quality of materials, equipment, workmanship and operation of equipment provided under this specification division for a period of one year from and after completion of building and acceptance of mechanical systems by Owner.

1.9. WARRANTY

A. The Contractor warrants to the Owner and Architect-Engineer that upon notice from them within a one year warranty period following date of acceptance, that all defects that have appeared in materials and/or workmanship, will be promptly corrected to original condition required by contract documents at Contractor's expense.
B. Warranty for all equipment shall take effect from the date of substantial completion regardless of the date equipment was installed.
C. The above warranty shall not supersede any separately stated warranty or other requirements required by law or by these specifications.

1.10. ALTERNATES

A. Refer to General Requirements for descriptions of any alternates that may be included.

1.11. MATERIALS, EQUIPMENT AND SUBSTITUTIONS

A. The intent of these specifications is to allow ample opportunity for Contractor to use his ingenuity and abilities to perform the work to his and the Owner's best advantage, and to permit maximum competition in bidding on standards of materials and equipment required.
B. Material and equipment installed under this contract shall be first class quality, new, unused and without damage.
C. In general, these specifications identify required materials and equipment by naming one or more manufacturer's brand, model, catalog number and/or other identification. The first named manufacturer or product is used as the basis for design; other manufacturers named must furnish products consistent with specifications of first named product as determined by Engineer. Base bid proposal shall be based only on materials and equipment by manufacturers named, except as hereinafter provided.
D. Where materials or equipment are described but not named, provide required items of first quality, adequate in every respect for intended use. Such items shall be submitted to Architect-Engineer for review prior to procurement.
E. Materials and equipment proposed for substitutions shall be equal to or superior to that specified in construction, efficiency, utility, aesthetic design, and color as determined by Architect-Engineer whose decision shall be final and without further recourse. Physical size of substitute brand shall be no larger than space provided including allowances for access for installation and maintenance. Requests must be accompanied by two copies of complete descriptive and technical data including manufacturer's name, model and catalog number, photographs or cuts, physical dimensions, operating characteristics and any other information needed for comparison.
F. If the Contractor wishes to incorporate products other than those named in the Base Bid Specifications they shall submit a request for approval of equivalency in writing no later than (10) ten calendar days prior to bid date. Substitutions after this may be refused at Engineers option. Equivalents will ONLY be considered approved when listed by addendum.

G. In proposing a substitution prior to or subsequent to receipt of bids, include in such bid the cost of altering other elements of this project, including adjustments in mechanical or electrical service requirements necessary to accommodate such substitution.
H. Within 10 working days after bids are received, the apparent low bidder shall submit to the Architect-Engineer for approval, three copies of a list of all major items of equipment they intend to provide. Within 30 working days after award of Contract, Contractor shall submit shop drawings for equipment and materials to be incorporated in work, for Architect-Engineer review. Where 30-day limit is insufficient for preparation of detailed shop drawings on major equipment or assemblies, Contractor shall submit manufacturer's descriptive catalog data and indicate date such detailed shop drawings will be submitted along with manufacturer's certification that order was placed within 30 working day limit.

1.12. ELECTRONIC PLAN FILES

A. Electronic files of the contract documents may be available from the Engineer to successful bidders and manufacturers for a fee of $50 per sheet, $100 minimum and $25 email/shipping charge. A release of liability form will be required along with payment prior to release of files.

1.13. TEMPORARY USE OF PERMANENT HVAC UNITS

A. If the Contractor elects to use permanent equipment for temporary conditioning only that permanent equipment associated with the heating system shall be allowed for use as space conditioning during the construction period. The Mechanical Contractor shall take full responsibility for all permanent equipment used for temporary conditioning during the construction period and shall provide a total of two years warranty covering all parts and labor on all permanent equipment utilized for temporary conditioning. This warranty shall cover all piping, fittings, valves, pipe and equipment insulation, pumps, boilers, chillers, condensing units, cooling towers, air handling units, exhaust and relief air fans, ductwork, ductwork insulation, diffusers, temperature controls, all electric motors, starters, disconnect switches, fuses, wire and conduit. This warranty shall cover all required maintenance on the system with the exception of filter changes, and shall start on the date shown on the final completion certificate.
B. CAUTION: The Contractor is being warned that the Architect-Engineer will not accept dirty equipment caused by construction contamination.

1.14. OPENINGS, ACCESS PANELS AND SLEEVES

A. This Contractor shall include the installation of all boxes, access panels and sleeves for openings required to install this work, except structural openings incorporated in the structural drawings. Sleeves shall be installed for all pipes passing through structural slabs and walls. Contractor shall set and verify the location of sleeves that pass through beams, as shown on structural plans. All floor and wall penetrations shall be sealed to meet fire-rating requirements.
B. All penetrations through interior or exterior and rated or non-rated walls and floors shall be appropriately sealed prevent entry and movement of rodents and insects. Contractor shall coordinate their work with all other trades.

1.15. ARCHITECTURAL VERIFICATION AND RELATED DOCUMENTS

A. Contractor shall consult all Architectural Drawings and specifications in their entirety incorporating and certifying all millwork, furniture, and equipment rough-in including utility characteristics such as voltage, phase, amperage, pipe sizes, duct sizes, including height, location and orientation. Shop drawings incorporating these requirements should be submitted to the Architect for approval prior to installation or rough in.

1.16. EXTENT OF CONTRACT WORK

A. Provide mechanical systems indicated on drawings, specified or reasonably implied. Provide every device and accessory necessary for proper operation and completion of mechanical systems. In no case will claims for "Extra Work" be allowed for work about which Contractor could have been informed before bids were taken.
B. Electrical work required to install and control mechanical equipment, which is not shown on plans or specified under Division 26, shall be included in Contractor's base bid proposal. Mechanical systems and components are to be installed as a complete system, including all miscellaneous interlock (low voltage and minor line voltage power wiring such as control motors, limit switches, relays, etc), control wiring, safeties. Coordinate interlock to other systems such as fire alarm that interlock to mechanical systems and insure that provisions are made in equipment for connection of these systems. Coordinate with all other trades for specific needs and requirements based on submitted systems.
C. Contractor shall become familiar with equipment provided by other contractors that require mechanical connections and controls.
D. All automatic temperature control devices shall be mounted as indicated in automatic temperature control section of specifications.
E. The cost of larger wiring, conduit, control and protective devices resulting from installation of equipment which

was not used for basis of design as outlined in specifications shall be paid for by Mechanical Contractor at no cost to Owner or Architect-Engineer.

F. Contractor shall be responsible for providing supervision to Electrical Contractor to insure that required connections, interlocking and interconnection of mechanical and electrical equipment are made to attain intended control sequences and system operation.

G. Furnish four complete sets of electrical wiring diagrams to Architect-Engineer to be included in the maintenance manuals and three complete sets to Electrical Contractor. Diagrams shall show factory and field wiring of components and controls. Control devices and field wiring to be provided by Electrical Contractor shall be clearly indicated by notation and drawing symbols on wiring diagrams.

H. Contractor shall obtain complete electrical data on mechanical shop drawings and shall list this data on an approved form that shall be presented monthly or on request, to Electrical Contractor. Data shall be complete with wiring diagrams received to date and shall contain necessary data on electrical components of mechanical equipment such as HP, voltage, amperes, watts, locked rotor current to allow Electrical Contractor to order electrical equipment required in his contract.

1.17. WORK NOT INCLUDED IN CONTRACT

A. Consult Division 26 of specifications for work to be provided by Electrical Contractor in conjunction with installation of mechanical equipment.

1.18. CODES, RULES AND REGULATIONS

A. Provide Work in accordance with applicable codes, rules and regulations of Local and State, Federal Governments and other authorities having lawful jurisdiction.

B. Conform to latest editions and supplements of following codes, standards or recommended practices.

C. BUILDING CODES:

1. International Codes (Latest adopted version of applicable codes)

D. SAFETY CODES:

1. National Electrical Safety Code Handbook H30 - National Bureau of Standards.
2. Occupational Safety and Health Standard (OSHA) - Department of Labor.

E. NATIONAL FIRE CODES:

1. NFPA No. 54 National Fuel Gas Code
2. NFPA No. 70 National Electrical Code
3. NFPA No. 89M Clearances, Heat Producing Appliances
4. NFPA No. 90A Air Conditioning and Ventilating Systems
5. NFPA No. 91 Standard for Exhaust Systems
6. NFPA No. 101 Life Safety Code
7. NFPA No. 204 Standard for Smoke and Heat Venting

F. UNDERWRITERS LABORATORIES INC:

1. All materials, equipment and component parts of equipment shall bear UL labels whenever such devices are listed by UL.

G. MISCELLANEOUS CODES:

1. ANSI A117.1 - Handicapped Accessibility
2. Applicable State Boiler Codes
3. Americans with Disabilities Act (ADA)

H. ENERGY EFFICIENCY REQUIREMENTS:

1. All mechanical systems and components shall be manufactured and installed in compliance with ASHRAE 90.1 – 2007 and latest adopted version of IECC.

1.19. STANDARDS

A. Drawings and specifications indicate minimum construction standard. Should any work indicated be sub-standard to any ordinances, laws, codes, rules or regulations bearing on work, Contractor shall promptly notify Architect-Engineer in writing before proceeding with work so that necessary changes can be made. However, if the Contractor proceeds with work knowing it to be contrary to any ordinances, laws, rules, and regulations, Contractor shall thereby have assumed full responsibility for and shall bear all costs required to correct non-complying work.

1.20. PERMITS/FEES

A. The Contractor shall secure and pay for necessary permits and certificates of inspection required by

governmental ordinances, laws, rules or regulations. Keep a written record of all permits and inspection certificates and submit two copies to Architect-Engineer with request for final inspection.

B. The Contractor shall include in their base bid any fees or charges by the local utility providers to establish new services to the structure. Coordinate with the utility suppliers to verify exactly which part of the work required for the new utility service, is to be performed by the contractor and which part will be supplied by the utility company.

PART 2 - PRODUCTS

2.1. Not Used

PART 3 - EXECUTION

3.1. SUBMITTALS

A. Contractor shall furnish submittals of all materials and equipment required by the specifications. Refer to each specification section for the submittals (if any) required for that section.

B. Submittal format shall be as indicated below. Submittals not meeting these requirements will be returned without action for re-submittal.

1. Submittals shall be furnished in an Adobe PDF format.
2. Submittals shall be per individual submittal section, as listed in the table of contents. All required submittals within that section shall be grouped together in a single submittal.
    a. Furnishing submittals by division or by individual item may result in delayed reviewing of the submittal(s) due to additional administrative time required to process the large size and/or quantity of files.
3. Submittals shall have a cover page containing the following information: The project name, the applicable specification section and paragraph, the submittal date, and the Contractor's stamp (see below for requirements).
4. Mark each submitted item as applicable with scheduled mark, name, etc. corresponding to the plans.
5. Where generic catalog cuts are submitted for review, conspicuously mark or provide schedule of equipment, capacities, controls, fitting sizes, etc. that are to be provided. Each catalog sheet shall bear the equipment manufacturer’s name and address.
6. Where equipment submitted does not appear in base specifications or specified equivalent, mark submittals with applicable alternate numbers, change order number or letters of authorization.
7. All submittals on materials and equipment listed by UL shall indicate UL approval on submittal.

C. Contractor review:

1. Contractor shall check all submittals to verify that they meet specifications and/or drawings requirements before forwarding submittals to the Architect-Engineer for their review. All submittals submitted to Architect-Engineer shall bear contractor’s approval stamp that shall indicate that Contractor has reviewed submittals and that they meet specification and/or drawing requirements. Contractor’s submittal review shall specifically check for but not be limited to the following: equipment capacities, physical size in relation to space allowed; electrical characteristics, provisions for supply, return and drainage connections to building systems. All submittals not meeting Contractor’s approval shall be returned to their supplier for re-submittal.
2. No submittals will be considered for review by the Architect-Engineer without Contractor’s approval stamp, or that have extensive changes made on the original submittal as a result of the Contractor’s review.
3. Before submitting shop drawings and material lists, verify that all equipment submitted is mutually compatible and suitable for the intended use. Verify that all equipment will fit the available space and allow ample room for maintenance. If the size of equipment furnished makes necessary any change in location, or configuration, submit a shop drawing showing the proposed layout.

D. Review Schedule:

1. The shop drawing / submittal dates shall be at least as early as required to support the project schedule and shall also allow for two weeks Architect-Engineer review time plus a duplication of this time for re-submittal if required.
2. Submittal of all shop drawings as soon as possible after permitting approval but before construction starts is preferred.
3. Approval of shop drawings submitted prior to receipt of a permit for that respective scope of work should be considered conditional pending review/approval of the construction documents by the AHJ. Changes required to the submittal as a result of permitting comments received after architect’s/engineer’s review shall not be a justification for a change in price.
4. Any time delay caused by correcting and re-submitting submittals/shop drawings will be the

Contractor's responsibility.

E. The Architect's-Engineer's checking and subsequent review of such drawings, schedules, literature, or illustrations shall not relieve the Contractor from responsibility for deviations from Drawings or Specifications unless he has, in writing, called the Architect's-Engineer's attention to such deviations at the time of submission, and secured their written approval; nor shall it relieve the contractor from responsibility for errors in dimensions, details, size of members, or omissions of components for fittings; or for coordinating items with actual building conditions and adjacent work.
F. Any corrections or modifications made by the Architect-Engineer shall be deemed acceptable to the Contractor at no change in price unless written notice is received by the Architect-Engineer prior to the performance of any work incorporating such corrections or modifications.
G. Submittals that require re-submission shall have the items that were revised "flagged" or in some other manner marked to call attention to what has been changed.
H. Coordination

1. After shop drawings have been reviewed and approved by all parties, transmit a set of submittals to each other trade (eg Plumbing, Mechanical, Electrical, Controls, etc) that will interface with installation. Each other contractor shall review the submittal for coordination and return a stamped submittal indicating they have reviewed the submittal for coordination purposes.

3.2. SHOP DRAWINGS

A. Shop drawings shall meet all of the above requirements for submittals.
B. Contractor shall submit Adobe PDF sets of all fabrication drawings. Cost of drawing preparation, printing and distribution shall be paid for by the contractor and included in his base bid.
C. No work shall be fabricated until Architect-Engineer's review has been obtained.
D. Sheet metal shop drawings for duct fabrication shall be a minimum of 1/4" scale. Sheet metal shop drawings shall not be a reproduction of the contract document and shall show details of the following: Fabrication, assembly, and installation, including plans, elevations above finished floor, sections, components, and attachments to other work. Duct layout indicating pressure classifications and sizes on plans, fittings, reinforcement and spacing, seam and joint construction, penetrations through fire-rated and other partitions, hangers and supports, including methods for building attachment, vibration isolation, seismic restraints, and duct attachment.

3.3. OPERATING AND MAINTENANCE INSTRUCTIONS (O & M MANUALS)

A. Submit with shop drawings of equipment, four copies of installation, operating, maintenance instructions, and parts lists for equipment provided. Equipment manufacturer shall prepare instructions.
B. Keep in safe place, keys and wrenches furnished with the equipment provided under this contract. Present to the Owner and obtain a receipt for them upon completion of project.
C. Prepare a complete brochure, covering systems and equipment provided and installed under this contract. Submit brochures to Architect-Engineer for review before delivery to Owner. Brochures shall contain following:

1. Certified equipment drawings/or catalog data with equipment provided clearly marked as outlined above.
2. Record copy of all submittals indicating actual equipment installed indicating options, characteristics. Copies of submittals shall bear the stamps of all parties that reviewed submittals.
3. Complete installation, operating, maintenance instructions and parts lists for each item of equipment.
4. Special emergency operating instructions with a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to various parts of mechanical system.

D. Provide brochures bound in three-ring binders with metal hinge. Reinforce binding edge of each sheet of loose-leaf type brochure to prevent tearing from continued usage. Clearly print on label insert of each brochure:

1. Project name and address.
2. Section of work covered by brochure, i.e., "Plumbing", etc.

3.4. RECORD DOCUMENTS

A. A. During construction, keep an accurate record of all deviations between the work as shown on Drawings and that which is actually installed. Keep this record set of prints at the job site for review by the Architect/Engineer.
B. Upon completion of the installation and acceptance by the owner, transfer all record drawing information to one neat and legible set of prints. Then deliver them to the Architect/Engineer for transmittal to the Owner.
C. Provide one copy of on high quality heavy weight presentation type paper. Blueprints or other media which fade shall not be used.

D. Provide one electronic scanned version of record documents in Adobe PDF format on a DVD. Transmit DVD in conjunction with hard copy documents.

3.5. CLEANING UP

A. Contractor shall take care to avoid accumulation of debris, boxes, crates, etc., resulting from the installation of his work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean.
B. Contractor shall clean up all ductwork and equipment at the completion of the project.
C. All equipment, cabinets and enclosures shall be thoroughly vacuumed clean prior to energizing equipment and at the completion of the project. Equipment shall be opened for observation by the Architect/Engineer as required.

3.6. WATERPROOFING

A. Avoid, if possible, the penetration of any waterproof membranes such as roofs, machine room floors, basement walls, and the like. If such penetration is necessary, perform it prior to the waterproofing and furnish all sleeves or pitch-pockets required. Advise the Architect/Engineer and obtain written permission before penetrating any waterproof membrane, even where such penetration is shown on the Drawings.
B. If Contractor penetrates any walls or surfaces after they have been waterproofed, he shall restore the waterproof integrity of that surface as directed by the Architect/Engineer at his own expense

3.7. CUTTING AND PATCHING

A. Contractor shall do cutting and patching of building materials required for installation of work herein specified. Remove walls, ceilings and floors (or portions thereof) necessary to accomplish scope of work. Do not cut or drill through structural members including wall, floors, roofs, and supporting structure, without the Architect's and Structural Engineer's approval and in a manner approved by them.
B. Make openings in concrete with concrete hole saw or concrete drill. Use of star drill or air hammer for this work will not be permitted.
C. Patching shall be by the contractors of the particular trade involved, shall match the existing construction type, quality, finish and texture, and shall meet approval of Architect-Engineer. Damage to building finishes, caused by installation of mechanical work shall be repaired at Contractor's expense to approval of Architect-Engineer.

3.8. SETTING, ADJUSTMENT AND EQUIPMENT SUPPORTS

A. Work shall include mounting, alignment and adjustment of systems and equipment. Set equipment level on adequate foundation and provide proper anchor bolts and isolation as shown, specified or required by manufacturers in installation instructions. Level, shim and grout equipment bases as recommended by manufacturer. Mount motors, align and adjust drive shafts and belts according to manufacturer's instructions.
B. Equipment failures resulting from improper installation or field alignment shall be repaired or replaced by Contractor at no cost to Owner.
C. Floor or pad mounted equipment shall not be held in place solely by its own dead weight. Include anchor fastening in all cases.
D. Provide floor or slab mounted equipment with 3-1/2" high concrete bases unless specified otherwise. Mechanical contractor shall form all pads; General contractor shall provide and place all concrete and reinforcing for said pads. Individual concrete pad shall be no less than 4" wider and 4" longer than equipment, and shall extend no less than 2" from each side of equipment.
E. Provide each piece of equipment or apparatus suspended from ceiling or mounted above floor level with suitable structural support, platform or carrier in accordance with best-recognized practice. Verify that structural members of buildings are adequate to support equipment and unless otherwise indicated on plans or specified, arrange for their inclusion and attachment to building structure. Provide hangers with vibration isolators.
F. Submit details of hangers, platforms and supports together with total weights of mounted equipment to Architect-Engineer for review before proceeding with fabrication or installation.

3.9. START-UP, CHANGEOVER, TRAINING AND OPERATIONAL CHECK

A. Contractor shall perform the initial start-up of the systems and equipment and shall provide necessary supervision and labor to make the first seasonal changeover of systems. Personnel qualified to start-up and service this equipment, including manufacturer's technicians, and the Owner's operating personnel shall be present during these operations.
B. Contractor shall be responsible for training Owner's operating personnel to operate and maintain the systems and equipment installed. Keep a record of training provided to Owner's personnel listing the date, subject covered, instructors name, names of Owner's personnel attending and total hours of instruction given each individual.
C. All owner-training sessions shall be orderly and well organized and shall be video recorded digitally. At the end of the owner training, the "training" session recording shall be transmitted to the owner via DVD and shall

become property of the owner.

3.10. FINAL CONSTRUCTION REVIEW

A. At final construction review, each respective Contractor and major subcontractors shall be present or shall be represented by a person of authority. Each Contractor shall demonstrate, as directed by the Architect-Engineer, that the work complies with the purpose and intent of the contract documents. Respective Contractor shall provide labor, services, instruments or tools necessary for such demonstrations and tests.

END OF SECTION 230010

SECTION 230011 – BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 230010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Provide documentation of all completed tests described herein and their results.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1. TESTING PROCEDURES FOR PIPING SYSTEMS

A. Test all lines and systems before they are insulated, painted or concealed by construction or backfilling. Provide fuel, water, electricity, materials, labor and equipment required for tests.
B. Where entire system cannot be tested before concealment, test system in sections. Verify that system components are rated for maximum test pressures to be applied. Where specified test pressures exceed component ratings, remove or isolate components from system during tests. Upon completion, each system shall be tested as an entire system.
C. Repair or replace defects, leaks and material failures revealed by tests and then retest until satisfactory. Make repairs with new materials.
D. All systems shall hold scheduled test pressures for specified time without loss of initial test pressure.
E. Upon completion of testing submit five copies of a typewritten report to A/E. Report shall list systems tested, test methods, test pressures, holding time and all failures with corrective action taken.
F. For test pressure schedules see piping material schedules.

3.2. TEST METHODS AND PRESSURES

A. Test methods and pressures shall be as follows:

1. Hydrostatic Test (Closed Systems):

   a. Hydrostatic test shall be performed using clean unused domestic water. Test pressures shall be as scheduled for system or 150% of operating pressure where not specified.

2. Hydrostatic Test (Open System):

   a. Test entire system with 10-foot head of water. Where system is tested in sections each joint in building except uppermost 10 feet of system shall be submitted to at least 10-foot head of water. Water shall be held in system for 15 minutes before inspection starts. System shall hold test pressure without leaks.

3. Pneumatic Test:

   a. Test entire system with compressed air. Systems operating above 25 PSI shall be tested at 75 PSI or 15% of operating pressure or whichever is greater.
   b. Allow at least 1 hour after test pressure has been applied before making initial test.
   c. Curing test, completely isolate entire system from compressor or other sources of air pressure.

4. Pressure Relief and Safety Valve:

   a. Before installation, test pressure temperature, and safety relief valves to confirm relief settings comply with specifications.
   b. Tag items that pass test with date of test, observed relief pressure setting and inspector’s signature.
   c. Items installed in systems without test tag attached will be rejected.

3.3. TESTING OF REFRIGERANT LINES

A. After the system is installed and before any piping is insulated, the entire refrigeration circuit must be thoroughly leak tested. Test all pipe joints for leaks. Make certain that all joints are inspected thoroughly. Mark carefully any spots where leaks occur.
B. Leaks are repaired by disassembling the connection, cleaning the fitting and remaking. No attempt should be made to repair a leak by simply adding brazing material.

3.4. MISCELLANEOUS CONTROL WIRING

A. All control wiring regardless of voltage shall be routed in a concealed manner.
B. All exterior control wiring shall be installed in conduit.
C. Wiring to thermostats and other wall mounted devices and sensors shall be routed in ¾" conduit to backboxes in walls and to an accessible ceiling or location.
D. All conduit and wiring shall be installed in accordance with Division 26.
E. Cabling and circuiting shall be plenum rated where required.
F. Refer to additional specifications where systems and controls are specified as DDC or similar.

3.5. CLEANING OF SYSTEMS AND EQUIPMENT

A. After pressure testing of systems and equipment and before operational test thoroughly clean interiors of piping and equipment. Clean equipment as recommended by equipment manufacturers. Where specific instructions are not provided clean equipment systems as follows:

1. Air Handling Systems:

a. Before starting any air system clean all debris, foreign matter and construction dirt from air system and fan. Provide equipment requiring filters, such as air handling units, fan coil units, blower, etc., with throw-away filters. After cleaning air system install temporary filters and run continuously for a minimum of eight hours at full volume before installing permanent filters. Provide temporary throw-away filters in all permanent heating and air conditioning equipment systems being utilized during construction. Prior to testing and balancing systems remove temporary filter media and install clean unused filters of the type specified. Clean filters shall be installed in equipment by mechanical contractor before final acceptance inspection by Architect and Engineer.

3.6. MAINTENANCE OF SYSTEMS

A. Contractor shall be responsible for operation, maintenance and lubrication of equipment installed under this contract.
B. Keep a complete record of equipment maintenance and lubrication and submit two copies with request for final construction review.
C. Records shall indicate types of lubricants used and date or time when next maintenance or lubrication will need to be performed by Owner. Where special lubricants are required, Contractor shall provide Owner with a one year supply as determine by Equipment Manufacturer's recommendations.

3.7. PAINTING OF MATERIALS AND EQUIPMENT

A. Touch-up painting and refinishing of factory applied finishes shall be by Mechanical Contractor. Contractor shall be responsible for obtaining proper type of painting materials and color from equipment manufacturer.
B. Unless specified otherwise factory built equipment shall be factory painted. Paint shall be applied over surfaces only after they have been properly cleaned and coated with a corrosion resistant primer.
C. After installation, damage to painted surfaces shall be properly prepared and primed with primers equal to factory materials. Finish coating shall be same color and type as factory finish.
D. Where extensive refinishing is required equipment shall be completely repainted.

3.8. EXCAVATION AND BACKFILL

A. Perform necessary excavation to receive Work. Provide necessary sheathing, shoring, cribbing, tarpaulins, etc. for this operation, and remove it at completion of work. Perform excavation in accordance with appropriate section of these specifications, and in compliance with OSHA Safety Standards.
B. Excavate trenches of sufficient width to allow ample working space, and no deeper than necessary for installation work.
C. Conduct excavations so no walls or footings are disturbed or injured. Backfill excavations made under or adjacent to footing with selected earth or sand and tamp to compaction required by Architect-Engineer. Mechanically tamp backfill under concrete and pavings in six inch layers to 95% standard density, Reference Division 2.
D. Backfill trenches and excavations to required heights with allowance made for settlement. Tamp fill material thoroughly and moistened as required for specified compaction density. Dispose of excess earth, rubble and debris as directed by Architect.
E. When available, refer to test hole information on Architectural or Civil drawings or specifications for types of soil to be encountered in excavations.

3.9. FIRE BARRIERS

A. General

1. For penetrations through fire-resistance-rated constructions, including both empty openings and

openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

B. Submittals

1. Product Data: For Each Type Of Product Indicated.
2. Shop Drawings: For Each Through-Penetration Firestop System, Show Each Type Of Construction Condition Penetrated, Relationships To Adjoining Construction, And Type Of Penetrating Item. Include Firestop Design Designation Of Qualified Testing And Inspecting Agency That Evidences Compliance With Requirements For Each Condition Indicated.
    a. Submit Documentation, Including Illustrations, From A Qualified Testing And Inspecting Agency That Is Applicable To Each Through-Penetration Firestop System Configuration For Construction And Penetrating Items.
    b. Where Project Conditions Require Modification To A Qualified Testing And Inspecting Agency's Illustration For A Particular Through-Penetration Firestop Condition, Submit Illustration, With Modifications Marked, Approved By Through-Penetration Firestop System Manufacturer's Fire-Protection Engineer As An Engineering Judgment Or Equivalent Fire-Resistance-Rated Assembly.
3. Through-Penetration Firestop System Schedule: Indicate Locations Of Each Through-Penetration Firestop System, Along With The Following Information:
    a. Types Of Penetrating Items.
    b. Types Of Constructions Penetrated, Including Fire-Resistance Ratings And, Where Applicable, Thicknesses Of Construction Penetrated.
    c. Through-Penetration Firestop Systems For Each Location Identified By Firestop Design Designation Of Qualified Testing And Inspecting Agency.

C. Product Certificates: For through-penetration firestop system products, signed by product manufacturer.
D. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
E. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
F. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by building inspector, if required by authorities having jurisdiction.
G. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.
H. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
I. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.
J. Provide sleeves through all fire-rated walls and fill voids surrounding sleeves and interior to sleeves around piping with Nelson “Flameseal” fire stop putty with U.L. listed 3 hour rating installed as per manufacturers recommendations.
K. Equivalent by Hilti, Inc., Johns Manville, Nelson Firestop Products, NUCO Inc., RectorSeal Corporation, Specified Technologies Inc., 3M, Tremco, USG, Dow, Chemelex.

3.10. EQUIPMENT ANCHORS

A. Provide floor or foundation mounted equipment such as pumps, boilers, air handling units, etc. with Decatur Engineering Company concrete anchors.
B. Where equipment anchors cannot be installed during forming of floors or foundations anchor equipment with McCulloch Kwik-Bolt concrete anchors.
C. Anchors shall be proper type and size recommended by manufacturer for equipment to be anchored.

3.11. WELDING

A. Contractor shall be responsible for quality of welding and suitability of welding procedures. All welding shall be in accordance with American Welding Society Standard B3.0 and ANSI Standard B31.1.
B. Welded pipe joints shall be made by certified welding procedures and welders. Welding electrodes shall be type and material recommended by electrode manufacturer for materials to be welded. All pipe and fittings ends shall be beveled a minimum of 30 degrees prior to welding.

C. Only welders who have successfully passed welder qualifications tests in previous 12 months for type of welding required shall do welding. Each welder shall identify his work with a code marking before starting any welded pipe fabrication. Contractor shall submit three copies of a list of welders who will work on project listing welders' code, date and types of latest qualification test passed by each welder.

D. Welded joints shall be fusion welded in accordance with Level AR3 of American Welding Society Standard AWS D10.9 "Standard for Qualification of Welding Procedures and Welders for Pipe and Tubing". Welders qualified under National Certified Pipe Welding Bureau will be acceptable.

E. Bevel all piping and fittings in accordance with recognized standards by flame cutting or mechanical means. Align and position parts so that branches and fittings are set true. Make changes in direction of piping systems with factory made welding fittings. Make branch connections with welding tees or forged weldolets.

END OF SECTION 230011

SECTION 230013 – PROJECT COORDINATION

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2. SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination Drawings.
2. Administrative and supervisory personnel.
3. Project meetings.
4. Requests for Interpretation (RFIs).

B. Each related sub-contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

1.3. COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Delivery and processing of submittals.
2. Progress meetings.
3. Preinstallation conferences.
4. Project closeout activities.
5. Startup and adjustment of systems.

1.4. SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:

a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
b. Indicate required installation sequences.
c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 40 inches. Format shall be PDF or other electronic format to facilitate multiple user commenting and sharing easily.

3. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including project managers, superintendent and other personnel in attendance at Project site to the General Contractor and other major subcontractors. Identify individuals and their duties and responsibilities; list email addresses and telephone numbers. Update the list as required during the project if personnel change.

1.5. COORDINATION

A. Certain materials will be provided by other trades. Examine the Contract Documents and reviewed record Submittals to ascertain these general requirements. Contract Documents reflect a basis of design and may not reflect actual equipment or items being utilized.
B. Carefully check space requirements with other trades and the physical confines of the area to insure that all material can be installed in the spaces allotted thereto including finished suspended ceilings and the spaces within the existing building. Make modifications thereto as required and approved.
C. Transmit to other trades all information required for work to be provided under their respective Sections in ample time for installation.
D. Wherever work interconnects with work of other trades, coordinate with other trades to insure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items of work that require access so that the ceiling trade will know where to install access doors and panels.
E. Obtain equipment submittal information for all pieces of equipment to be connected to from other trades that clearly indicates all connection requirements, locations, sizes, and similar requirements. Obtain this information in ample time to coordinate other trade submittals and equipment coordination. Where requirements differ from that on plans or differs from provisions made in the work, immediately notify the Architect/Engineer. Do not proceed with work that is incompatible with equipment provided.
F. Coordinate, project and schedule work with other trades in accordance with the construction sequence.
G. Coordinate with the local Utility Companies to their requirements for service connections and provide all necessary materials, labor and testing.
H. Coordinate with contractors for work under other Divisions of this specification for all work necessary to accomplish this contractor's work.
I. Conduct a coordination meeting after reviewing all other trade coordination drawings with other relevant trades. This meeting shall be held to prevent conflicts during construction. Each major relevant subcontractor shall attend this meeting. Report any potential conflicts or clearance problems to Architect/Engineer after meeting.
J. Adjust location of piping, ductwork, conduit, wiring, etc. to prevent interferences, both anticipated and encountered. Determine the exact route and location of each item prior to fabrication.

1. Right-of-Way:

a. Lines that pitch have the right-of-way over those that do not pitch. For example: steam, condensate, and plumbing drains normally have right-of way. Lines whose elevations cannot be changed to have right-of-way over lines whose elevations can be changed.
b. Make offsets, transitions and changes in direction in raceways as required to maintain proper headroom in pitch of sloping lines whether or not indicated on the Drawings.

1.6. DRAWINGS AND FILES.

A. The Drawings show only the general run of MEP systems, equipment, fixtures, piping and ductwork and other components as well as approximate location of items such as outlets, switches, diffusers, lights, and equipment connections, etc. Coordinate all exact locations of items with other trades, architectural elevations, equipment requirements, owner requirements, ceilings, access, serviceability, etc. All such modifications and coordination shall be made without additional cost to the Owner. Any significant changes in location of items necessary in order to meet field conditions shall be brought to the immediate attention of the Architect/Engineer and receive his approval before such alterations are made
B. Wherever the work is of sufficient complexity, additional Detail Drawings to scale similar to that of the bidding Drawings, prepared on tracing medium of the same size as Contract Drawings. With these layouts, coordinate the work with the work of other trades. Such detailed work to be clearly identified on the Drawings as to the area to which it applies. Submit for review Drawings clearly showing the work and its relation to the work of other trades before commencing shop fabrication or erection in the field. Attend meetings with other trades to review all documents.
C. When directed by the General Contractor for areas of necessary coordination provide 3D building modelling coordination files and documents with other trades. Transmit information electronically and attend meetings as directed by the G/C as well as take part in coordination activities and documentation. Contractor shall be required to generate their own electronic files for this process.

1.7. PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

B. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. The Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Possible conflicts.
i. Compatibility problems.
j. Time schedules.
k. Manufacturer's written recommendations.
l. Warranty requirements.
m. Compatibility of materials.
n. Space and access limitations.
o. Regulations of authorities having jurisdiction.
p. Testing and inspecting requirements.
q. Installation procedures.
r. Coordination with other work.
s. Required performance results.
t. Protection of adjacent work.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

C. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contractor is on time, ahead or behind schedule, in relation to Construction Schedule. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time. Discuss impact of various contractor schedules upon other contractors and how to remedy impacts.
b. Review present and future needs of each contractor present, including the following:

i. Interface requirements.

ii. Sequence of operations.
iii. Status of submittals.
iv. Deliveries.
v. Off-site fabrication.
vi. Access.
vii. Quality and work standards.
viii. Change Orders.

3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.8. REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI.

1. Submit Contractor's suggested solution(s) to RFI. If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
2. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 220013

SECTION 230713 – DUCT INSULATION

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 230010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUMMARY

A. Section Includes:

1. Insulation Materials:

a. Flexible elastomeric.
b. Mineral fiber.

2. Insulating cements.
3. Adhesives.
4. Mastics.
5. Sealants.
6. Factory-applied jackets.
7. Field-applied jackets.
8. Tapes.

1.3. SUBMITTALS

1. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).
2. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

B. QUALITY ASSURANCE

1. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

a. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
b. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.4. DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.5. COORDINATION

A. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

PART 2 PRODUCTS

2.1. INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
C. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

2.2. DUCT LINER

A. Fibrous-Glass Duct Liner (Flat Applications): Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with

NAIMA AH124, "Fibrous Glass Duct Liner Standard."

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. CertainTeed Corporation; Insulation Group.
    b. Johns Manville.
    c. Knauf Insulation.
    d. Owens Corning.
2. Maximum Thermal Conductivity:
    a. Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
    b. Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
3. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
4. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

B. Fibrous-Glass Duct Liner (Round Applications): Engineered, pre-formed insulation designed for specific duct diameters and fittings. Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard." Rigid, resin bonded fibrous glass board with a damage-resistant, flame retardant veil faced airstream surface with a reinforced aluminum foil (FRK) backing.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. CertainTeed Corporation; Insulation Group.
    b. Johns Manville.
    c. Knauf Insulation.
    d. Owens Corning.
        i. Maximum Thermal Conductivity:
            - Type I, Flexible: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
2. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

C. Fiber-Free Duct Liner (Flat Applications): Polyester blanket insulation with FSK facing. Comply with ASTM C 1071, NFPA 90A, or NFPA 90B.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Ductmate.
2. Maximum Thermal Conductivity:
    a. Type I, Flexible: 0.24 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
3. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
4. Duct liner shall be an engineered nonwoven, thermally bonded Polyester with a smooth and durable FSK facing. Liner must have a noise reduction coefficient of at least 0.65 and have thermal values greater or equal to an R-4.2 at l ", R-5 at 1.25", R-6 at 1 Yi" and R-8 at 2" respectively.
5. Polyester liner must be able to withstand a constant internal temperature up to 250°F must be compliant with Greenguard Environmental Institute, and contain zero VOCs per ASTM D5116. Liner must comply with all applicable standards including ASTM E84, ASTM C518, ASTM G-21, NFPA 90A and 90B, and UL 181.
6. Polyester duct liner must be attached using a non-flammable, low VOC water based adhesive. When applicable, apply a non-flammable, low voe water based lagging adhesive to the exposed leading edge of the insulation. Install fasteners per SMACNA HV AC Duct Liner installation instructions. Liner must consist of at least 25% recycled content.
7. Polyester duct liner must be installed per section 7.4 of the 2005 SMACNA Manual, "HVAC Duct Construction Standards, Metal and Flexible," Third Edition unless otherwise specified

D. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C 534,

Type II, Grade 1; and with NFPA 90A or NFPA 90B.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Aeroflex USA Inc.
    b. Armacell LLC.
    c. Rubatex International, LLC
2. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
3. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

2.3. DUCT WRAP

A. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article. 1.0 lb. density standard duct insulation type IV with foil-scrim-craft facing and .27 BTUH thermal conductivity at 75 degrees mean temperature.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    a. CertainTeed Corp.; Duct Wrap.
    b. Johns Manville; Microlite.
    c. Knauf Insulation; Duct Wrap.
    d. Manson Insulation Inc.; Alley Wrap.
    e. Owens Corning; All-Service Duct Wrap.

B. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. For equipment applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. CertainTeed Corp.; Commercial Board.
    b. Fibrex Insulations Inc.; FBX.
    c. Johns Manville; 800 Series Spin-Glas.
    d. Knauf Insulation; Insulation Board.
    e. Manson Insulation Inc.; AK Board.
    f. Owens Corning; Fiberglas 700 Series.

C. Flexible Elastomeric Duct Wrap: Closed cell insulation with a 16 mil laminated covering membrane (a UV protective white or silver, blended polymeric top surface and a puncture-resistant blended polymeric base, around a scrim reinforced core). The membrane has a 10-year limited warranty against breakdown due to UV radiation. Mold-resistant flexible elastomeric thermal insulation. It is manufactured without the use of CFCs, HFCs or HCFCs.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Armacell LLC ArmaTuff Plus II.
2. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

D. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. For equipment applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:
    a. CertainTeed Corp.; Commercial Board.
    b. Fibrex Insulations Inc.; FBX.
    c. Johns Manville; 800 Series Spin-Glas.
    d. Knauf Insulation; Insulation Board.
    e. Manson Insulation Inc.; AK Board.
    f. Owens Corning; Fiberglas 700 Series.

E. Fire-Rated Insulation Systems

1. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by a NRTL acceptable to authority having jurisdiction.
2. Products: Subject to compliance with requirements, provide one of the following:

    a. CertainTeed Corp.; FlameChek.
    b. Johns Manville; Firetemp Wrap.
    c. Nelson Firestop Products; Nelson FSB Flameshield Blanket.
    d. Thermal Ceramics; FireMaster Duct Wrap.
    e. 3M; Fire Barrier Wrap Products.
    f. Unifrax Corporation; FyreWrap.
    g. Vesuvius; PYROSCAT FP FASTR Duct Wrap.

F. Insulation Pins and Washers:

    a. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, length to suit depth of insulation indicated with integral 1-1/2-inchgalvanized carbon-steel washer.

2. Insulation-Retaining Washers: Self-locking washers formed from galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inchesin diameter.

2.4. INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

2.5. ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.

1. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
C. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
D. PVC Jacket Adhesive: Compatible with PVC jacket.

2.6. MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.
B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.

1. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F.
3. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
4. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 3 perms at 0.0625-inch dry film thickness.
2. Service Temperature Range: Minus 20 to plus 200 deg F.
3. Solids Content: 63 percent by volume and 73 percent by weight.
4. Color: White.

2.7. SEALANTS

A. Joint Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 deg F.
4. Color: White or gray.
5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. FSK and Metal Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.

3. Service Temperature Range: Minus 40 to plus 250 deg F.
4. Color: Aluminum.
5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.8. FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.9. FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
B. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.

1. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. See Division 01 Section "Product Requirements."
2. Factory cut and rolled to size.
3. Finish and thickness are indicated in field-applied jacket schedules.
4. Moisture Barrier for Indoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
5. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
6. Factory-Fabricated Fitting Covers:

a. Same material, finish, and thickness as jacket.
b. End caps.
c. Beveled collars.
d. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.10. TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Width: 3 inches.
2. Thickness: 6.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Width: 2 inches.
2. Thickness: 3.7 mils.
3. Adhesion: 100 ounces force/inch in width.
4. Elongation: 5 percent.
5. Tensile Strength: 34 lbf/inch in width.

PART 3 – EXECUTION

3.1. EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3. INSULATION SCHEDULE

A. Refer to drawings for insulation and ductwork schedule.

3.4. GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.
B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and duct system as specified in insulation system schedules.
C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
E. Install multiple layers of insulation with longitudinal and end seams staggered.
F. Keep insulation materials dry during application and finishing.
G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
H. Install insulation with least number of joints practical.
I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
4. For below ambient services, apply vapor-barrier mastic over staples.
5. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
6. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
O. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Access doors.

P. Undamaged insulation systems on cold surface ductwork and equipment shall perform their intended functions as vapor barriers and thermal insulation without premature deterioration of insulation or vapor barrier. Contractor shall take every reasonable precaution to provide insulation systems with continuous unbroken vapor barriers.
Q. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.

6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 f_{pm}.
7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
    a. Fan discharges.
    b. Intervals of lined duct preceding unlined duct.
    c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
9. For double wall ductwork, secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
    a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.
10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

3.5. PENETRATIONS

A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
    1. Comply with requirements in Penetration Firestopping and fire-resistive joint sealers.
C. Insulation Installation at Floor Penetrations:
    1. Pipe: Install insulation continuously through floor penetrations.
    2. Seal penetrations through fire-rated assemblies. Comply with requirements in Penetration Firestopping."

3.6. MINERAL-FIBER INSULATION INSTALLATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.
    1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
    2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
    3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
        a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
        b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
        c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
        d. Do not overcompress insulation during installation.
        e. Impale insulation over pins and attach speed washers.
        f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
B. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
    1. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    2. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.

C. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
D. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
E. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.
F. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 50 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
    b. On duct sides with dimensions larger than 18 inches, space pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from 1 edge and 1 end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to 2 times the insulation thickness but not less than 3 inches.

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.7. FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8. EXTERIOR FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. install using manufacturer recommended adhesives or with pre-applied pressure sensitive adhesive (PSA) for application to large, flat or curved metal surfaces such as ducts, vessels, very large pipes or tanks.
B. The seams must be installed in compression and sealed with adhesives. Adhesives are contact adhesives and shall be applied to duct and insulation surfaces.
C. Cover seams with manufactured Seal Tape specific for application matching jacket.
D. Exterior duct work must be pitched to allow rain water to run off the insulation.
E. Do not install below ground.
F. The application temperature should be above 40°F (+4°C) and 100°F (+38°C).

3.9. FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.

5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor barrier mastic.

B. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.10. FINISHES

A. Equipment and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
D. Do not field paint aluminum or stainless-steel jackets.

3.11. FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
B. Perform tests and inspections.
C. Tests and Inspections:

1. Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
2. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.
E. Insulation failing to meet workmanship and appearance standards shall be replaced with an acceptable installation before final acceptance of project will be given. Insulation failing to meet performance requirements of this specification for a period of one year after date of final acceptance or through one heating season and one cooling season, whichever is longer shall be replaced with an acceptable installation. All costs to correct insulation deficiencies and costs to repair damages to other work shall be at Mechanical Contractors expense at no cost to owner.

3.12. FIELD QUALITY ASSURANCE

A. Upon completion of insulation work and before operation is to commence, visually inspect the work and verify that it has been correctly installed.
B. Open all system dampers and turn on fans to blow all scraps and other loose pieces of material out of the duct system. Allow for a means of removal of such material.
C. Check the duct system to ensure that there are no air leaks through joints.

3.13. PROTECTION

A. Replace damaged insulation, which cannot be satisfactorily repaired, including insulation with duct liner damage and moisture-saturated insulation.
B. The insulation contractor shall advise the general and/or the mechanical contractor as to requirements for protection of the insulation work during the remainder of the construction period, to avoid damage and deterioration of the finished insulation work.

END OF SECTION 230713

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SECTION 230913 – PROGRAMMABLE THERMOSTATS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 230010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Product Data: For each control device indicated.

1. Wiring Diagrams: Power, signal, and control wiring.

B. Operation and maintenance data.

PART 2 PRODUCTS

2.1. GENERAL

A. Provide Thermostats by Honeywell, Johnson Controls, White-Rogers, Carrier or approved equal.

2.2. UNITS

A. Provide programmable thermostats with stages of cooling and heating as required by stages of cooling and heating on specified equipment (Refer to drawings and other portions of this specification to determine exact control required.)
B. Thermostat shall have the following:

1. Seven (7) day programming capability with 2 occupied/unoccupied periods per day.
2. Automatic heat/cool change over.
3. Start time optimization
4. Continuous fan operation in occupied mode.
5. Intermittent fan operation in unoccupied mode.
6. Battery backup
7. Temporary override capability
8. Locking setpoints to prevent tampering.
9. Anti-recycle controls

C. Provide with all subbases required and interfaces to other equipment as required.

PART 3 EXECUTION

3.1. INSTALLATION

A. Coordinate with Electrical Contractor to provide all wiring between condensing units, furnaces, thermostats and all other required controls.
B. Provide backbox and ¾" conduit to above accessible ceilings inside walls for thermostat wiring.
C. All wiring shall be concealed in conduit or above accessible ceilings.
D. Obtain a desired operational schedule from the owner or tenant and program each thermostat with desired settings.
E. Provide Thermostats by Honeywell, Johnson Controls, White-Rogers, Carrier or approved equal.

END OF SECTION 230913

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SECTION 232000 – HVAC PIPING

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 230010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Product Data: For each type of product to be used.

PART 2 - PRODUCTS

2.1. PIPING MATERIALS

A. Piping used throughout project shall conform to the following specifications. Piping shall be plainly marked with manufacturers name and weight. See piping material schedule on the drawings for materials to be used for each piping system.

1. Copper Tube:

a. Provide hard temper copper water tube conforming to requirements of current ASTM Specification B-88. Tubing shall be Type K, L, or M as listed in schedule. Tubing joints shall be soldered or brazed. See schedule for joining method to be used.
b. Pipe by Anaconda, Cerro, Chase, Mueller or Revere Copper.

2. Copper Tube Type ACR:

a. Provide hard temper nitrogenized copper refrigerant tube conforming to requirements of current ASTM B-88. Tubes shall be Type L or K as listed in schedule.
b. Tubing joints shall be brazed.
c. Pipe by Anaconda, Cerro, or Mueller.

3. Polyvinyl Chloride Drain Waste Pipe:

a. Provide Schedule 40 polyvinyl chloride solid core plastic drain waste and vent pipe conforming to ASTM D2665. Joints shall be properly cleaned, primed and glued where scheduled.
b. Polyvinyl Chloride (PVC) Pipe & Fittings Cell Class 12454 B.

i. ASTM D 2241 SDR-26

c. Pipe by Charlot, Genova, Crestline or equal.

2.2. PIPING FITTINGS

A. Piping fitting used throughout project shall be proper type for installation method used and shall be compatible with piping system material. Fittings listed in piping material schedule shall conform to the following specifications:

1. Wrought Copper Fittings:

a. Provide wrought solder joint copper tube fitting conforming to ANSI Standard B16.22
b. Fittings by Anaconda, Chase or Nibco.

2. Cast Bronze Fittings:

a. Provide cast bronze solder joint fittings conforming to ANSI Standard B16.18.
b. Fittings by Anaconda, Chase or Nibco.

3. PVC Fittings:

i. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe. PVC Non-pressure Piping Joints: Join piping according to ASTM D 2665.
ii. Joints shall be of a push-on type with a bell-end grooved to receive a synthetic rubber gasket when scheduled. Solvent welded joints are not allowed outside the building. The joint shall be made in accordance with ASTM D 3212.

b. Equivalents: Spears, Lasco or equal.

PART 3 - EXECUTION

3.1. PIPING INSTALLATION

A. Piping systems materials and installation shall conform to the following standards and codes.

1. System: Heating and Air Conditioning Piping

a. Code: ANSI Standard B31.1.0 “Power Piping”

B. No piping containing water shall be located in areas subject to freezing temperatures, including: unheated attics, unheated plenums, chases wall spaces or cavities within exterior walls, under slabs, or in concrete.

C. Pipe sizes indicated on plans and as specified refer to nominal size in inches, unless otherwise indicated. Pipes are sized to nearest ½”. In no case shall piping smaller than size specified be used.

D. Contractor shall provide and be responsible for proper location of pipe sleeves, hangers, supports, and inserts. Install hangers, supports, inserts, etc., as recommended by manufacturer and as specified and detailed on drawings.

E. Verify construction types and provide proper hangers, inserts and supports for construction used. Install inserts, hangers and supports in accordance with manufacturers load ratings and provide for thermal expansion of piping without exceeding allowable stress on piping or supports. Provide solid type hangers and supports where pipe travel exceeds manufacturer’s recommendations for fixed hanger and supports.

F. Install piping parallel with building lines and parallel with other piping to obtain a neat and orderly appearance of piping system. Secure piping with approved anchors and provide guides where required to insure proper direction of piping expansion. Piping shall be installed so that allowable stress for piping, valves and fittings used are not exceeded during normal operation or testing of piping system.

G. Install piping so that systems can be completely drained. Provide piping systems with valve drain connections at all low pipe and ahead of all sectionalizing valves whether shown on plans or not. Drain lines shall be ¾”.

H. Drain valves on closed piping systems such as chilled water system shall have lock shields and plugged or capped outlets to protect system from inadvertent drainage.

I. Pitch all piping and where possible make connections from horizontal piping so that air can be properly vented from system. Provide air vents as specified at all system high points and at drop in piping in direction of flow. Use eccentric reducers where necessary to avoid air pockets in horizontal piping.

J. Provide unions or flanged joints in each pipe line preceding connections to equipment to allow removal for repair or replacement. Provide all screwed and control valves with unions adjacent to each piping connection. Provide screwed end valves with union adjacent to valve unless valve can be otherwise easily removed from line.

K. Fittings pressures and temperature ratings shall be equal to or exceed maximum operating temperature and working pressure of piping system. No mitered or field fabricated pipe fittings will be permitted.

L. All pipe threads shall meet ANSI Standard B2.1 for taper pipe threads. Lubricate pipe threads with Teflon thread sealant and lubricating compound applied full strength. Powdered or made-up compound will not be permitted. Pipe thread compound shall be applied only to male pipe threads.

M. Brazed socket type joints shall be made with suitable brazing alloys. Minimum socket depth shall be sufficient for intended service. Brazing alloy shall be end fed into socket, and shall fill completely annular clearance between socket and pipe or tube. Brazed joints depending solely upon a fillet rather than a socket type joint will not be acceptable.

N. Soft soldered socket type joints shall be made with sill-floss or 95-5 tin-antimony solder as required by temperature and pressure rating of piping system. Soldered socket-type joints shall be limited to systems containing non-flammable and non-toxic fluids. Soldered socket-type joints shall not be used on piping systems subject to shock vibration. Soldered joints depending solely upon a fillet rather than a socket-type joint will not be acceptable.

O. Make changes in piping size and direction with approved factory made fittings. Provide fittings suitable for at least 125 PSI working pressure or of pressure rating required for maximum working pressure of system whichever is greater.

3.2. PIPING SUPPORTS, ANCHORS, SLEEVES AND SEALS

A. Furnish proper type and size pipe sleeves to General Contractor for installation in concrete or masonry walls or floors. Sleeves are not required for supply and waste piping through wall supporting plumbing fixtures or for cast iron soil pipe passing through concrete slab or grade except where penetrating a membrane waterproof floor.

B. Mechanical Contractor shall supervise installation of sleeves to insure proper location and installation.

C. Each sleeve shall be continuous through wall floor or roof and shall be cut flush on each side except where indicated otherwise. Sleeves shall not be installed in structural member except where indicated or approved.

D. Sleeves passing through above grade floors subject to flooding such as toilet rooms, bathrooms, equipment rooms and kitchens shall be cast iron with integral flanges and shall extend 1 inch above finished floor. Size sleeves for and seal space between pipe sleeve with Thunderline Link-Seal.

E. Provide steel pipe sleeves in bearing walls and masonry walls. Opening in non-bearing walls, floors and

ceilings may be 20 gauge galvanized pipe sleeves or openings cut with concrete core d.....

F. Pipe insulation shall run continuous through pipe sleeves with ¼" minimum clearance between insulation and pipe sleeve. Provide metal jackets over insulated pipes passing through fire walls, floors and smoke partitions. Jacket shall be 0.018 stainless steel extending 12 inches on either side of barrier and secured to insulation with 3/8" wide band. Seal annular space between jacket and pipe sleeves with Thunderline High Temperature Link Seal.

G. Pipe wall penetrations exposed to view shall have tight fitting escutcheons or flanges to cover all voids around openings.

H. All below grade and exterior wall penetrations shall be installed in a pipe sleeve and sealed between the pipe and pipe sleeve with Thunderline High Temperature Link Seal or similar compressed link type system.

I. Provide sleeves through all fire-rated walls and fill voids surrounding sleeves and interior to sleeves around cables with Nelson "Flameseal" fire stop putty with U.L. listed 3 hour rating installed as per manufacturers recommendations.

J. Equivalent by Dow, Chemelex, 3M.

3.3. PIPE HANGERS AND SUPPORTS

A. Provide and be responsible for locations of piping hangers, supports and inserts, etc., required for installation of piping under this contract. Design of hangers and supports shall conform to current issue of Manufacturers Standardization Society Specification (MSS) SP-58.

B. Pipe hangers shall be capable of supporting piping in all conditions of operation. They shall allow free expansion and contraction of piping, and prevent excessive stress resulting from transferred weight being induced into pipe or connected equipment. Support horizontal or vertical pipes at locations of least vertical movement.

C. Where horizontal piping movements are such that hanger rod angularity from vertical is greater than 4 degrees from cold to hot position of pipe, offset hanger, pipe, and structural attachments to that rod is vertical in hot position.

D. Hangers shall not become disengaged by movements of supported pipe.

E. Provide sufficient hangers to adequately support piping system at specified spacing, at changes in piping direction and at concentrated loads. Hangers shall provide for vertical adjustment to maintain pitch required for proper drainage, and for longitudinal travel due to expansion and contraction of piping. Fasten hangers to building structural members wherever practicable.

F. Unless indicated otherwise on drawings support horizontal steel piping as follows:

PIPE SIZE	ROD DIAMETER	MAXIMUM SPACING
Up to 1-1/4"	3/8"	8 Ft.
1-1/2" to 2"	3/8"	10 Ft.
2-1/2" to 3-1/2"	½"	12 Ft.
4" and 5"	5/8"	15 Ft.

G. Unless indicated otherwise on drawings support horizontal copper tubing as follows:

NOM. TUBING SIZE	ROD DIAMETER	MAXIMUM SPACING
Up to 1"	3/8"	6 Ft.
1-1/4" to 1-1/2"	3/8"	8 Ft.
2"	3/8"	9 Ft.
2-1/2"	½"	9 Ft.
3" and 4"	½"	10 Ft.

H. Support horizontal cast iron soil pipe with two hangers for each section located close to each hub.

I. Support vertical cast iron soil pipe at every floor, steel and copper tubing at every other floor except where indicated otherwise on drawings.

J. Provide continuous threaded hanger rods wherever possible. No chain, wire, or perforated straps shall be used.

K. Hanger rods shall be subject to tensile loading only, where lateral or axial pipe movement occurs provide suitable linkage to permit swing. Provide pipe support channels with galvanized finish for concealed locations and painted finish for exposed locations. Submit design for multiple pipe supports indicating pipe sizes, service and support detail to Architect-Engineer for review prior to fabrication.

L. Provide Grinnell pipe hangers for vertical pipe risers as follows:

PIPE MATERIAL	PIPE SIZE	HANGER FIG. NO.
Copper	½" thru 4"	CT-121
Steel	¾" thru 20"	261

M. Provide Grinnell Fig. 194, 195 or 199 steel wall brackets for piping suspended or supported from walls. Brackets shall be prime coated carbon steel.

N. Mount hangers for insulated piping on outside of pipe insulation sized to allow for full thickness of pipe insulation.

O. Provide Grinnell Fig. 167 insulation protection shields sized so that line compressive load does not exceed one-third of insulation compressive strength. Shield shall be galvanized steel and support lower 180 degrees of pipe insulation on copper tubing. Provide wood block at each pipe hanger in thickness of insulation. Insulation vapor barrier jacket shall overlap wood block to maintain vapor barrier.

P. Structural attachments for pipe hangers shall be as follows:

Q. Concrete Structure: Provide Grinnell Fig. No. 285 cast in concrete insert for loads up to 400 lbs. and Grinnell Fig. 281 wedge cast in type concrete insert for loads up to 1200 lbs.

R. Provide Grinnell pipe hangers for horizontal single pipe runs as follows:

PIPE MATERIALS	PIPE SIZE	HANGER FIG. NO.
Copper	½" thru 4"	CT-65
Steel	3/8" thru 4"	65
Steel	5" thru 30"	260

S. Provide Fee and Mason Fig. 600 channel trapeze pipe hangers for horizontal multiple pipe runs with pipe clamps or pipe rollers as follows:

PIPE MATERIALS	PIPE SIZE	CLAMP NO.	ROLLER NO.
Copper	3/8" thru 4"	8600 CP*	8010 CP*
Steel	3/8" thru 6"	8500	8010

*Copper Plated

T. Pipe supports for horizontal piping mounted on pipe racks or stanchions shall be Advanced Thermal Systems low friction graphite slide supports or equivalent by Elcen or Grinnell. Where racks and supports are not detailed on drawings submit detailed support drawings to Architect-Engineer for review prior to fabrication.

U. Provide Fee and Mason Fig. 404 vibration control hangers at locations where piping vibrations would be transmitted to building structure by conventional hangers. Apply hangers within their load supporting range.

V. Provide Elcen Fig. 50 pipe saddle with adjuster to support piping from floor. Provide complete with pedestal type floor stand.

W. Provide necessary structural steel and attachment accessories for installations of pipe hangers and supports. Where heavy piping loads are to be attached to building structure verify structural loading with Architect-Engineer prior to installations.

X. Equivalent hangers and supports by Auto-Grip, Basic Engineer, Bee Line, Elcen, Fee & Mason, Fluorocarbon Company, Unistrut or Super Strut Inc.

A. Provide premanufactured pipe support for piping located on flat roofs, unless otherwise indicated on drawings. Support will be of modular designs with roller bearings and guide saddles for straight piping runs longer than 50' and Unistrut type clamp/support type for other shorter runs. Maximum pipe support spacing shall be 10' for steel piping. Copper piping and refrigerant piping shall be supported at shorter distances. Piping near equipment connections shall be supported within 3' of units. System supports shall be compatible with roofing materials and shall be provided with plates, pads, etc to spread weight and wear on roof surface. Provide pipe supports from Miro Industries, B-Line, or approved equivalent.

END OF SECTION 232000

SECTION 233113 – METAL DUCTS

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 230010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Double-wall rectangular ducts and fittings.
3. Single-wall round and flat-oval ducts and fittings.
4. Double-wall round and flat-oval ducts and fittings.
5. Sheet metal materials.
6. Sealants and gaskets.
7. Hangers and supports.

1.3. PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"
C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

1.4. SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.

D. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.

5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:

    a. Lighting fixtures.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.
    f. Perimeter moldings.

E. Welding certificates.
F. Field quality-control reports.

PART 2 PRODUCTS

2.1. SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
B. Rectangular Ducts: Fabricate ducts with indicated dimensions for the inner duct allowing for insulation if lined.

2.2. SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

    1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

        a. Lindab Inc.
        b. McGill AirFlow LLC.
        c. SEMCO Incorporated.
        d. Sheet Metal Connectors, Inc.
        e. Spiral Manufacturing Co., Inc.
        f. Norlock Metal Products, Inc.

B. Flat-Oval Ducts: Indicated dimensions are the duct width (major dimension) and diameter of the round sides connecting the flat portions of the duct (minor dimension).
C. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

    a. Transverse Joints in Ducts Larger Than 60 Inchesin Diameter: Flanged.

D. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

    1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
    2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.

E. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
F. All exposed round ducts shall be spiral wound construction.
G. Concealled low pressure round ducts may be snap-lock construction when 8” or less. 10” round ducts shall be spiral wall construction.

2.3. ELBOW CONFIGURATION:

A. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

    1. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
    2. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
    3. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

B. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."

1. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

a. Radius-to Diameter Ratio: 1.5.

2. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
3. Round Elbows, 14 Inches and Larger in Diameter: Standing seam or Welded.

2.4. BRANCH CONFIGURATION:

A. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."

1. Rectangular Main to Rectangular Branch: 45-degree entry.
2. Rectangular Main to Round Branch: High Efficiency 45 degree takeoff.

B. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.

1. Velocity 1000 fpmor Lower: 90-degree tap.
2. Velocity 1000 to 1500 fpm: Conical tap.
3. Velocity 1500 fpm or Higher: 45-degree lateral.

2.5. SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. PVC-Coated, Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Minimum Thickness for Factory-Applied PVC Coating: 4 mils thick on sheet metal surface of ducts and fittings exposed to corrosive conditions, and minimum 1 mil thick on opposite surface.
3. Coating Materials: Acceptable to authorities having jurisdiction for use on ducts listed and labeled by an NRTL for compliance with UL 181, Class 1.

D. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

E. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

F. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

2.6. SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Sealant: Modified styrene acrylic.
3. Indoor and outdoor, Water resistant, Mold and mildew resistant.
4. Maximum Static-Pressure Class: 10-inch wg, positive and negative.

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.

4. Indoor or outdoor, Water resistant, Mold and mildew resistant.
5. VOC: Maximum 75 g/L (less water).
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.

D. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solids Content: Minimum 60 percent.
4. Indoor or outdoor, Water resistant, Mold and mildew resistant.
5. Maximum Static-Pressure Class: 10-inch wg, positive or negative.

E. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.

F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
G. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

H. Pressure sensitive duct joint sealer:

1. Provide Hard Cast, Inc. “Foil Grip” pressure sensitive duct joint sealer. Seal class “A”, “B”, and “C”.

2.7. HANGERS AND SUPPORTS

A. Indicate the extent of corrosive environment on Drawings.
B. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
C. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
D. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."
E. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
F. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
G. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
H. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
I. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 EXECUTION

3.1. DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
C. All metal ductwork scheduled for interior thermal and acoustical liner is not sized on plans to include the proper thickness of insulation. Add 1” or 2” in height and width of ductwork as required to accommodate insulation thickness. Mount specialties such as turning vanes, dampers, etc., to ductwork with that section insulated “Build Outs” to maintain continuity of thermal barrier.
D. All ductwork within 15 feet of connection to rooftop units shall be constructed to 6” WG class regardless of unit static pressure ratings and be a minimum of 18 gauge sheet metal. Roof deck shall only be cut out as required for ductwork penetrations and annular gap around duct shall be sealed with elastomeric caulk to reduce rooftop unit breakout noise.
E. Install round and flat-oval ducts in maximum practical lengths.
F. Install ducts with fewest possible joints.

G. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
H. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
I. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
J. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
K. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
L. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
M. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.
N. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2. INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3. DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
B. Seal ducts to the scheduled seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
C. In residential occupancies duct tightness shall be verified by either of the following:

1. Postconstruction test: Total leakage shall be less than or equal to 4 cfm (113.3 L/min) per 100 square feet (9.29 m^2) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the entire system, including the manufacturer’s air handler enclosure. All register boots shall be taped or otherwise sealed during the test.
2. Rough-in test: Total leakage shall be less than or equal to 4 cfm (113.3 L/min) per 100 square feet (9.29 m2) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the system, including the manufacturer’s air handler enclosure. All registers shall be taped or otherwise sealed during the test. If the air handler is not installed at the time of the test, total leakage shall be less than or equal to 3 cfm (85 L/min) per 100 square feet (9.29 m2) of conditioned floor area.
3. Exception: The total leakage test is not required for ducts and air handlers located entirely within the building thermal envelope.

3.4. HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."
B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
D. Hangers Exposed to View: Threaded rod and angle or channel supports.
E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet

metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5. CONNECTIONS

A. Coordinate duct installations and specialty arrangements with Drawings.
B. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."
C. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6. PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.7. FIELD QUALITY CONTROL

A. Perform tests and inspections.
B. Leakage Tests:

1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
2. Test the following systems:

   a. Ducts with a Pressure Class Higher Than 3-Inch wg: Test representative duct sections totaling no less than 25 percent of total installed duct area for each designated pressure class.

3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
4. Test for leaks before applying external insulation.
5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
6. Give seven days' advance notice for testing.

C. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."

   a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

3. Duct system will be considered defective if it does not pass tests and inspections.
4. Prepare test and inspection reports.

3.8. START UP

A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.9. DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

SYSTEM	Material	Pressure Class	Min. SMACNA Seal Class	Leakage Class
Supply				
Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units	Galv. SM	2” Pos.	C	Round-3 Rect-6
Return				
Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units	Galv. SM	2” Neg.	C	Round-3 Rect-6

Exhaust				
Ducts Connected to General Exhaust	Galv. SM	2" Pos. or Neg.	B	Round-3 Rect-6
Outside Air				
Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units	Galv. SM	2" Neg.	C	Round-3 Rect-6

3.10. CLOTHES DRYER EXHAUST SYSTEM DUCTWORK

A. Dryer exhaust ducts shall be constructed of minimum 0.016-inch thick (0.4 mm) ridged metal ducts, having smooth interior surfaces with joints running in the direction of flow. Exhaust Ducts shall not be connected or installed with sheet metal screws or other fasteners that will obstruct the flow. Ductwork shall be riveted for a smooth interior connector. Tape shall not be used as the only means to secure the connections.

B. Exhaust ducts shall terminate on the outside of the building. Exhaust duct terminations shall be made in accordance with the dryer manufacturer's installation instructions. Exhaust ducts shall terminate at a location as required by the manufacturer's instructions. If the manufacture's instructions do not specify a termination location, the exhaust duct shall terminate not less than 3 feet (914 mm) in any direction from openings into buildings. Exhaust duct terminations shall be equipped with a backdraft damper. Screens shall not be installed at the duct termination.

C. The maximum length of a clothes dryer exhaust duct shall not exceed 25 feet from the dryer location to the wall or roof termination. The maximum length of the duct shall be reduced 2.5 feet for each 45-degree bend and 5 feet for each 90-degree bend. The maximum length of the exhaust duct does not include the transition duct.

D. After riveting duct joints shall be sealed using Hard Cast, Inc. "Foil Grip" pressure sensitive duct joint sealer.

E. For residential style exhaust systems exceeding 25 feet in equivalent length and less than 60 feet and 6 elbows provide Fantech Model FR110 capable of 100cfm at 0.7" ESP, 120 volt. Provide with automatic pressure switch to turn fan on and off when dryer is running.

END OF SECTION 233113

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SECTION 233300 – AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 230010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.
b. Manual volume damper installations.
c. Control damper installations.
d. Fire-damper and smoke-damper installations, including sleeves; and duct-mounted access doors.
e. Wiring Diagrams: For power, signal, and control wiring.

2. Operation and maintenance data.

C. QUALITY ASSURANCE

1. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
2. Comply with AMCA 500-D testing for damper rating.

PART 2 PRODUCTS

2.1. MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60.
2. Exposed-Surface Finish: Mill phosphatized.

C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.2. BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air Balance Inc.
2. Cesco Products.
3. Duro Dyne Inc.
4. Greenheck Fan Corporation.
5. Nailor Industries Inc.
6. NCA Manufacturing, Inc.
7. Pottorff; a division of PCI Industries, Inc.
8. Ruskin Company.
9. SEMCO Incorporated.
10. Vent Products Company, Inc.

B. Description: Gravity balanced.
C. Frame: 0.052-inch- thick, galvanized sheet steel, with welded corners and mounting flange.
D. Blades: Multiple single-piece blades, maximum 6-inch width, 0.025-inch- thick, roll-formed aluminum with sealed edges.
E. Blade Action: Parallel.
F. Blade Seals: Neoprene, mechanically locked.

G. Blade Axles: Nonferrous metal.
H. Tie Bars and Brackets: Galvanized steel.
I. Return Spring: Adjustable tension.
J. Bearings: Steel ball or synthetic pivot bushings.
K. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Electric actuators.
4. Chain pulls.
5. Retain one of first two subparagraphs below.
6. Screen Mounting: Front mounted in sleeve.

a. Sleeve Thickness: 20-gage minimum.
b. Sleeve Length: 6 inches minimum.

L. Screen: Rear mounted. Galvanized steel. Bird.
M. 90-degree stops.

2.3. MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Air Balance Inc.
b. Flexmaster U.S.A., Inc.
c. McGill AirFlow LLC.
d. METALAIRE, Inc.
e. Nailor Industries Inc.
f. Pottorff; a division of PCI Industries, Inc.
g. Ruskin Company.
h. Trox USA Inc.
i. Vent Products Company, Inc.

2. Suitable for horizontal or vertical applications.
3. Frames: Hat-shaped, galvanized-steel channels, 0.064-inch minimum thickness. Mitered and welded corners. Flanges for attaching to walls and flangeless frames for installing in ducts.
4. Blades: Multiple or single blade. Parallel blade design for mixing applications and opposed-blade design for balance only applications. Stiffen damper blades for stability. Galvanized-steel, 0.064 inch thick.
5. Blade Axles: Galvanized steel.
6. Bearings: Molded synthetic. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
7. Tie Bars and Brackets: Galvanized steel.

B. Jackshaft:

1. Size: 1-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

C. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.4. CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cesco Products.
2. Duro Dyne Inc.
3. Flexmaster U.S.A., Inc.
4. Greenheck Fan Corporation.
5. McGill AirFlow LLC.

6. METALAIRE, Inc.
7. Nailor Industries Inc.
8. NCA Manufacturing, Inc.
9. Ruskin Company.
10. Vent Products Company, Inc.
11. Young Regulator Company.

B. Frames: Hat shaped. Galvanized-steel channels, 0.064 inch thick. Mitered and welded corners.
C. Blades: Multiple blade with maximum blade width of 8 inches. Parallel-blade design when used at junctions of differing air temperatures and opposed-blade design otherwise. Galvanized steel. 0.064 inch thick. Closed-cell neoprene edging for low leakage applications.
D. Blade Axles: 1/2-inch- diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.
E. Bearings: Molded synthetic. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft. Thrust bearings at each end of every blade.

2.5. FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Greenheck Fan Corporation.
4. McGill AirFlow LLC.
5. METALAIRE, Inc.
6. Nailor Industries Inc.
7. NCA Manufacturing, Inc.
8. Pottorff; a division of PCI Industries, Inc.
9. Prefco; Perfect Air Control, Inc.
10. Ruskin Company.
11. Vent Products Company, Inc.

B. Type: Static and dynamic; rated and labeled according to UL 555 by an NRTL.
C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 4000-fpm velocity.
D. Fire Rating: 1-1/2 and 3 hours.
E. Frame: Curtain type with blades outside airstream except when located behind grille where blades may be inside airstream; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.
F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
G. Minimum Thickness: 0.052 or 0.138 inch thick, as indicated, and of length to suit application.
H. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
I. Mounting Orientation: Vertical or horizontal as indicated.
J. Blades: Roll-formed, interlocking, 0.034-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.
K. Horizontal Dampers: Include blade lock and stainless-steel closure spring.
L. Heat-Responsive Device: Replaceable, 165 deg F rated, fusible links.

2.6. SMOKE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Greenheck Fan Corporation.
4. Nailor Industries Inc.
5. Prefco.
6. Ruskin Company.

B. General Requirements: Label according to UL 555S by an NRTL.
C. Frame: Multiple-blade type; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.
D. Blades: Roll-formed, horizontal, interlocking, 0.034-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.
E. Leakage: Class I.
F. Rated pressure and velocity to exceed design airflow conditions.
G. Mounting Sleeve: Factory-installed, 0.052-inch- thick, galvanized sheet steel; length to suit wall or floor

application.

H. Damper Motors: two-position action.

1. Electrical Connection: 115 V, single phase, 60 Hz. Coordinate voltage with Fire alarm contractor prior to ordering. Where building is not equipped with a fire alarm system, provide a stand alone 120v smoke detector and remote LED indicator light mounted in ceiling below duct detector. Mount detector within 5' of damper and provide all necessary wiring and interconnections to damper and detector and relays/power supplies.

2.7. FIRE/SMOKE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Greenheck Fan Corporation.
4. Nailor Industries Inc.
5. Prefco.
6. Ruskin Company.

B. Frame: Multiple-blade type; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.

C. Blades: Roll-formed, horizontal, interlocking, 0.034-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.

D. Leakage: Class I.

E. Rated pressure and velocity to exceed design airflow conditions.

F. Mounting Sleeve: Factory-installed, 0.052-inch- thick, galvanized sheet steel; length to suit wall or floor application.

G. Damper Motors: two-position action.

1. Electrical Connection: 115 V, single phase, 60 Hz. Coordinate voltage with Fire alarm contractor prior to ordering. Where building is not equipped with a fire alarm system, provide a stand alone 120v smoke detector and remote LED indicator light mounted in ceiling below duct detector. Mount detector within 5' of damper and provide all necessary wiring and interconnections to damper and detector and relays/power supplies.
2. Power open, locked and reset, spring closed.

2.8. TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. METALAIRE, Inc.
4. SEMCO Incorporated.
5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

C. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.9. DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cesco Products; a division of Mestek, Inc.
2. Ductmate Industries, Inc.
3. Flexmaster U.S.A., Inc.
4. Greenheck Fan Corporation.
5. McGill AirFlow LLC.
6. Nailor Industries Inc.
7. Pottorff; a division of PCI Industries, Inc.
8. Ventfabrics, Inc.
9. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door:

a. Double wall, rectangular. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. 1-by-1-inch butt or piano hinge and cam latches.
b. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
b. Access Doors up to 18 Inches Square: Two hinges and two sash locks.
c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches.
d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

2.10. FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ventfabrics, Inc.
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.
C. Coatings and Adhesives: Comply with UL 181, Class 1.
D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to 2 strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.

1. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene. 26 oz./sq. yd. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.

2.11. LOW PRESSURE FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Thermaflex
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Low Pressure Flexible Duct

1. Thermaflex M-KE rated for +6” W.G. max. and -1” W.G. max. for duct sizes 4” to 14”, +6” W.G. max. and -0.5” W.G. max for duct sizes 14” to 16”, +4” W.G. max. and -0.5” W.G. max for duct sizes 18” to 20”. Rated for 3500 FPM maximum velocity. UL listed “UL-181 Standards Class I Duct Material” complying with NFPA Standards 90A and 90B. Duct shall be composed of an acoustically rated inner polymeric liner duct bonded to coated steel wire helix. Fiberglass insulation and tear resistant metalized polyester film outer vapor barrier. Maximum flexible duct length or run shall be 5’-0” unless otherwise noted. Flexible ductwork shall be securely attached to both the rigid duct connection and diffuser neck with plastic band clamps or stainless steel worm driven clamps. Equivalent by Wiremold, Cleavaflex, Flexmaster.

2.12. HIGH PRESSURE FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Thermaflex
4. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Flexible Duct Inlet to Terminal Boxes

1. Flexmaster type Triple Lock-Acoustic (TL/A) insulated acoustic air duct, manufactured by using a dead soft aluminum strip which is perforated, spirally wound and mechanically joined together. The inner duct is draped with a thick fiberglass insulation and covered by a flame retardant, non-toxic polyethylene vapor barrier. UL-181 Class 1 product uses a Triple Lock (T/L basic) perforated core with an open area of 20% to 25% to completely cushion sounds such as air movement and duct vibrations.
2. Maximum flexible duct length or run shall be 4’-0” unless otherwise noted. Attach ducts with metal screws and stainless steel clamp. Equivalent by Wiremold, Cleavaflex, Flexmaster.

2.13. DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 EXECUTION

3.1. INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
C. Install backdraft and control dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.
F. Install test holes at fan inlets and outlets and elsewhere as indicated.
G. Install fire and smoke dampers according to UL listing.
H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstream and downstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.
5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors; and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
7. Control devices requiring inspection.
8. Elsewhere as indicated.

I. Install access doors with swing against duct static pressure.
J. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

K. Install flexible connectors to connect ducts to equipment.
L. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
M. Retain first paragraph below to allow use of flexible duct to connect terminal units to metal duct.
N. Connect terminal units to supply ducts directly with maximum 12-inch lengths of high pressure flexible duct. Do not use flexible ducts to change directions.
O. Connect diffusers or light troffer boots to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.
P. Connect flexible ducts to metal ducts with draw bands.
Q. Install duct test holes where required for testing and balancing purposes.

3.2. FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.

2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.

END OF SECTION 233300

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SECTION 233400 – HVAC FANS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 230010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and scheduled.
B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
C. Field quality-control test reports.
D. Operation and maintenance data.

PART 2 PRODUCTS

2.1. CEILING AND CABINET EXHAUST FANS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Broan Mfg. Co., Inc.
2. Carnes Company HVAC.
3. Greenheck.
4. Loren Cook Company.
5. NuTone Inc.
6. Panasonic.
7. Penn Ventilation.

B. Motor and drives shall be isolated from the exhaust airstream. Air for cooling the motor shall be supplied to the internal motor compartment through a vent tube from a location free from discharge contaminants. Motors shall be readily accessible for maintenance. The wheel shaft shall be ground, polished, coated with a rust inhibitive finish and mounted in heavy duty, permanently sealed pillow block ball bearings which are capable of 200,000 hours of life, average operation. The drives shall be sized at a minimum of 165% of driven horsepower. Drive belts shall be oil-resistant, non-static and be capable of 25,000 hours of life, average operation. Sheaves shall be fully machined cast iron or pressed steel, keyed and securely attached to the shafts. Variable pitch motor sheaves shall be standard.
C. Provide where shown on plans exhaust fans as hereinafter specified. All fans shall bear the AMCA Certified Ratings Seal for sound and air performance. Reference the exhaust fan schedule on plans.
D. Provide exhaust fans with speed controls to be furnished to the electrical contractor for mounting at the fan.

PART 3 EXECUTION

3.1. INSTALLATION

1. Install power ventilators level and plumb.
2. Secure roof-mounting fans to roof curbs with cadmium-plated hardware. At least one anchor shall be installed on each side of unit when attaching atop a curb.
3. Ceiling Units: Suspend units from structure; use steel wire or metal straps.
4. Support suspended units from structure using threaded steel rods and spring hangers. Vibration-control devices are specified in SECTION 230548 – MECHANICAL SOUND AND VIBRATION CONTROL
5. In seismic zones, restrain support units.
6. Install units with clearances for service and maintenance.
7. Label units according to requirements specified in Division 23 Section "Mechanical Identification."

B. CONNECTIONS

1. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Duct Accessories."
2. Install ducts adjacent to power ventilators to allow service and maintenance.
3. Ground equipment.
4. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and

UL 486B.

5. Interlock operation of fans to associated backdraft and control dampers.

C. FIELD QUALITY CONTROL

1. Equipment Startup Checks:

   a. Verify that shipping, blocking, and bracing are removed.
   b. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
   c. Verify that cleaning and adjusting are complete.
   d. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
   e. Verify lubrication for bearings and other moving parts.
   f. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
   g. Disable automatic temperature-control operators.

2. Starting Procedures:

   a. Energize motor and adjust fan to indicated rpm.
   b. Measure and record motor voltage and amperage.

3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
5. Shut unit down and reconnect automatic temperature-control operators.
6. Refer to Division 23 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.
7. Replace fan and motor pulleys as required to achieve design airflow.
8. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

D. ADJUSTING

1. Adjust damper linkages for proper damper operation.
2. Adjust belt tension.
3. Lubricate bearings.

E. CLEANING

1. On completion of installation, internally clean fans according to manufacturer's written instructions. Remove foreign material and construction debris. Vacuum fan wheel and cabinet.
2. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

F. DEMONSTRATION

1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
2. Schedule training with Owner, through Architect, with at least seven days' advance notice.

END OF SECTION 233400

SECTION 233713 – DIFFUSERS, REGISTERS, AND GRILLES

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 230010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1. GRILLES, REGISTERS AND DIFFUSERS

A. Provide units by Titus, E.H. Price, Metal-Aire, Tuttle & Bailey, Krueger
B. Provide product data for each type of product indicated, include the following: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings. Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.
C. Submit information showing ceiling suspension assembly members, method of attaching hangers to building structure, size and location of initial access modules for acoustical tile. ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings. Duct access panels.
D. Unless noted otherwise finish shall be off white when mounted in ceiling, prime coat when mounted on wall finish.
E. All devices shall be provided with balancing means by either a damper in the takeoff to device or a damper that is part of the diffuser/grille assembly. All dampers shall be accessible to operate and balance.

PART 3 EXECUTION

3.1. GENERAL

A. Provide where shown on plans grilles, registers, and diffusers. See drawings for types, sizes, air flow and quantity. Refer to schedule on plans.

3.2. INSTALLATION

A. Installation of diffusers, registers, and grilles shall meet the following requirements:

1. Installed units shall be level and plumb.
2. Set all units with rubber gaskets for air tight connection with mounting surface.
3. Install all registers with curve of louver away from line of sight. Unless noted otherwise, provide duct mounted diffusers and registers with standard margins.
4. For units installed in lay-in ceiling panels, locate units in the center of panel.
5. For duct-mounted units, install with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3. COORDINATION

A. Provide proper mounting supplies and arrangements for areas shown. Check Architectural drawings for ceiling and all construction.
B. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

1. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

C. Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical.

3.4. BALANCING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

SECTION 238116 – MINI-SPLIT SYSTEMS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 230010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and scheduled.
B. Wiring Diagrams: For units with fan coils fed from/through the outdoor units.
C. Field quality-control test reports.
D. Operation and maintenance data.

PART 2 PRODUCTS

2.1. GENERAL

A. MANUFACTURERS:

1. Approved equivalent manufacturers: Daikin, Mitsubishi, LG, Samsung.

B. QUALITY ASSURANCE

1. The units shall be listed by Electrical Laboratories (ETL) and bear the cETL label.
2. All wiring shall be in accordance with the National Electric Code (NEC).
3. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
4. The outdoor unit will be factory charged with R-410A.

C. DELIVERY, STORAGE AND HANDLING

1. Unit shall be stored and handled according to the manufacturer's recommendations.

D. WARRANTY

1. The units shall have a manufacturer's warranty for a period of one (1) year from date of installation. The units shall have a limited labor warranty for a period of one (1) year from date of installation. The compressors shall have a warranty of six (6) years from date of installation. During the stated period, should any part fail due to defects in material and workmanship, it shall be repaired or replaced at factory by trained service professional.

2.2. UNITS

A. GENERAL

1. REQUIREMENTS

a. Units shall be operable with refrigerant R-410A, equipped with an electronic expansion valve, for installation within a conditioned space. The unit shall be equipped with a programmed drying mechanism that dehumidifies while inhibiting changes in room temperature when used with remote control. A mold-resistant, resin net air filter shall be included as standard equipment.
b. Indoor units shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
c. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
d. Both refrigerant lines shall be insulated from the outdoor unit.
e. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 21" of lift.
f. The indoor units shall be equipped with a return air thermistor.
g. The voltage range will be 253 volts maximum and 187 volts minimum.

2. Fan: The fan shall be statically and dynamically balanced impeller with high and low fan speeds available. The airflow rate shall be available in high and low settings. The fan motor shall be thermally protected.

3. Coil:
    a. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
    b. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
    c. The coil shall be a 2 or 3-row cross fin copper evaporator coil with design completely factory tested.
    d. The refrigerant connections shall be flare connections.
    e. A condensate pan shall be located under the coil.
    f. A condensate pump shall be located below the coil in the condensate pan with a built in safety alarm.
    g. A thermistor will be located on the liquid and gas line.
4. Filter: The return air shall be filtered by means of a washable long-life filter with mildew proof resin.
5. Electrical: A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
6. Control: The unit shall have controls provided by manufacturer to perform input functions necessary to operate the system. The unit shall be compatible with interfacing with connection to LonWorks networks or interfacing with connection to BMS system. Consult with manufacturer prior to applying controls and provide all necessary interface materials and labor.

B. 4 WAY CEILING CASSETTE UNIT

1. General: Indoor unit shall be a ceiling cassette fan coil unit for installation into the ceiling cavity equipped with an air panel grill. It shall be available from 7,500 Btu/h to 36,000 Btu/h. It shall be a four-way air distribution type, ivory white, impact resistant with a washable decoration panel.
2. Indoor Unit:
    a. The 4-way supply air flow can be field modified to 3-way and 2-way airflow to accommodate various installation configurations including corner installations.
    b. Return air shall be through the concentric panel, which includes a resin net mold resistant filter.
    c. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 21” of lift.
3. Unit Cabinet:
    a. The cabinet shall be space saving and shall be located into the ceiling.
    b. Three auto-swing positions shall be available to choose, which include standard, draft prevention and ceiling stain prevention.
    c. The airflow of the unit shall have the ability to shut down one or two sides allowing for simpler corner installation.
    d. Fresh air intake shall be possible by way of optional fresh air intake kit.
    e. A branch duct knockout shall exist for branch ducting supply air.
    f. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
    g. Optional high efficiency air filters are available for each model unit.
4. Fan: The fan shall be direct-drive turbo fan type.
5. Filter Optional high efficiency filters shall be available.
6. Accessories: Fresh air intake and supply air duct connections. Remote “in-room” sensor kit.

C. CONCEALED CEILING DUCTED UNIT

1. General: Indoor unit shall be a built-in ceiling concealed fan coil unit for installation into the ceiling cavity. The unit shall be constructed of a galvanized steel casing. It shall be available from 9,500 Btu/h to 48,000 Btu/h capacities. It shall be a horizontal discharge air with horizontal return air or bottom return air configuration.
2. Unit Cabinet: The cabinet shall be located into the ceiling and ducted to the supply and return openings. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
3. Fan: The fan shall be direct-drive Sirocco type fan.
4. Accessories: Remote “in-room” sensor kit, Suction panel and air suction canvas.

D. CEILING SUSPENDED CASSETTE UNIT

1. General: Indoor unit shall be a ceiling suspended fan coil unit for installation onto a wall or ceiling within a conditioned space. This compact design with finished white casing shall be available from

12,000 Btu/h to 36,000 Btu/h capacities.

2. Unit Cabinet: The cabinet shall be affixed to a factory supplied wall/ceiling hanging brackets and located in the conditioned space. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
3. Fan: The fan shall be a direct-drive cross-flow fan.
4. Accessories: Remote “in-room” sensor kit, condensate pump.

E. WALL MOUNTED UNIT

1. General: Indoor unit shall be a wall mounted fan coil unit for installation onto a wall within a conditioned space. This compact design with finished white casing shall be available from 7,500 Btu/h to 24,000 Btu/h capacities.
2. Unit Cabinet: The cabinet shall be affixed to a factory supplied wall mounting template and located in the conditioned space. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
3. Fan: The fan shall be a direct-drive cross-flow fan.
4. Accessories: Remote “in-room” sensor kit,. condensate pump.

2.3. OUTDOOR UNIT

A. General

1. The outdoor unit is designed specifically for use with series components.
2. The outdoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports and refrigerant regulator.

    a. High/low pressure gas line, liquid and suction lines must be individually insulated between the outdoor and indoor units.

3. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for reprogramming.
4. The unit shall incorporate an auto-charging feature and a refrigerant charge check function.
5. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation.
6. The outdoor unit shall be capable of heating operation at 0°F dry bulb ambient temperature without additional low ambient controls.
7. The system shall continue to provide heat to the indoor units in heating operation while in the defrost mode.

B. Unit Cabinet:

1. The outdoor unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.
2. The outdoor unit shall have factory installed hail guards or field installed Permatron model # Hailguard 54 black polypropylene netting.

C. Fan: The condensing unit shall consist of one or more propeller type, direct-drive 350 and 750 W fan motors that have multiple speed operation via a DC (digitally commutating) inverter. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.

D. Condenser Coil:

1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.
3. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design.
4. The fins are to be covered with an anti- corrosion acrylic resin and hydrophilic film type E1.
5. The pipe plates shall be treated with powdered polyester resin for corrosion prevention. The thickness of the coating must be between 2.0 to 3.0 microns.

E. Compressor:

1. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed scroll “G-type” with a maximum speed of 7,980 rpm.
2. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the

neodymium magnets will position the rotor into the optimum position for a low torque start.

3. The capacity control range shall be as low as 6% to 100%.
4. Each non-inverter compressor shall also be of the hermetically sealed scroll type.
5. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
6. Oil separators shall be standard with the equipment together with an intelligent oil management system.
7. The compressor shall be spring mounted to avoid the transmission of vibration.
8. In the case of multiple condenser modules, conjoined operation hours of the compressors shall be balanced by means of the Duty Cycling Function, ensuring sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours.

F. Electrical:

1. The control voltage between the indoor and outdoor unit shall be 16VDC non-shielded, stranded 2 conductor cable.

PART 3 EXECUTION

3.1. COORDINATION

A. Provide approved submittals to other parties or verify G/C has provided record submittals for use in coordination of connections between other trades well in advance to coordinate other submittals and construction rough-ins.

3.2. UNIT INSTALLATION

A. Suspended Units: Suspend from structure using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.
B. Controls: Install thermostats and humidistats at mounting height of 60 inches above floor.
C. Identify according to Division 23 Section Mechanical Identification.
D. Manufacturer to final size all refrigerant lines. Provide all valves, fittings and any other components as required for refrigerant line lengths indicated by drawings. Provide all refrigerant and oil required for each refrigerant circuit.

3.3. AIR HANDLER CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
B. Connect condensate drain pans. Extend to nearest equipment or floor drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.
C. Connect ducts according to Division 23 Section Ductwork.
D. Install piping adjacent to machine to allow service and maintenance.
E. Ground equipment according to Division 26 Section "Grounding and Bonding."
F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4. AIR HANDLER ADJUSTING

A. Adjust initial temperature and humidity set points.
B. Set controls, and other adjustments for optimum heating performance and efficiency. Adjust heat-distribution features, including shutters, dampers, and relays, to provide optimum heating performance and system efficiency.

3.5. SYSTEM AND EQUIPMENT INDENTIFICATION

A. Provide engraved equipment labels for al pieces of equipment including indoor units and outdoor units.

3.6. FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections. Report results in writing.
B. Perform the following field quality-control tests and inspections and prepare test reports:

1. After installing units and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
5. Remove malfunctioning units, replace with new units, and retest as specified above.

3.7. STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.
B. Complete installation and startup checks according to manufacturer's written instructions and do the following:

1. Inspect for visible damage to unit casing.
2. Inspect for visible damage to compressor, air-cooled outside coil, and fans.
3. Inspect internal insulation.
4. Verify that labels are clearly visible.
5. Verify that clearances have been provided for servicing.
6. Verify that controls are connected and operable.
7. Verify that filters are installed.
8. Clean outside coil and inspect for construction debris.
9. Adjust vibration isolators.
10. Lubricate bearings on fan.
11. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
12. Start unit according to manufacturer's written instructions.
13. Complete startup sheets and attach copy with Contractor's startup report.
14. Inspect and record performance of interlocks and protective devices; verify sequences.
15. Operate unit for an initial period as recommended or required by manufacturer.
16. Calibrate thermostats/sensors.
17. Adjust and inspect high-temperature limits.

C. Start refrigeration system and measure and record the following:

1. Coil leaving-air, dry- and wet-bulb temperatures.
2. Coil entering-air, dry- and wet-bulb temperatures.
3. Outside-air, dry-bulb temperature.
4. Outside-air-coil, discharge-air, dry-bulb temperature.

D. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
E. Measure and record the following minimum and maximum airflows.

1. Supply-air volume.
2. Return-air volume.
3. Outside-air intake volume.

F. Simulate maximum cooling demand and inspect the following:

1. Compressor refrigerant suction and hot-gas pressures.

G. After startup and performance testing, change filters, vacuum cooling and outside coils, lubricate bearings.
H. Provide one spare set of clean filters and deliver to owner.

3.8. COMMISSIONING

A. Verify that units are installed and connected according to the Contract Documents.
B. Complete installation and startup checks according to manufacturer's written instructions and do the following:
C. Inspect for physical damage to unit casing.
D. Verify that access doors move freely and are weathertight.
E. Clean units and inspect for construction debris.
F. Check that all bolts and screws are tight.
G. Adjust vibration isolation and flexible connections.
H. Verify that controls are connected and operational.
I. Lubricate bearings on fans.
J. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
K. Adjust fan belts to proper alignment and tension.
L. Start unit according to manufacturer's written instructions.
M. Complete manufacturer's starting checklist.
N. Measure and record airflow over coils.
O. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.
P. After startup and performance test lubricate bearings.

3.9. UNIT DEMONSTRATION

A. Startup Services: Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:
B. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown,

troubleshooting, servicing, and preventive maintenance.
C. Schedule training with Owner, through Architect, with at least 7 days' advance notice.

3.10. AIR HANDLER CLEANING

A. After completing installation, clean units internally according to manufacturer's written instructions.
B. Install new filters in each unit within 14 days after Substantial Completion.

3.11. COORDINATION

A. Provide approved submittals to other parties or verify G/C has provided record submittals for use in coordination of connections between other trades well in advance to coordinate other submittals and construction rough-ins.
B. Review other trades submittals for coordination of connections and related installation clearances, appurtenances and related equipment.
C. Conduct coordination meeting with all related trades prior to installation of equipment. Bring all apparent conflicts to the attention of the Architect/Engineer.

3.12. CONDENSING UNIT INSTALLATION

A. Install condensing units according to manufacturer's written instructions.
B. Install units level and plumb, firmly anchored in locations indicated; maintain manufacturer's recommended clearances.
C. Install ground-mounted units on 4-inch-thick, reinforced concrete base, 4 incheslarger than condensing unit on each side. Coordinate installation of anchoring devices.
D. Install roof-mounted units on manufactured equipment supports. Anchor unit to supports with removable fasteners.
E. Install hailguards on outdoor units. Permatron model # Hailguard 54 black polypropylene netting.

3.13. CONDENSING UNIT CONNECTIONS

A. Connect precharged refrigerant tubing to unit's quick-connect fittings. Install tubing so it does not interfere with access to unit. Install furnished accessories.
B. Connect refrigerant piping to air-cooled condensing units; maintain required access to unit. Install furnished field-mounted accessories.
C. Ground equipment.
D. All exterior control wiring shall be installed in conduit.
E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.14. CONDENSING UNIT FIELD QUALITY CONTROL

A. Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks and replace lost refrigerant and oil.
B. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
D. Remove and replace malfunctioning units with new units and retest.

3.15. CONDENSING UNIT CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Clean units to remove dirt and construction debris and repair damaged finishes.

END OF SECTION 238116

SECTION 238128 – SPLIT SYSTEM HEAT PUMPS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 230010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and scheduled.
B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
C. Field quality-control test reports.
D. Operation and maintenance data.

PART 2 PRODUCTS

2.1. GENERAL

A. Provide complete systems as scheduled on plans by one manufacturer.
B. Equivalents by Carrier, York, Daikin, Lennox, Trane, Goodman.

2.2. UNITS

A. HEAT PUMP UNITS

1. GENERAL

a. Units shall be assembled on heavy gauge steel mounting/lifting rails and shall be weather proof. Units shall include a hermetic reciprocating compressor(s), plate fin condenser coil, fans and motors, controls and holding charge of R-22. Operating range shall be between 115 degrees F and 35 degrees F in cooling as standard from the factory. Units shall be UL 1995 listed, CAS CAN/CAS-C22.2 No. 236-M90, certified and rated in accordance with ARI Standard 210/240, 360 and 270.

2. CASING

a. Unit casing shall be constructed of 18 gauge zinc coated heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized and finished with a weather-resistant baked enamel finish. Units' surface shall be tested 500 hours in salt spray test. Units shall have removable end panels which allow access to all major components and controls.

3. REFRIGERATION SYSTEM - SINGLE COMPRESSOR

a. Units shall have a single refrigeration circuit. Each refrigeration circuit has an integral subcooling circuit. A refrigeration filter drier shall be provided as standard. The units shall have both a liquid line and suction gas line service valve with gauge port.
b. Units shall have one scroll compressor. Motor shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10 percent of unit nameplate voltage. Crankcase heater, temperature and current-sensitive motor overloads shall be included for maximum protection. Shall have integral spring isolation and sound muffling to minimize vibration transmission and noise. External high and low pressure cutout devices shall be provided. Evaporator defrost control provided in indoor shall prevent compressor slugging by temporarily interrupting compressor operation when low evaporator coil temperatures are encountered.

4. CONDENSER COIL

a. Coils shall be internally finned or smooth bore 3/8" copper tubes mechanically bonded to configured aluminum plate fin as standard. Factory pressure and leak tested to 425 psig air pressure. Metal grilles with PVC coating for coil protection is optional.

5. CONDENSER FAN AND MOTOR(S)

a. Direct-drive, statically and dynamically balanced propeller fan(s) with aluminum blades and electro-coated steel hubs shall be used in draw-through vertical discharge position. Either permanently lubricated totally enclosed or open construction motors shall be provided and

shall have built in current and thermal overload protection. Motor(s) shall have to be either ball or sleeve bearing type.

6. DEFROST CONTROLS

   a. Electronic timed initiated, temperature terminated defrost system with choice of 50, 70 or 90 minute cycle. Timed override limits defrost cycle to 10 minutes.

7. CONTROLS

   a. Heat pump units shall be completely factory wired with necessary controls terminal block for power wiring.
   b. Condensing units shall be completely factory wired with necessary controls and contactor pressure lugs or terminal block for power wiring. Control wiring shall be 24-volt control circuit which includes fusing and control transformer. Units shall provide external location for mounting a fused disconnect device. Time delay timers to prevent compressors in dual compressor units from simultaneous start-up and anti-recycle timers are available as optional accessories.

8. ACCESSORIES

   a. Time Delay Relay: Shall prevent compressors in dual compressor unit from coming on line simultaneously. Timer shall be 24-volt, 60 cycle, with four minute timing period.
   b. Anti-Short-Cycle Timer: Shall prevent rapid on-off conditions by not allowing compressor to operate for 5-7 minutes upon shutdown. Shall consist of a solid state timing device, 24 volt, 60 cycle with either 5 or 7 minute fixed-off timing period.
   c. Provide unit with louvered condenser coil hail guard to alleviate coil damage.

B. SMALL HEAT PUMP AIR HANDLERS

1. GENERAL

   a. Air handler units shall be completely factory assembled including coil condensate drain pan, fan motor(s), filters and controls in an insulated casing that can be applied in either vertical or horizontal configuration. Units shall be rated and tested in accordance with ARI Standard 210, 240, 360. Units shall be UL listed and labeled in accordance with UL 465/1995 for indoor blower coil units. Air handler units shall be internally isolated to prevent sound transmission to building structure. Units shall be mounted on 4" high heavy gauge steel rails.

2. CASING

   a. Unit casing shall be constructed of zinc coated, heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized and finished with a weather-resistant baked enamel finish. Casing is completely insulated with fire-retardant, permanent, odorless glass fiber material. Knockouts shall be provided for unit electrical power and refrigerant piping connections. Captive screws shall be standard on all access panels.

3. REFRIGERATION SYSTEM

   a. A factory-installed thermal expansion valve controls each refrigeration circuit.

4. EVAPORATOR COIL

   a. Configured aluminum fin surface shall be mechanically bonded to 3/8" internally enhanced copper tubing and factory pressure and leak tested at 375 psig. Coil is arranged for draw-through airflow and shall provide condensate drain pan constructed of PVC plastic and provide external connections on either side of the unit.

5. EVAPORATOR FAN

   a. Double inlet, double width, forward curved, centrifugal-type fan(s) with adjustable belt drive shall be standard. Thermal overload protection shall be standard on motor. Fan and motor bearings shall be permanently lubricated.

6. CONTROLS

   a. Magnetic evaporator fan contactor, low voltage terminal strip, check valve(s), and single point power entry shall be included. All necessary controls shall be factory-installed and wired. Evaporator defrost control shall be included to prevent compressor slugging by temporarily interrupting compressor operation when low evaporator coil temperatures are encountered.

7. FILTERS

a. Filters shall be Farr 30/30 type and shall have 2-inch thick fiberglass media contained in a rigid frame. Filters shall have a rigid supporting maze across both the entering and leaving faces of the media. Filters shall be sized so as not to exceed scheduled face velocities.

8. ACCESSORIES

a. Electric Heaters:

i. UL and CSA approved electric heat modules shall be available for installation directly on fan discharge. Electric Heaters shall be as scheduled with two stage control, single-point electric power connection and terminal strip connections. Electric heater elements shall be constructed of heavy duty nickel chromium elements internally delta connected on 208/240 volt, three phase. Each 208/240 volt heater shall have pilot duty with secondary backup fuse links for automatic reset of high limit controls.

ii. Evaporator Coils:

- Shall be completely factory assembled including the expansion valves and drain pans. Single circuit condensing units shall be matched to single circuit coils and dual circuit condensing units to dual circuit coils. Unit casing shall be constructed of zinc coated, heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized and finished with an enamel finish. Casing shall be completely insulated with fire-retardant, permanent, odorless glass fiber material. The coils shall be convertible to either vertical and/or horizontal airflow configuration. Aluminum fin surface shall be mechanically bonded to 3/8" OD copper tubing. Coils shall be factory pressure and leak tested.

iii. Vibration Isolators:

- Shall reduce transmission of noise and vibration to building structures, equipment and adjacent spaces. Packages shall be available in either neoprene-in shear or spring-flex types in floor or suspended mountings.

9. THERMOSTATS

i. Provide 7-day electronic programmable thermostat for stages of heating and cooling as required.

PART 3 EXECUTION

3.1. AIR HANDLER INSTALLATION

A. Suspended Units: Suspend from structure using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.
B. Base-Mounted Units: Secure units to substrate. Provide optional bottom closure base if required by installation conditions.
C. Controls: Install thermostats and humidistats at mounting height of 60 inches above floor.
D. Identify according to Division 23 Section Mechanical Identification.
E. Manufacturer to final size all refrigerant suction and liquid lines. Provide all accumulators, solenoid valve and any other components as required for refrigerant line lengths indicated by drawings. Provide all refrigerant and oil required for each refrigerant circuit.
F. Mount units on 3½” reinforced concrete pads a minimum of 6” larger in each dimension.

3.2. AIR HANDLER CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
B. Connect condensate drain pans. Extend to nearest equipment or floor drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.
C. Connect ducts according to Division 23 Section Ductwork.
D. Install piping adjacent to machine to allow service and maintenance.
E. Ground equipment according to Division 26 Section "Grounding and Bonding."
F. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
G. Connect and wire any outside air dampers and interlock with unit operation. Install all electrical in accordance with Division 26. Provide all necessary relays, interlocks and circuiting to open outside air dampers during operation of unit fan.

3.3. FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including connections. Report results in writing.

B. Perform the following field quality-control tests and inspections and prepare test reports.

1. After installing units and after electrical circuitry has been energized, test units for compliance with requirements.
2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
5. Remove malfunctioning units, replace with new units, and retest as specified above.

3.4. STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.
B. Complete installation and startup checks according to manufacturer's written instructions and do the following:

1. Inspect for visible damage to unit casing.
2. Inspect for visible damage to compressor, air-cooled outside coil, and fans.
3. Inspect internal insulation.
4. Verify that labels are clearly visible.
5. Verify that clearances have been provided for servicing.
6. Verify that controls are connected and operable.
7. Verify that filters are installed.
8. Clean outside coil and inspect for construction debris.
9. Adjust vibration isolators.
10. Lubricate bearings on fan.
11. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
12. Start unit according to manufacturer's written instructions.
13. Complete startup sheets and attach copy with Contractor's startup report.
14. Inspect and record performance of interlocks and protective devices; verify sequences.
15. Operate unit for an initial period as recommended or required by manufacturer.
16. Calibrate thermostats/sensors.
17. Adjust and inspect high-temperature limits.

C. Start refrigeration system and measure and record the following:

1. Coil leaving-air, dry- and wet-bulb temperatures.
2. Coil entering-air, dry- and wet-bulb temperatures.
3. Outside-air, dry-bulb temperature.
4. Outside-air-coil, discharge-air, dry-bulb temperature.

D. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
E. Measure and record the following minimum and maximum airflows.

1. Supply-air volume.
2. Return-air volume.
3. Outside-air intake volume.

F. Simulate maximum cooling demand and inspect the following:

1. Compressor refrigerant suction and hot-gas pressures.

G. After startup and performance testing, change filters, vacuum cooling and outside coils, lubricate bearings.
H. Provide one spare set of clean filters and deliver to owner.

3.5. AIR HANDLER ADJUSTING

A. Adjust initial temperature and humidity set points.
B. Set controls, and other adjustments for optimum heating performance and efficiency. Adjust heat-distribution features, including shutters, dampers, and relays, to provide optimum heating performance and system efficiency.

3.6. AIR HANDLER CLEANING

A. After completing installation, clean units internally according to manufacturer's written instructions.
B. Install new filters in each unit within 14 days after Substantial Completion.

3.7. CONDENSING UNIT INSTALLATION

A. Install condensing units according to manufacturer's written instructions.
B. Install units level and plumb, firmly anchored in locations indicated; maintain manufacturer's recommended

clearances.

C. Install ground-mounted units on 4-inch-thick, reinforced concrete base, 4 inches larger than condensing unit on each side. Concrete, reinforcement, and formwork requirements are specified in Division 3. Coordinate installation of anchoring devices.
D. Install roof-mounted units on equipment supports specified in Division 7. Anchor unit to supports with removable fasteners.
E. Install units on spring isolators specified in Division 23 Section "Mechanical Vibration Controls and Seismic Restraints."

3.8. CONDENSING UNIT CONNECTIONS

A. Connect precharged refrigerant tubing to unit's quick-connect fittings. Install tubing so it does not interfere with access to unit. Install furnished accessories.
B. Connect refrigerant piping to air-cooled condensing units; maintain required access to unit. Install furnished field-mounted accessories.
C. Ground equipment.
D. All exterior control wiring shall be installed in conduit.
E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.9. CONDENSING UNIT FIELD QUALITY CONTROL

A. Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks and replace lost refrigerant and oil.
B. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
D. Remove and replace malfunctioning units with new units and retest.

3.10. CONDENSING UNIT CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Clean units to remove dirt and construction debris and repair damaged finishes.

3.11. CONDENSING COMMISSIONING

A. Verify that units are installed and connected according to the Contract Documents.
B. Complete installation and startup checks according to manufacturer's written instructions and do the following:
C. Inspect for physical damage to unit casing.
D. Verify that access doors move freely and are weathertight.
E. Clean units and inspect for construction debris.
F. Check that all bolts and screws are tight.
G. Adjust vibration isolation and flexible connections.
H. Verify that controls are connected and operational.
I. Lubricate bearings on fans.
J. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
K. Adjust fan belts to proper alignment and tension.
L. Start unit according to manufacturer's written instructions.
M. Complete manufacturer's starting checklist.
N. Measure and record airflow over coils.
O. Check operation of condenser capacity control device.
P. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.
Q. After startup and performance test, lubricate bearings and adjust belt tension.

3.12. CONDENSING UNIT DEMONSTRATION

A. Startup Services: Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:
B. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
C. Schedule training with Owner, through Architect, with at least 7 days' advance notice.

END OF SECTION 238128

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SECTION 238240 – ELECTRIC HEATERS

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 230010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.
B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Plans, elevations, sections, and details.
2. Location and size of each field connection.
3. Equipment schedules to include rated capacities, furnished specialties, and accessories.

C. Field quality-control test reports.
D. Operation and maintenance data.

1.3. QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
C. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

PART 2 PRODUCTS

2.1. CABINET UNIT HEATERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Berko Electric Heating; a division of Marley Engineered Products.
2. Carrier Corporation.
3. Chromalox, Inc.; a division of Emerson Electric Company.
4. Indeeco.
5. International Environmental Corporation.
6. Markel Products; a division of TPI Corporation.
7. Marley Electric Heating; a division of Marley Engineered Products.
8. Daikin Applied International.
9. QMark Electric Heating; a division of Marley Engineered Products.

B. Description: A factory-assembled and -tested unit complying with ARI 440.

1. Comply with UL 2021.

C. Coil Section Insulation: Glass-fiber insulation; surfaces exposed to airstream shall be aluminum-foil facing to prevent erosion of glass fibers.

1. Thickness: 1/2 inch.
2. Thermal Conductivity (k-Value): 0.26 Btu x in./h x sq. ft. at 75 deg Fmean temperature.
3. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
4. Adhesive: Comply with ASTM C 916 and with NFPA 90A or NFPA 90B.
5. Retain subparagraph below to comply with LEED-NC Prerequisite EQ 1.
6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

D. Cabinet: Steel with baked-enamel finish with manufacturer's standard paint, in color selected by Architect]

1. Vertical Unit, Exposed Front Panels: Minimum 0.0528-inch-sheet steel, removable panels with channel-formed edges secured with tamperproof cam fasteners.
2. Horizontal Unit, Exposed Bottom Panels: Minimum 0.0528-inch-thick, sheet steel, removable panels secured with tamperproof cam fasteners and safety chain.

3. Recessing Flanges: Steel, finished to match cabinet.
4. Control Access Door: Key operated.
5. Base: Minimum 0.0528-inch- thick steel, finished to match cabinet, 4 inches high with leveling bolts.

E. Filters: Minimum arrestance according to ASHRAE 52.1 and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

1. Pleated: 90 percent arrestance and 7 MERV.

F. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and hum, mounted in ceramic inserts in a galvanized-steel housing; with fuses in terminal box for overcurrent protection and limit controls for high-temperature protection. Terminate elements in stainless-steel machine-staked terminals secured with stainless-steel hardware.

G. Fan and Motor Board: Removable.

1. Fan: Forward curved, double width, centrifugal; directly connected to motor. Thermoplastic or painted-steel wheels, and aluminum, painted-steel, or galvanized-steel fan scrolls.
2. Motor: Permanently lubricated, multispeed; resiliently mounted on motor board. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
3. Wiring Terminations: Connect motor to chassis wiring with plug connection.

H. Basic Unit Controls:

1. Control voltage transformer.
2. Wall-mounting or Unit-mounted thermostat as shown on plans or scheduled with the following features.

a. Heat-off switch.
b. Fan on-auto switch.
c. Manual fan speed switch.
d. Adjustable deadband.
e. Exposed set point.
f. Deg Findication.

I. Electrical Connection: Factory wire motors and controls for a single field connection.

2.2. WALL AND CEILING HEATERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Berko Electric Heating; a division of Marley Engineered Products.
2. Chromalox, Inc.; a division of Emerson Electric Company.
3. Indeeco.
4. Markel Products; a division of TPI Corporation.
5. Marley Electric Heating; a division of Marley Engineered Products.
6. QMark Electric Heating; a division of Marley Engineered Products.

B. Description: An assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.

C. Cabinet:

1. Front Panel: Stamped-steel louver, with removable panels fastened with tamperproof fasteners.
2. Finish: Baked enamel over baked-on primer with manufacturer's standard color selected by Architect, applied to factory-assembled and -tested wall and ceiling heaters before shipping.
3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

D. Surface-Mounting Cabinet Enclosure: Steel with finish to match cabinet.

E. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and hum, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware, and limit controls for high temperature protection. Provide integral circuit breaker for overcurrent protection.

F. Fan: Aluminum propeller directly connected to motor.

1. Motor: Permanently lubricated, multispeed. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

G. Controls: Unit-mounted thermostat. Low-voltage relay with transformer kit.

H. Electrical Connection: Factory wire motors and controls for a single field connection with disconnect switch.

PART 3 EXECUTION

3.1. INSTALLATION

A. Install unit heaters to comply with NFPA 90A.
B. Suspend cabinet unit heaters from structure with elastomeric hangers.
C. Suspend propeller unit heaters from structure with all-thread hanger rods and elastomeric hangers.
D. Install wall-mounting thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.
E. Install new filters in each fan-coil unit within two weeks of Substantial Completion.
F. Connect supply and return ducts to cabinet unit heaters with flexible duct connectors specified in Division 23 Section "Air Duct Accessories."
G. Ground equipment according to Division 26.
H. Connect wiring according to Division 26.

3.2. FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 238240

END OF DIVISION 230000

DIVISION 26
TABLE OF CONTENTS

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SECTION 260010 – ELECTRICAL PROVISIONS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. All contract documents including drawings, alternates, addenda and modifications and general provisions of the Contract, including General and Supplementary Conditions and all other Division Specification Sections, apply to work of this section. All preceding and following sections of this specification division are applicable to the Electrical Contractor, all sub-contractors, and all material suppliers.

1.2. SCOPE OF WORK

A. This DIVISION requires the furnishing and installing of complete functioning Electrical systems, and each element thereof, as specified or indicated on Drawings or reasonably inferred, including every article, device or accessory reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the Work include materials, labor, supervision, supplies, equipment, transportation, and utilities.
B. In case of an inconsistency between the Drawings and Specifications or within either document, the better quality or the greater quantity of work shall be provided in accordance with the Architect or Engineer's interpretation.
C. Refer to Architectural, Structural and Mechanical Drawings and all other contract documents and to relevant equipment drawings and shop drawings to determine the extent of clear spaces and make all offsets required to clear equipment, beams and other structural members to facilitate concealing conduit in the manner anticipated in the design.

1.3. SPECIFICATION FORM AND DEFINITIONS

A. The Engineer indicated in these specifications is Pearson Kent McKinley Raaf Engineers LLC. 13300 W 98th Street, Lenexa, KS 66215, PHONE 913-492-2400, EMAIL admin@pkmreng.com.
B. Contractor, wherever used in these specifications, shall mean the Company that enters into contract with the Owner to perform this section of work.
C. When a word, such as "proper", "satisfactory", "equivalent", and "as directed", is used, it requires the Architect-Engineer's review.
D. "PROVIDE" means to supply, purchase, transport, place, erect, connect, test, and turn over to Owner, complete and ready for regular operation, the particular Work referred to.
E. "INSTALL" means to join, unite, fasten, link, attach, set up, or otherwise connect together before testing and turning over to Owner, complete and ready for regular operation, the particular Work referred to.
F. "FURNISH" means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories, and all other items customarily required for the proper and complete application for the particular Work referred to.
G. "WIRING" means the inclusion of all raceways, fittings, conductors, connectors, tape, junction and outlet boxes, connections, splices, and all other items necessary and/or required in connection with such Work.
H. "CONDUIT" means the inclusion of all fittings, hangers, supports, sleeves, etc.
I. "AS DIRECTED" means as directed by the Architect/Engineer, or his representative.
J. "CONCEALED" means embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed above hung ceilings.

1.4. QUALIFICATIONS

A. The contractors responsible for work under this section shall have completed a job of similar scope and magnitude within the last 3 years. The contractors shall employ an experienced, competent and adequate work force licensed in their specific trade and properly supervised at all times. Unlicensed workers and general laborers shall be adequately supervised to insure competent and quality work and workmanship required by this contract and all other regulations, codes and practices. At all times the contractors shall comply with all applicable local, state and federal guidelines, practices and regulations. Contractor may be required to submit a statement of qualifications upon request before any final approval and selection. Failure to be able to comply with these requirements is suitable reason for rejection of a bid.

1.5. LOCAL CONDITIONS

A. The contractor shall visit the site and determine the existing local conditions affecting the work required. Failure to determine site conditions or nature of existing or new construction will not be considered a basis for granting additional compensation.

1.6. CONTRACT CHANGES

A. Changes or deviations from the contract documents; including those for extra or additional work must be submitted in writing for review of Architect-Engineer. No verbal change orders will be recognized.

1.7. LOCATIONS AND INTERFERENCES

A. Locations of equipment, conduit and other electrical work are indicated diagrammatically by electrical drawings. Layout work from dimensions on Architectural and Structural Drawings. Verify equipment size from manufacturers shop drawings.
B. Study and become familiar with contract drawings of other trades and in particular general construction drawings and details in order to obtain necessary information for figuring installation. Cooperate with other workmen and install work in such a way to avoid interference with their Work. Minor deviations, not affecting design characteristics, performance or space limitation may be permitted if reviewed prior to installation by Architect-Engineer.
C. Any conduit, apparatus, appliance or other electrical item interfering with proper placement of other work as indicated on drawings, specified, or required, shall be removed, relocated and reconnected without extra cost. Damage to other Work caused by this contractor, subcontractor, workers or any cause whatsoever, shall be restored as specified for new work.
D. Do not scale electrical drawings for dimensions. Accurately layout work from dimensions indicated on Architectural drawings unless they are found to be in error.

1.8. PERFORMANCE

A. Final acceptance of work shall be subject to the condition that all systems, equipment, apparatus and appliances operate satisfactorily as designed and intended. Work shall include required adjustment of systems and control equipment installed under this specification division.
B. The Contractor warrants to the Owner and Architect-Engineer the quality of materials, equipment, workmanship and operation of equipment provided under this specification division for a period of one year from and after completion of building and acceptance of mechanical systems by Owner.

1.9. WARRANTY

A. The Contractor warrants to the Owner and Architect-Engineer that upon notice from them within a one year warranty period following date of acceptance, that all defects that have appeared in materials and/or workmanship, will be promptly corrected to original condition required by contract documents at Contractor's expense.
B. The above warranty shall not supersede any separately stated warranty or other requirements required by law or by these specifications.

1.10. ALTERNATES

A. Refer to General Requirements for descriptions of any alternates that may be included.

1.11. MATERIALS, EQUIPMENT AND SUBSTITUTIONS

A. The intent of these specifications is to allow ample opportunity for the Contractor to use their ingenuity and abilities to perform the work to their and the Owner's best advantage, and to permit maximum competition in bidding on standards of materials and equipment required.
B. Material and equipment installed under this contract shall be first class quality, new, unused and without damage.
C. In general, these specifications identify required materials and equipment by naming one or more manufacturer's brand, model, catalog number and/or other identification. The first named manufacturer or product is used as the basis for design; other manufacturers named must furnish products consistent with specifications of first named product as determined by Engineer. Base bid proposal shall be based only on materials and equipment by manufacturers named, except as hereinafter provided.
D. Where materials or equipment are described but not named, provide required items of first quality, adequate in every respect for intended use. Such items shall be submitted to Architect-Engineer for review prior to procurement.
E. Materials and equipment proposed for substitutions shall be equal to or superior to that specified in construction, efficiency, utility, aesthetic design, and color as determined by Architect-Engineer whose decision shall be final and without further recourse. Physical size of substitute brand shall be no larger than space provided including allowances for access for installation and maintenance. Requests must be accompanied by two copies of complete descriptive and technical data including manufacturer's name, model and catalog number, photographs or cuts, physical dimensions, operating characteristics and any other information needed for comparison.
F. If the Contractor wishes to incorporate products other than those named in the Base Bid Specifications they shall submit a request for approval of equivalency in writing no later than (10) ten calendar days prior to bid date. Substitutions after this may be refused at Engineers option. Equivalents will ONLY be considered approved when listed by addendum.

    1. In proposing a substitution prior to or subsequent to receipt of bids, include in such bid the cost of altering other elements of this project, including adjustments in mechanical or electrical service

requirements necessary to accommodate such substitution.

G. Within 10 working days after bids are received, the apparent low bidder shall submit to the Architect-Engineer for approval, three copies of a list of all major items of equipment they intend to provide. Within 30 working days after award of Contract, Contractor shall submit shop drawings for equipment and materials to be incorporated in work, for Architect-Engineer review. Where 30-day limit is insufficient for preparation of detailed shop drawings on major equipment or assemblies, Contractor shall submit manufacturer's descriptive catalog data and indicate date such detailed shop drawings will be submitted along with manufacturer's certification that order was placed within 30 working day limit.

1.12. ELECTRONIC PLAN FILES

A. Electronic files of the contract documents may be available from the Engineer to successful bidders and manufacturers for a fee of $50 per sheet, $100 minimum and $25 email/shipping charge. A release of liability form will be required along with payment prior to release of files.

1.13. OPENINGS, ACCESS PANELS AND SLEEVES

A. This Contractor shall include the installation of all boxes, access panels and sleeves for openings required to install this work, except structural openings incorporated in the structural drawings. Sleeves shall be installed for all conduits passing through structural slabs and walls. Contractor shall set and verify the location of sleeves that pass through beams, as shown on structural plans. All floor and wall penetrations shall be sealed to meet fire-rating requirements.

B. All penetrations through interior or exterior and rated or non-rated walls and floors shall be appropriately sealed prevent entry and movement of rodents and insects. Contractor shall coordinate their work with all other trades.

1.14. ARCHITECTURAL VERIFICATION AND RELATED DOCUMENTS

A. Contractor shall consult all Architectural Drawings and specifications in their entirety incorporating and certifying all millwork, furniture, and equipment rough-in including utility characteristics such as voltage, phase, amperage, pipe sizes, duct sizes, including height, location and orientation. Shop drawings incorporating these requirements should be submitted to the Architect for approval prior to installation or rough in.

1.15. EXTENT OF CONTRACT WORK

A. Provide electrical systems indicated on drawings, specified or reasonably implied. Provide every device and accessory necessary for proper operation and completion of electrical systems. In no case will claims for "Extra Work" be allowed for work about which Electrical Contractor could have been informed before bids were taken.

B. Where specific information for devices, lights or equipment shown on the plans is missing, provide an allowance in the contract amount for furnishing a product reasonably implied by the level of other devices, lights and equipment provided in the contract documents.

C. Electrical Contractor shall be familiar with equipment provided by other Contractors that require electrical connections and control. Follow circuiting shown on drawings for lighting, power and equipment connections.

D. Make required electrical connections to equipment provided under Architectural and Mechanical divisions of this project. Receive and install electric control devices requiring field installation, wiring, and service connection. Equipment supplied by the automatic temperature control contractor shall be installed by the mechanical or automatic temperature control subcontractor. Make required internal field wiring modifications indicated on wiring diagrams of factory installed control systems for control sequence specified. These field modifications shall be limited to jumper connections and connection of internal wiring to alternate terminal block lugs. The cost for field modifications requiring rewiring of factory installed control systems for equipment provided by General or Mechanical Contractors shall be included in base bid of the respective contractor. All temperature control wiring shall be by a licensed electrician under the supervision of temperature control contractor.

E. Check electrical data and wiring diagrams received from Mechanical Contractor of compliance with project voltages, wiring, controls and protective devices shown on electrical drawings. Promptly bring discrepancies found to attention of Architect-Engineer for a decision.

F. Provide safety disconnect switches, contactors, and manual and magnetic motor starters for mechanical and electrical equipment requiring such devices. Omit these devices where included as part of factory installed prewired control systems provided with mechanical equipment. With exception of factory installed devices, provide safety disconnect switches, contacts and motor starters by one manufacturer to allow maximum interchangeability of repair parts and accessories for these devices.

G. To maximum extent possible electrical controls in boiler rooms, equipment rooms, and control rooms shall be grouped in accessible locations and arranged according to function. Where possible use group control panels and combination starters in lieu of individually enclosed devices.

1.16. CODES, ORDINANCES, RULES AND REGULATIONS

A. Provide work in accordance with applicable rules, codes, ordinances and regulations of Local, State, Federal Governments, and other authorities having lawful jurisdiction.
B. Conform to latest editions and supplements of following codes, standards or recommended practices.
C. BUILDING CODES:

1. International Building Codes (Latest adopted version of applicable codes)

D. SAFETY CODES:

1. National Electrical Safety Code Handbook H30 - National Bureau of Standards
2. Occupational Safety and Health Standard (OSHA) Department of Labor
3. Safety Code for Elevators ANSI A17.1

E. NATIONAL FIRE CODES AND STANDARDS:

1. NFPA No. 70 National Electrical Code
2. NFPA No. 72 National Fire Alarm and Signaling Code
3. NFPA No. 90A Air Conditioning & Ventilation Systems
4. NFPA No. 101 Life Safety Code

F. UNDERWRITERS LABORATORIES INC.:

1. All materials, equipment and component parts of equipment shall bear UL labels whenever such devices are listed by UL.

G. MISCELLANEOUS CODES:

1. ANSI A117.1 - Handicapped Accessibility
2. Americans with Disabilities Act (ADA)

H. ENERGY EFFICIENCY REQUIREMENTS:

1. All electrical systems and components shall be manufactured and installed in compliance with ASHRAE 90.1 – 2007 and latest adopted version of IECC.

1.17. STANDARDS

A. Drawings and specifications indicate minimum construction standard, should any work indicated be sub-standard to any ordinances, laws, codes, rules or regulations bearing on work, Contractor shall promptly notify Architect/Engineer in writing before proceeding with work so that necessary changes can be made. However, if Electrical Contractor proceeds with work knowing it to be contrary to any ordinances, laws, rules, and regulations he shall thereby have assumed full responsibility for and shall bear all costs required to correct non-complying work.

1.18. PERMITS/FEES

A. Electrical Contractor shall secure and pay for necessary permits and certificates of inspection required by governmental ordinances, laws, rules or regulations. Keep a written record of all permits and inspection certificates and submit two copies to Architect/Engineer with request for final review.
B. Contractor shall include in bid any charges by local utility providers to establish new services to the structure. Coordinate with the utility suppliers to verify exact which part of the work is to be performed by whom.

PART 2 - PRODUCTS

A. Not Used

PART 3 – EXECUTION

3.1. COORDINATION

A. Certain materials will be provided by other trades. Examine the Contract Documents to ascertain these requirements.
B. Carefully check space requirements with other trades and the physical confines of the area to insure that all material can be installed in the spaces allotted thereto including finished suspended ceilings and the spaces within the existing building. Make modifications thereto as required and approved.
C. Transmit to other trades all information required for work to be provided under their respective Sections in ample time for installation.
D. Wherever work interconnects with work of other trades, coordinate with other trades to insure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items of work that require access so that the ceiling trade will know where to install access doors and panels.

E. Coordinate, project and schedule work with other trades in accordance with the construction sequence.
F. The Drawings show only the general run of raceways and approximate location of outlets. Any significant changes in location of outlets, cabinets, etc., necessary in order to meet field conditions shall be brought to the immediate attention of the Architect/Engineer and receive his approval before such alterations are made. All such modifications shall be made without additional cost to the Owner.
G. Obtain from the Architect/Engineer in the field the location of such outlets or equipment not definitely located on the Drawings.
H. Circuit "tags" in the form of arrows are used where shown to indicate the home runs of raceways to electrical distribution points. These tags show the circuits in each home run and the panel designation. Show the actual circuits numbers on the finished record drawings and on panel directory card. Where circuiting is not indicated, Electrical Subcontractor must provide required circuiting in accordance with the loading indicated on the drawings and/or as directed.
I. Adjust location of conduits, panels, equipment, pull boxes, fixtures, etc. to accommodate the work to prevent interferences, both anticipated and encountered. Determine the exact route and location of each raceway prior to fabrication.

1. Right-of-Way:

a. Lines that pitch have the right-of-way over those that do not pitch. For example: steam, condensate, and plumbing drains normally have right-of way. Lines whose elevations cannot be changed to have right-of-way over lines whose elevations can be changed.
b. Make offsets, transitions and changes in direction in raceways as required to maintain proper headroom in pitch of sloping lines whether or not indicated on the Drawings.

J. Wherever the work is of sufficient complexity, prepare additional Detail Drawings to scale similar to that of the bidding Drawings, prepared on tracing medium of the same size as Contract Drawings. With these layouts, coordinate the work with the work of other trades. Such detailed work to be clearly identified on the Drawings as to the area to which it applies. Submit for review Drawings clearly showing the work and its relation to the work of other trades before commencing shop fabrication or erection in the field.
K. Coordinate with the local Electric Utility Company and the local Telephone Company as to their requirements for service connections and provide all necessary materials, labor and testing.
L. Coordinate with contractors for work under other Divisions of this specification for all work necessary to accomplish this contractor's work.

3.2. SUBMITTALS

A. Contractor shall furnish submittals of all materials and equipment required by the specifications. Refer to each specification section for the submittals (if any) required for that section.
B. Submittal format shall be as indicated below. Submittals not meeting these requirements will be returned without action for re-submittal.

1. Submittals shall be furnished in an Adobe PDF format.
2. Submittals shall be per individual submittal section, as listed in the table of contents. All required submittals within that section shall be grouped together in a single submittal.

a. Furnishing submittals by division or by individual item may result in delayed reviewing of the submittal(s) due to additional administrative time required to process the large size and/or quantity of files.

3. Submittals shall have a cover page containing the following information: The project name, the applicable specification section and paragraph, the submittal date, and the Contractor's stamp (see below for requirements).
4. Mark each submitted item as applicable with scheduled mark, name, etc. corresponding to the plans.
5. Where generic catalog cuts are submitted for review, conspicuously mark or provide schedule of equipment, capacities, controls, fitting sizes, etc. that are to be provided. Each catalog sheet shall bear the equipment manufacturer’s name and address.
6. Where equipment submitted does not appear in base specifications or specified equivalent, mark submittals with applicable alternate numbers, change order number or letters of authorization.
7. All submittals on materials and equipment listed by UL shall indicate UL approval on submittal.

C. Contractor review:

1. Contractor shall check all submittals to verify that they meet specifications and/or drawings requirements before forwarding submittals to the Architect-Engineer for their review. All submittals submitted to Architect-Engineer shall bear contractor’s approval stamp that shall indicate that Contractor has reviewed submittals and that they meet specification and/or drawing requirements. Contractor’s submittal review shall specifically check for but not be limited to the following: equipment capacities, physical size in relation to space allowed; electrical characteristics, provisions for supply,

return and drainage connections to building systems. All submittals not meeting Contractor's approval shall be returned to their supplier for re-submittal.

2. No submittals will be considered for review by the Architect-Engineer without Contractor's approval stamp, or that have extensive changes made on the original submittal as a result of the Contractor's review.
3. Before submitting shop drawings and material lists, verify that all equipment submitted is mutually compatible and suitable for the intended use. Verify that all equipment will fit the available space and allow ample room for maintenance. If the size of equipment furnished makes necessary any change in location, or configuration, submit a shop drawing showing the proposed layout.

D. Review Schedule:

1. The shop drawing / submittal dates shall be at least as early as required to support the project schedule and shall also allow for two weeks Architect-Engineer review time plus a duplication of this time for re-submittal if required.
2. Submittal of all shop drawings as soon as possible after permitting approval but before construction starts is preferred.
3. Approval of shop drawings submitted prior to receipt of a permit for that respective scope of work should be considered conditional pending review/approval of the construction documents by the AHJ. Changes required to the submittal as a result of permitting comments received after architect's/engineer's review shall not be a justification for a change in price.
4. Any time delay caused by correcting and re-submitting submittals/shop drawings will be the Contractor's responsibility.

E. The Architect's-Engineer's checking and subsequent review of such drawings, schedules, literature, or illustrations shall not relieve the Contractor from responsibility for deviations from Drawings or Specifications unless he has, in writing, called the Architect's-Engineer's attention to such deviations at the time of submission, and secured their written approval; nor shall it relieve the contractor from responsibility for errors in dimensions, details, size of members, or omissions of components for fittings; or for coordinating items with actual building conditions and adjacent work.
F. Any corrections or modifications made by the Architect-Engineer shall be deemed acceptable to the Contractor at no change in price unless written notice is received by the Architect-Engineer prior to the performance of any work incorporating such corrections or modifications.
G. Submittals that require re-submission shall have the items that were revised "flagged" or in some other manner marked to call attention to what has been changed.
H. Coordination

1. After shop drawings have been reviewed and approved by all parties, transmit a set of submittals to each other trade (eg Plumbing, Mechanical, Electrical, Controls, etc) that will interface with installation. Each other contractor shall review the submittal for coordination and return a stamped submittal indicating they have reviewed the submittal for coordination purposes.

3.3. SHOP DRAWINGS

A. Shop drawings shall meet all of the above requirements for submittals.
B. Contractor shall submit Adobe PDF sets of all fabrication drawings. Cost of drawing preparation, printing and distribution shall be paid for by the contractor and included in his base bid.
C. No work shall be fabricated until Architect-Engineer's review has been obtained.
D. Electrical equipment location and conduit coordination shop drawings for conduit fabrication and electrical equipment clearances shall be a minimum of 1/4" scale. Shop drawings shall not be a reproduction of the contract document and shall show details of the following: Fabrication, assembly, and installation, including plans, elevations above finished floor, sections, components, and attachments to other work.

3.4. OPERATING AND MAINTENANCE INSTRUCTIONS (O & M MANUALS)

A. Submit with shop drawings of equipment, three sets of operating and maintenance instructions and parts lists for all items of equipment provided. Instructions shall be prepared by equipment manufacturer.
B. Keep in safe place, keys and wrenches furnished with equipment under this contract. Present to Owner and obtain receipt for same upon completion of project.
C. Prepare a complete brochure, covering systems and equipment provided and installed under his contract. Submit brochures to Architect/Engineer for review before delivery to Owner. Contractor at his option may prepare this brochure or retain an individual to prepare it for him. Include cost of this service in bid. Brochures shall contain following:

1. Certified equipment drawings/or catalog data with equipment provided clearly marked as outlined under Section this specification.
2. Complete installation, operating, maintenance instructions and parts lists for each item of equipment.
3. Record copy of all submittals indicating actual equipment installed indicating options, characteristics.

Copies of submittals shall bear the stamps of all parties that reviewed submittals.

4. Special emergency operating instructions with a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to various parts of system.
5. Record Set Drawings: The Contractor shall mark up a set of contract documents during construction noting all changes and deviations including change orders. These will be delivered to Architect at end of the project. After the originals are changed to reflect the blue line set, a copy shall be included in the brochure.
6. Provide brochure bound in black vinyl three-ring binders with metal hinge. Reinforce binding edge of each sheet of loose-leaf type brochure to prevent tearing from continued usage. Clearly print on label insert of each brochure:

    a. Project name and address.
    b. Section of work covered by brochure, i.e., Electrical.

3.5. RECORD DOCUMENTS

A. During construction, keep an accurate record of all deviations between the work as shown on Drawings and that which is actually installed. Keep this record set of prints at the job site for review by the Architect/Engineer.
B. Upon completion of the installation and acceptance by the owner, transfer all record drawing information to one neat and legible set of prints. Then deliver them to the Architect/Engineer for transmittal to the Owner.

3.6. PREMIUM TIME WORK

A. The following Work shall be performed at night or weekend other than holiday weekends as directed and coordinated with the Owner.

    1. All tie-in, cut-over and modifications to the existing electrical system and other existing system requiring tie-ins or modifications shall be arranged and scheduled with the Owner to be done at a time as to maintain continuity of the service and not interfere with normal building operations.

3.7. CLEANING UP

A. Contractor shall take care to avoid accumulation of debris, boxes, crates, etc., resulting from the installation of his work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean.
B. Contractor shall clean up all fixtures and equipment at the completion of the project.
C. All switchboards, panelboards, wireways, trench ducts, cabinets and enclosures shall be thoroughly vacuumed clean prior to energizing equipment and at the completion of the project. Equipment shall be opened for observation by the Architect/Engineer as required.

3.8. WATERPROOFING

A. Avoid, if possible, the penetration of any waterproof membranes such as roofs, machine room floors, basement walls, and the like. If such penetration is necessary, perform it prior to the waterproofing and furnish all sleeves or pitch-pockets required. Advise the Architect/Engineer and obtain written permission before penetrating any waterproof membrane, even where such penetration is shown on the Drawings.
B. If Contractor penetrates any walls or surfaces after they have been waterproofed, he shall restore the waterproof integrity of that surface as directed by the Architect/Engineer at his own expense

3.9. CUTTING AND PATCHING

A. Contractor shall do cutting and patching of building materials required for installation of work herein specified. Remove walls, ceilings and floors (or portions thereof) necessary to accomplish scope of work. Do not cut or drill through structural members including wall, floors, roofs, and supporting structure, without the Architect's and Structural Engineer's approval and in a manner approved by them.
B. Make openings in concrete with concrete hole saw or concrete drill. Use of star drill or air hammer for this work will not be permitted.
C. Patching shall be by the contractors of the particular trade involved, shall match the existing construction type, quality, finish and texture, and shall meet approval of Architect-Engineer. Damage to building finishes, caused by installation of electrical work shall be repaired at Contractor's expense to approval of Architect-Engineer.

3.10. SETTING, ADJUSTMENT AND EQUIPMENT SUPPORTS

A. Work shall include mounting, alignment and adjustment of systems and equipment. Set equipment level on adequate foundations and provide proper anchor bolts and isolation as shown or specified. Level, shim, and grout equipment bases as recommended by manufacturer. Mount motors, align and adjust drive shafts and belts according to manufacturer's instruction. Equipment failures resulting from improper installation or field alignment shall be repaired or replaced by Contractor at no cost to Owner.
B. Floor or pad mounted equipment shall not be held in place solely by its own dead weight. Include anchor

fastening in all cases.

C. Provide electrical floor mounted equipment with 3-1/2" high concrete bases unless shown or specified otherwise. Electrical contractor shall size all pads. General contractor shall form all pads, provide and place all concrete for said pads. Individual concrete pad shall be no less than 4" wider and 4" longer than equipment, and shall extend no less than 2" from each side of equipment.

D. Provide each piece of equipment or apparatus suspended from ceiling or mounted above floor level with suitable structural support, platform or carrier in accordance with best recognized practice. Electrical contractor shall arrange for attachment to building structure, unless otherwise indicated on drawings or as specified. Provide hangers with vibration eliminators where required. Contractor shall verify that structural members of building are adequate to support equipment. Submit details of hangers, platforms and supports together with total weights of mounted equipment to Architect/Engineer for review before proceeding with fabrication or installation.

E. Provide 3-1/2" high concrete housekeeping pad as specified above where two or more conduits penetrate floor below panelboards.

3.11. START-UP, CHANGEOVER, TRAINING AND OPERATION CHECK

A. Electrical Contractor shall be responsible for training Owner's operating personnel to operate and maintain systems and equipment installed. Keep a record of training provided to Owner's personnel listing the date, subject covered, instructor's name, names of Owner's personnel attending and total hours of instruction given each individual.

B. All owner-training sessions shall be orderly and well organized and shall be video recorded digitally. At the end of the owner training, the "training" session recording shall be transmitted to the owner via DVD and shall become property of the owner.

3.12. FINAL CONSTRUCTION REVIEW

A. At final construction review, Electrical Contractor and the major sub-contractors shall be present or shall be represented by a person of authority. Each Contractor shall demonstrate, as directed by Architect/Engineer, that the work complies with purpose and intent of plans and specifications. Respective Contractor shall provide labor, services, instruments or tools necessary for such demonstrations and tests.

END OF SECTION 260010

SECTION 260011 – BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 260010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1. NEUTRAL AND GROUND WIRES

A. Where individual circuit homeruns (hots, neutral, and ground as part of a single circuit) are indicated on the plans serving lighting and branch circuit receptacle loads, these shall be individual circuits with individual neutrals (no sharing of neutrals and/or grounds).
B. Where shared circuit homeruns (hots, neutral, and ground as part of separate circuits) are indicated on the plans, these shall be allowed to share one (common) ground for three (3) circuits from different phases occurring in one (1) conduit run. When additional circuits occur in conduit run, additional ground wires shall be installed. Conduit shall be upsized and conductors shall be de-rated based on NEC current carrying conductor tables, counting all hots and neutrals as current carrying conductors.

    1. No sharing of neutral conductors is allowed in multi-wire branch circuit homeruns, unless the installation meets the requirements of 2014 NEC 210.4(B), and is specifically approved by the engineer of record.

3.2. TESTS RECORDING, REPORTING TESTS AND DATA

A. Record nameplate horsepower, amperes, volts, phase service factor and other necessary data on motors and other electrical equipment furnished and/or connected under this contract.
B. Record motor starter catalog number, size and rating and/or catalog number of thermal-overload units installed in all motor starters furnished and/or connected under this contract. See motor starter specification for instructions for proper sizing of thermal-overload units.
C. Record amperes-per-phase at normal or near-normal loading of each item of equipment furnished and/or connected.
D. Record correct readings of each feeder conductor after energized and normally loaded, and again after balancing of feeder loads as required by current readings.
E. Record voltage and ampere-per-phase readings taken at service entrance equipment after completion of project with building operating at normal electrical load.
F. Short-Circuit Calculations

    1. Contractor shall contact utility company after utility company design is complete and determine exact available fault current in amperes at the point of utility connection (Service Point).
    2. Contractor shall utilize the above available fault current to calculate the available fault current in amperes (RMS-SYM) at the service equipment.
    3. The available fault current shall be labeled on the service equipment – refer to Section 260553.

G. Submit at least two (2) typewritten copies of data noted above to Architect-Engineer for review prior to final inspection.
H. Keep a record of all deviations made from routes, locations, circuiting, etc. shown on contract drawings. Prior to final inspection submit one new set of project drawings with all deviations and changes clearly indicated.

3.3. CLEANING AND PAINTING OF MATERIALS AND EQUIPMENT

A. Before energizing switchboards, transformers, panelboards, starters, variable frequency drive and other similar electrical equipment, Contractor shall thoroughly vacuum out all dirt, dust and debris from inside of equipment and shall thoroughly clean outside and inside of equipment.
B. Touch-up painting and refinishing of factory applied finishes shall be by Electrical Contractor. Contractor shall be responsible for obtaining proper type of painting materials and color from equipment manufacturer.
C. Unless specified otherwise factory built equipment shall be factory painted. Paint shall be applied over surfaces only after they have been properly cleaned and coated with a corrosion resistant primer.
D. After installation, damage to painted surfaces shall be properly prepared and primed with primers equal to factory materials. Finish coating shall be same color and type as factory finish.
E. Where extensive refinishing is required equipment shall be completely repainted.

3.4. EXCAVATION AND BACKFILL

A. Perform necessary excavation to receive work. Provide necessary sheathing, shoring, cribbing, tarpaulins, etc. for this operation, and remove at completion of work. Perform excavation in accordance with appropriate section of these specifications, and in compliance with OSHA Safety Standards.
B. Excavate trenches of sufficient width to allow ample working space, and no deeper than necessary for installation work.
C. Conduct excavations so no walls or footings are disturbed or injured.
D. Backfill excavations made under or adjacent to footing with selected earth or sand and tamp to compaction required by A/E.
E. Mechanically tamp backfill under concrete and pavings in 6” layers to 95% standard density, Reference Division 2.
F. Backfill trenches and excavations to required heights with allowance made for settlement.
G. Tamp fill material thoroughly and moistened as required for specified compaction density.
H. Dispose of excess earth, rubble and debris as directed by Architect.
I. When available, refer to test hole information on architectural drawings or specifications for types of soil to be encountered in excavations.

3.5. FIRE BARRIERS

A. Provide sleeves through all fire-rated walls and fill voids surrounding sleeves and interior to sleeves around piping with Nelson “Flameseal” fire stop putty with U.L. listed 3 hour rating installed as per manufacturers recommendations.
B. Equivalent by Dow, Chemelex, 3M.
C. All holes or voids created by the electrical contractor to extend conduit or wiring through fire rated floors and walls shall be sealed with an intumescent material capable of expanding up to 8 to 10 times when exposed to temperatures of 250 degrees F. It shall have ICBO, BOCAI and SBCCI (NRB 243) approved ratings to 3 hours per ASTM E-814 (UL 1479). Acceptable Material: 3M Fire Barrier Caulk, Putty, Strip and sheet forms.

3.6. TEMPORARY COVERINGS

A. Provide temporary covering over all electrical panels, distribution panelboards, outlet boxes and other equipment as required to keep same free from damage due to moisture, plaster, paint, concrete or other foreign materials. Any equipment with finish damaged by moisture, paint, plaster or other foreign materials shall be cleaned and refinished as directed by the Architect without additional cost to the Owner.
B. All temporary openings in conduits shall be covered with metal or plastic caps.

3.7. PROTECTIVE COVERS

A. Provide protective wire guards over all wall mounted and ceiling mounted devices subject to damage in areas such as gymnasiums, shops and similar occupancies.
B. Provide lockable covers over thermostats and similar wall mounted devices where items are located in public spaces but should not be operable by the general public.

3.8. SLEEVES

A. Provide proper type and size sleeves to General Contractor for electrical ducts, busses, conduits, etc. passing through building construction. Supervise installation to insure proper sleeve location. Unless indicated or approved install no sleeves in structural members.
B. Provide cast iron sleeves extending 1 inch above finished floor where sleeves pass through floors subject to flooding such as toilet rooms, bathrooms, equipment rooms and kitchen. Seal opening between pipe and sleeve with Thunderline Corp. Link Seal.
C. Unless specified otherwise provide 18 gauge galvanized sheet metal sleeves through floors and non-bearing walls. Where piping passes through exterior walls, equipment room walls, air plenum walls and walls between areas that must be isolated from occupied areas, seal space between sleeves and piping, air or water tight are required with Thunderline Corp. Link Seal.
D. Provide O-Z Electrical Manufacturing Co., Inc. Type “FSK” or “WSK” or equivalent thruwall and floor seals where conduits pass through concrete foundation walls below grade.
E. Provide Zurn Z-195 or equivalent flashing sleeve through walls and floors with waterproof membrane. Seal annular space between conduit and sleeve with Thunderline Link Seal or O-Z type CSM sealing bushing.

END OF SECTION 260011

SECTION 260519 – WIRE AND CABLE

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2. SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.3. SUBMITTALS

A. Product Data: For each type of product indicated.
B. Qualification Data: For testing agency.
C. Field quality-control test reports.

1.4. QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
B. Comply with NFPA 70.

1.5. COORDINATION

A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1. CONDUCTORS AND CABLES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Southwire Company.
2. General Cable Corporation.
3. Encore Wire Corporation.
4. AFC Cable Systems, Inc. (Multiconductor cable only)

B. Copper Conductors: Comply with NEMA WC 70.
C. Aluminum Conductors: Comply with NEMA WC 70.

a. Same shall be compacted aluminum (Stabiloy)

D. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN-2.

1. Provide consistent color coding of all circuits as follows:

	Distribution System
Phase	**120/208**
A	Black
B	Red
C	Blue
N	White
Ground	Green

Notes:

1) Stripe shall be white or yellow in color.

E. Multiconductor Cable: Comply with NEMA WC 70 for metal-clad cable, Type MC with ground wire.

2.2. CONNECTORS AND SPLICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cable manufacturers listed above under 2.1, Item A.
2. Hubbell Power Systems, Inc.

3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1. CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

1. Aluminum conductors acceptable only when specifically shown/scheduled on drawings.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

1. Aluminum conductors are not permitted for branch circuit wiring.

3.2. CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Provide insulation / cable types for conductors as follows:

Application	Insulation / Cable Type		
	THHN/THWN-2 [1]	XHHW-2 [1]	MC Cable [3]
Service Entrance	X [2]	X	
Feeders:			
Exposed, Exterior	X [2]	X	
Exposed, Interior	X		
Concealed in Ceilings, Walls, Partitions, and Crawlspaces	X		
Concealed in Concrete, below Slabs-on-Grade, and Underground	X [2]	X	
Branch Circuits:			
Exposed, Exterior	X [2]	X	
Exposed, Interior - Including Crawlspaces	X		
Concealed in Ceilings, Walls, and Partitions	X		X
Concealed in Concrete, below Slabs-on-Grade, and Underground	X [2]	X	

Notes:

1) Single conductors in raceway. Refer to Section 260533 - Raceway & Boxes for acceptable raceway types/applications.
2) THHN/THWN-2 is acceptable for these installations at contractor's discretion.
3) Metal Clad (MC) cable installations shall be in accordance with the following:
   (i) MC cable shall not be used for homeruns.
   (ii) MC cable may be used for light fixture and equipment whips in lengths no longer than 6'-0". The use of MC cable from lighting fixture to lighting fixture shall not be allowed.
   (iii) MC cable shall not be installed in exposed locations for lighting purposes. MC cable may be exposed in mechanical spaces for equipment whips.

1. Branch Circuits Concealed in Dwelling units: Nonmetallic-sheathed cable, Type NM.

B. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
C. Class 1 Control Circuits: Type THHN-THWN-2, in raceway.
D. Class 2 Control Circuits: Type THHN-THWN-2, in raceway or Power-limited cable, concealed in building finishes.

3.3. INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
E. Support cables per National Electrical Code requirements.
F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.4. CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. For Aluminum Conductors:

a. Use oxide inhibitor in each splice and tap conductor, and at all terminations.
b. Provide compression-type one-hole or two-hole lug terminations.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5. FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.
B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
2. Test Reports: Prepare a written report to record the following:

a. Test procedures used.
b. Test results that comply with requirements.
c. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

C. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

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SECTION 260526 – GROUNDING

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 260010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. DESCRIPTION OF WORK

A. Provide grounding electrodes, conductors, connections and equipment to provide a solidly grounded electrical system.

1.3. STANDARDS

A. Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the following:

1. Underwriters Laboratory Standard No. U.L. 467.
2. ANSI C-1 1978.
3. IEEE Standards No. 142-1982, 1100-1992 and No. 80.
4. National Electrical Safety Code.
5. NFPA.

1.4. SUBMITTALS

A. Submit test reports certifying resistance values for buried or driven grounds and water pipe grounds.

PART 2 - PRODUCTS

2.1. MATERIALS

A. Ground Cables: green color coded, insulated, annealed stranded tinned copper wire as indicated on Drawings; insulated wire to conform with requirements of Section 16120.
B. Ground Rods:

1. Copper-clad steel fabricated by molten welding process.
2. Diameter: 5/8 Inch. Use 3/4" for rocky soil.
3. Length: 8 feet.

2.2. CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.

1. Pipe Connectors: Clamp type, sized for pipe.

C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
D. Ground Lugs and Connectors for Cable Tray: Tin-plated aluminum alloy suitable for use with aluminum or copper conductors.

2.3. GENERAL

A. Grounding systems shall be installed in accordance with the requirements of the local authorities, and subject to the approval of the Architect/Engineer.
B. All ground wires and bonding jumpers shall be stranded copper installed in conduit. All ground wires shall be without joints and splices over its entire length.
C. The system neutral shall be grounded at the service entrance only, and kept isolated for grounding systems throughout the building.
D. Each system of continuous metallic piping and ductwork shall be grounded in accordance with the requirements of the National Electrical Code.
E. Mechanical equipment shall be bonded to the building equipment grounding system. This shall include but is not limited to, fans, pumps, chillers, etc.
F. PVC conduits and portions of metallic piping and duct systems which are isolated by flexible connections, insulated couplings, etc., shall be bonded to the equipment ground with a flexible bonding jumper, or separate grounding conductor.

G. Metal raceways, cable trays, cable armor, cable sheath, enclosures, frames, fittings and other metal noncurrent-carrying parts that are to serve as grounding conductors shall be effectively bonded where necessary to assure electrical continuity and the capacity to conduct safely any fault current likely to be imposed on them. Any nonconductive paint, enamel, or similar coating shall be removed at threads, contact points, and contact surfaces or be connected by means of fittings so designed as to make such removal unnecessary.

2.4. RECEPTACLES

A. Receptacles shall be grounded to the outlet box by means of a bonding jumper between the outlet box and the receptacle grounding terminal.

2.5. CONCENTRIC KNOCKOUTS

A. Provide grounding type bushings for conduits terminated through multiple concentric knockouts not fully knocked out, on inside of electrical enclosures. Install bonding jumper between ground bushing and enclosure

2.6. TOGGLE SWITCHES

A. Provide grounding clip on each toggle switch. Mount over device mounting strap such that contact is made between mounting strap, screw, faceplate and outlet box.
B. Provide devices with ground screw and bond to switch box.

2.7. GROUNDING METHODS

A. The metal frame of the building, where effectively grounded.
B. A metal underground water piping system used for grounding shall be in direct contact with the earth for ten feet or more and shall be electrically continuous. Provide bonding jumpers at water meter and at insulated joints.
C. Steel reinforcing bars used for grounding shall be encased by at least two inches of concrete, located within and near the bottom of a concrete foundation or footing that is in direct contact with the earth. Reinforcing bars shall be minimum 1/2 inch diameter and consisting of twenty feet of one or more steel reinforcing bars.
D. All bonding jumpers for the above grounding systems shall be sized in accordance with National Electrical Code.

PART 3 - EXECUTION

3.1. APPLICATIONS

A. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Bolted or Welded connectors.
3. Connections to Structural Steel: Bolted or Welded connectors.

3.2. INSTALLATION

A. Cold Water Pipe Grounding:

1. Make connection with clamp type fitting; do not damage water pipe.
2. Bond ground conductor and its conduit to water pipe.
3. Install No. 4/0 AWG bonding jumper with ground clamps around water meter.

B. Ground Conductors:

1. Size as shown on Drawings or as required by National Electrical Code. Grounding conductors shall be as shown on plans or if not specifically shown shall be no smaller than that required by the NEC.
2. Where ground cables are required, install insulated copper ground conductors in steel conduit, or as indicated.
3. Where ground cable is installed in metallic conduit, bond cable to conduit at both ends.
4. Connect ground conductors in cables and in conduit to appropriate ground buses (as in switchgear, motor control centers, and distribution panelboards) or directly to metallic enclosure if no ground bus is provided.

C. Service Ground

1. Connect system neutral ground and equipment ground system to common ground bus.
2. Ground secondary services at supply side of each individual secondary disconnecting means and at related transformers in accordance with National Electric Code.
3. Provide each service disconnect enclosure with neutral disconnecting means which interconnects with insulated neutral and uninsulated equipment ground sub to establish system common ground point.
4. Neutral disconnecting links shall be located so that low voltage neutral bar with interior secondary

neutrals can be isolated from common ground bus and service entrance conductors.

D. Conduit Attachment to Electrical Equipment:

1. Ground conduits to metal framework of electrical equipment with double locknuts or grounding bushings and bonding jumpers unless otherwise noted.
2. Install bonding jumpers at all electrical equipment to provide continuous ground return path through conduit.
3. Install bonding jumpers across expansion fittings between conduit sections for ground path continuity.
4. Bond conduits to cable tray where conduit enters or exits tray.
5. Equipment grounding conductors for branch circuit home runs shown on the drawings shall indicate an individual and separate ground conductor for that branch circuit which shall be terminated at the branch circuit panelboard, switchboard, or other distribution equipment. No sharing of equipment grounding conductors sized according to the size of the overcurrent device and NEC Table 250-122 shall be allowed.
6. Required equipment grounding conductors and straps shall be sized in compliance with N.E.C. Table 250-122.
7. Equipment grounding conductors shall be provided with green type TW 600 volt insulation. Related feeder and branch circuit grounding conductors shall be connected to ground bus with approved pressure connectors.
8. Provide feeder servicing several panelboards with a continuous grounding conductor connected to each related panelboard ground bus. Installation shall include necessary precautions regarding terminations with dissimilar metals.

E. Circuiting

1. Provide low voltage distribution system with a separate green insulated equipment grounding conductor for each single or three-phase feeder.
2. Single phase 120 volt branch circuits for lighting and power shall consist of phase and neutral conductors and a green ground conductor installed in common metallic conduit which shall serve as grounding conductor.
3. Provide flexible metallic conduit utilized in conjunction with above single phase branch circuits with suitable green insulated grounding conductors connected to approved grounding terminals at each end of flexible conduit.
4. Single phase branch circuit installed in nonmetallic conduits shall be provided with separate grounding conductor.
5. Install grounding conductor in common conduit with related phase and/or neutral conductors.
6. Where parallel feeders are installed in more than one raceway, each raceway shall have a green insulated equipment grounding conductor.

F. Receptacles and Switches:

1. Install bonding jumpers between outlet box and receptacle grounding terminal except where contact device or yoke is provided for grounding purposes.

G. Wireways:

1. Install grounding jumpers for bonding between wireway and other panelboards, conduit, switchgear, motor control centers, and at any other point where solid connection would otherwise not provided in supporting system to insure continuous ground.

H. Pull Boxes, Junction Boxes and Enclosures:

1. Connect all equipment grounding conductors together and connect to the box.

3.3. FIELD QUALITY CONTROL

A. Resistance Values for System and Equipment Grounds: for each ground rod and ground grid.

1. Acceptable Testing Equipment: Vibroground by Associated Research, Inc.; or Megger Earth Tester by James G. Biddle Co.
2. Method: Three (3) electrode fall of potential as prescribed by instrument manufacturer.
3. Drive additional ground rods spaced eight feet apart, if necessary, until total resistance of system is measured at five ohms or less.

END OF SECTION 260526

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SECTION 260529 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2. SUMMARY

A. This Section includes the following:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

B. Related Sections include the following:

1. Division 26 Section "Vibration And Seismic Controls For Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3. DEFINITIONS

A. EMT: Electrical metallic tubing.
B. IMC: Intermediate metal conduit.
C. RMC: Rigid metal conduit.

1.4. PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5. QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
B. Comply with NFPA 70.

1.6. COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 PRODUCTS

2.1. SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. ERICO International Corporation.
d. GS Metals Corp.
e. Thomas & Betts Corporation.
f. Unistrut; Tyco International, Ltd.
g. Wesanco, Inc.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and

sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

i. Hilti Inc.
ii. ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
iii. MKT Fastening, LLC.
iv. Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, [zinc-coated] steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

i. Cooper B-Line, Inc.; a division of Cooper Industries.
ii. Empire Tool and Manufacturing Co., Inc.
iii. Hilti Inc.
iv. ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
v. MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2. FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 EXECUTION

3.1. APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
B. Support raceways at intervals no greater than ten (10) feet and with one support within three (3) feet of each coupling, box, fitting, or outlet box. Provide one support within three (3) feet of each elbow or bend.
C. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
D. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 20 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports.

E. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.
F. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
G. Use one or two-hole saddle-type clamps where single conduits are exposed below 6’-0” AFF.

3.2. SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel:

    a. Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts
    b. Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69
    c. Spring-tension clamps].

7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3. INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.
B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4. CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03."
C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

END OF SECTION 260529

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SECTION 260533 – RACEWAYS AND BOXES

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 260010.
B. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. DESCRIPTION OF WORK

A. Provide complete raceways systems, boxes and fittings for all required electrical systems.

1.3. STANDARDS

A. Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the following:

1. Rigid Steel Conduit
   a. U.L. Standard UL-6
   b. A.N.S.I. C80-1
   c. Federal Specification WW-C-581E
2. Intermediate Metallic Conduit
   a. U.L. Standard UL-1242
   b. Federal Specification WW-C-581E
3. Electrical Metallic Tubing
   a. U.L. Standard UL-797
   b. A.N.S.I. C80-3
   c. Federal Specification WW-C-563
4. Flexible Steel Conduit
   a. U.L. Standard UL-1
5. Liquid Tight Flexible Conduit
   a. U.L. Standard UL-360
6. Non-Metallic Conduit
   a. U.L. Standard UL-651
   b. A.N.S.I. Standard F512
   c. N.E.M.A. Standard TC-2
   d. Federal Specifications GSA-FSS and W-C-1094-A
7. Wireways and Auxiliary Gutters
   a. U.L. Standard UL-870
8. Rigid Aluminum Conduit
   a. A.N.S.I. C80.5

1.4. SUBMITTALS

A. Provide manufacturer's catalog cuts of fittings.
B. Where wireways and/or auxiliary gutters are employed full erection drawings must be submitted. Drawings to include plan views, elevations, size of wireways, type and quantity of conductors proposed to be installed therein, etc.
C. Indicate duct banks or multi-trade coordinated shop drawings.
D. Submit shop drawings or catalog descriptive data on boxes exceeding twenty-four (24")inches for any one dimension.
E. Submit shop drawings or catalog descriptive for floor boxes and accessories.

PART 2 - PRODUCTS

2.1. RACEWAY TYPES

A. Standard Threaded Rigid Steel Conduit.

1. Rigid conduit heavy wall galvanized.
2. Threaded type fittings: "Erickson" couplings where threaded cannot be used.

B. Intermediate Metallic Conduit

1. Light weight rigid steel conduit.
2. Threaded type fittings: "Erickson" couplings where threaded cannot be used.

C. Electrical Metallic Tubing

1. Continuous, seamless tubing, galvanized or sheradized on the exterior, coated on the interior with a smooth hard finish of lacquer, varnish, or enamel.
2. Couplings and connectors:
    a. Indoor and two (2") inches in size and smaller, shall be steel set-screw type fittings.
    b. 2-1/2 inch size and larger must employ steel compression gland fittings.
    c. Outdoor shall be raintight steel compression gland fittings.
3. Indent type fittings shall not be used.
4. All connectors shall have insulated throat.
5. Where installed in slab or concrete work, provide approved concrete tight fittings.

D. Flexible Steel Conduit

1. Single strip, continuous, flexible interlocked, double-wrapped steel, galvanized inside and outside, forming smooth internal wiring channel.
2. Maximum length: (six 6) feet.
3. Each section of raceway must contain an equipment grounding wire bonded at each end and sized as required. Provide connectors with insulating bushings.
4. Steel squeeze-type or steel set screw type fittings.

E. Liquid Tight Flexible Electrical Conduit

1. Same as flexible steel conduit except with tough, insert water-tight plastic outer jacket.
2. Cast malleable iron body and gland nut, cadmium plated with one-piece brass grounding bushings which thread to interior of conduit. Spiral molded vinyl sealing ring between gland nut and bushing and nylon insulated throat.

F. Non-Metallic Raceway

1. Composed of polyvinyl chloride suitable for 90 degrees C. Provide rigid polyvinyl chloride (PVC) type EPC 40 heavy wall plastic conduit meeting current NEMA Standard TC-2. Conduit shall be listed UL 651 for underground and exposed use.
2. Raceway, fittings, and cement must be produced by the same manufacturer who must have had a minimum of ten (10) years experience in manufacturing the products.
3. Materials must have a tensile strength of 7,000-7,200 psi at 73.4 degrees F., flexural strength of 12,000 psi and compressive strength of 9,000 psi.
4. All joints shall be solvent cemented in accordance with the recommendations of the manufacturer.

G. Wireways and Auxiliary Gutters

1. Painted steel or galvanized steel.
2. Of sizes and shapes indicated on the Drawings and as required.
3. Provide all necessary elbows, tees, connectors, adapters, etc.
4. Wire retainers not less than twelve (12") inches on center.

H. Duct Banks

1. Provide duct banks and concrete encasements for both interior and exterior work as indicated on the Drawings and for all circuits in excess of 600 volts and as otherwise indicated.
2. Concrete shall be minimum fc = 3,000 pounds per square inch.
3. Support raceways installed in duct banks every five (5) feet to assure correct alignment.
4. Terminate raceways with flared bells to enable ease of pulling cable and to eliminate stress on the cable. Free bells and raceway terminations of burrs and rough edges.
5. Provide concrete markers at grade where duct banks are stubbed out for future use.
6. Install utility duct banks not less than thirty (30") inches below grade top elevation.
7. Provide rigid steel elbows for vertical risers.
8. Provide vinyl tracer ribbon twelve (12") inches above each duct bank buried in backfill.

I. Aluminum Conduit

1. Do not use aluminum conduit unless specifically indicated on the drawings for special purposes.

2.2. LOCKNUTS AND BUSHINGS

A. Locknuts shall be steel. Die cast locknuts shall not be used.
B. All bushings shall be insulated. Use nylon insulated metallic bushings for sizes 1" and larger. Plastic bushings may be used in 1/2" and 3/4" sizes.

2.3. OUTLET BOXES

A. General

1. Recessed wall boxes shall be 2-1/2" deep.
2. Surface-mounted wall boxes shall be 1-1/2” or 2-1/2" deep as required.
3. Lighting Fixture Box

a. Four (4") inch octagon with 3/8" fixture stud.
b. For suspended ceiling work, four (4") inch octagon with removable backplate where required, and two (2) parallel bars for securing to the cross-furring channels and extend flexible conduit to each fixture.

4. Plug any open knockouts not utilized.

B. Cast Type Conduit Boxes, Outlet Bodies and Fittings

1. Use Ferrous Alloy boxes and conduit bodies with Rigid Steel or IMC.
2. Use Ferrous Alloy or cast aluminum boxes and conduit bodies with Electrical Metallic Tubing.
3. Covers: Cast or sheet metal unless otherwise required.
4. Tapered threads for hubs.

C. Masonry Outlet Boxes

1. Use for all devices recessed in concrete or masonry.
2. Galvanized steel construction.

D. Drawn Steel Boxes

1. Use for all interior exposed devices (where not required or indicated to be cast type).
2. Drawn construction, minimum 0.625” thick galvanized steel.
3. Raised ground connection.
4. Provide with raised, drawn galvanized steel covers.

E. Welded Steel Boxes

1. May be used for recessed devices only, or as a junction box where located above ceiling or on walls where same is located above 6’-0” A.F.F.
2. Minimum 1/16” thick steel construction.

F. Weatherproof Boxes

1. Use for all exterior exposed devices.
2. Cast aluminum construction.
3. Internal hub threads.
4. NEMA 3R listed.

G. Non-Metallic Boxes

1. May be used for wood-frame construction only.
2. Thermoplastic construction.
3. UL Listed to UL 514C
4. UL Classified for two hour or less fire wall assemblies
5. Meets NEMA OS-2

2.4. JUNCTION AND PULL BOXES

A. Outlet boxes as listed above may be used as junction boxes where provided as a 2-gang box minimum.
B. Steel Boxes

1. No. 12 USS gauge sheet steel for boxes with maximum side less than forty (40") inches, and maximum area not exceeding 1,000 square inches; riveted or welded 3/4 inch flanges at exterior corners.
2. No. 10 USS gauge sheet steel for boxes with maximum side forty (40") to sixty (60") inches, and maximum area 1,000 to 1,500 square inches; riveted or welded 3/4 inch flanges at exterior corners.
3. No. 10 USS gauge sheet steel riveted or welded to 1-1/2 by 1-1/2" by 1/4" welded angle iron

framework for boxes with a maximum side exceeding sixty (60") inches and more than 1,500 square inches in area.

4. Covers
    a. Same gauge steel as box.
    b. Subdivided single covers so no section of cover exceeds fifty (50) pounds.
    c. Machine bolts, machine screws threaded into tapped holes, or sheet metal screws as required; maximum spacing twelve (12") inches.
5. Finish: Galvanized steel or paint with rust inhibiting primer and ANSI No. 61 light gray finish coat.
6. Where size of box is not indicated, size to permit pulling, racking and splicing of cables.
7. For Boxes over 600 Volts
    a. Provide insulated cable supports and removable steel barriers to isolate each feeder. Stencil cable voltage class in red letters on the front cover of the box.
    b. Braze a ground connector suitable for copper cables to the inside of the box.

C. Exterior Pull / Junction boxes

1. NEMA 3R or 4X rated.
2. Stainless steel or reinforced non-metallic construction.

D. In-Grade Pull Boxes (Quazite or similar)

1. Polymer concrete box. Removable cover with stainless steel bolts.
2. Box shall be traffic-rated where located in pavement or other areas subject to vehicle traffic.

2.5. FLOOR BOXES

A. General

1. Class I, water-tight, normal depth cast iron construction Type I, fully adjustable, for use in concrete.
2. Single Gang Round type.
3. Multiple Gang or Combination.
    a. Rectangular type partitions for separating power from communication sections.

B. Floor Box Covers

1. Rugged construction, impervious to cleaning detergents.
2. Compatible with floor covering.
3. Brass or bronze for flush lid mounting with devices below floor level. Lid shall have hinged or guarded openings for wires to route through the closed lid.
4. Providing continuous ground path to box.
5. Provide carpet flange in carpeted areas.

2.6. FIRE-RATED POKE-THROUGHS

A. General

1. 4, 6 or 8” fire rated poke throughs, UL listed for installation in fire rated concrete construction. Hubbell System One - Recessed Activation.
2. Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service-outlet assembly.
3. Comply with UL 514 scrub water exclusion requirements. Class I, water-tight, normal depth cast iron construction Type I, fully adjustable, for use in concrete.
4. Partitions for separating power from communication sections.

B. Covers

1. Rugged construction, impervious to cleaning detergents.
2. Compatible with floor covering.
3. Brass or bronze for flush lid mounting with devices below floor level. Lid shall have hinged or guarded openings for wires to route through the closed lid.
4. Providing continuous ground path to box.
5. Provide carpet flange in carpeted areas.

PART 3 - EXECUTION

3.1. APPLICATION OF RACEWAYS

A. The following applications must be adhered to except as otherwise required by Code. Raceways not conforming to this listing must be removed by the Contractor and replaced with the specified material at the

Contractor's expense.

1. Rigid Steel - Application: Where exposed to mechanical injury, where specifically required, exterior exposed locations, and where required by codes and for all circuits in excess of 600 volts.
2. I.M.C. - Application: Same as standard threaded rigid steel conduit.
3. E.M.T. - Applications: Use in every instance except where another material is specified. EMT shall not be used underground or in slab on grade.
4. Flexible Steel - Applications: Use in dry areas for connections to lighting fixtures in hung ceilings, connections to equipment installed in removable panels of hung ceilings at bus duct takeoffs, at all transformer or equipment raceway connections where sound and vibration isolation is required.
5. Liquid-Tight Flexible Conduit - Applications: Use in areas subject to moisture where flexible steel is unacceptable at connections to all motors, and all raised floor areas.
6. Non-Metallic Conduit - Application: Schedule 40 - Where specifically indicated on the drawings and for raceways in slab or below grade. All bends shall be made with steel elbows and wrapped unless the bend is encased in concrete.
7. Wireways and Auxiliary Gutters - Application: Where indicated on the Drawings and as otherwise specifically approved.

3.2. RACEWAY SYSTEMS IN GENERAL

A. Provide raceways for all wiring systems, including security, data transmission, paging, low voltage et. al. Where non-metallic raceways are utilized, provide sizes as required with the grounding conductor considered as an insulated additional conductor. Wiring of each type and system must be kept independent and installed in separate raceways – including, but not limited to:

   1. Wiring of different voltages (480/277V vs. 208/120V)

B. Install capped bushings on raceways as soon as installed and remove only when wires are pulled. Securely tie embedded raceway in place prior to embedment. Lay out the work in advance to avoid excessive concentrations of multiple raceway runs.

C. Locate raceways so that the strength of structural members is unaffected and they do not conflict with the services of other trades. Install one (1") inch or larger raceways, in or through structural members (beams, slabs, etc.) only when and in the manner accepted by the Architect/Engineer. Draw up couplings and fittings full and tight.

D. Install no conduits or other raceways sized smaller than permitted in applicable NEC Tables. Where conduit sizes shown on drawings are smaller than permitted by code, Contractor shall include cost for proper size conduit in his base bid. In no case reduce conduit sizes indicated on drawings or specified without written approval of Architect-Engineer. Minimum conduit size shall be 3/4".

E. Above-grade raceways to comply with the following:

   1. Install raceways concealed except at surface cabinets and for motor and equipment connection in electrical and mechanical rooms. Install a minimum of six (6") inches from flues, steam pipes, or other heated lines. Provide flashing and counter-flashing for waterproofing of raceways, outlets, fittings, etc., which penetrate the roof. Route exposed raceways parallel or perpendicular to building lines with right-angle turns and symmetrical bends. Run concealed raceways in a direct line and, where possible, with long sweep bends and offsets. Provide sleeves in forms for new concrete walls, floor slabs, and partitions for passage of raceways. Waterproof sleeved raceways where required.
   2. Raceways shall not be run on roofs or exposed on the outside of the buildings unless specifically noted as exposed on the drawings or approved by the Architect/Engineer.
   3. Provide raceway expansion joints for exposed and concealed raceways with necessary bonding conductor at building expansion joints and between buildings or structures and where required to compensate for raceway or building thermal expansion and contraction. Provide expansion fittings every 200 feet on outdoor conduit.
   4. Provide one (1) empty 3/4 inch raceway for each three (3) spare unused poles or spaces of each flush-mounted panelboard. Terminate empty 3/4 inch conduit in a junction box, which after completion, is accessible to facilitate future branch circuit extension.
   5. Provide raceway installation (with appropriate seal-offs, explosion-proof fittings, etc.) in special occupancy area, as required. Provide conduit seal-offs where portions of an interior raceway system pass through walls, ceiling, or floors which separate adjacent rooms having substantially different maintained temperatures, as in refrigeration or cold storage rooms.
   6. Provide pull string in spare or empty raceways. Allow five (5) feet of slack at each end and in each pull box. Tie each end of the string to a washer or equivalent that does not fit into the conduit. Tag both ends of string denoting opposite end termination location.

F. Below Grade

   1. Below grade raceways to comply to the following:

a. Do not penetrate waterproof membranes unless proper seal is provided.

2. Protect steel raceway in earth or fill with two (2) coats of asphalt base paint. Touch up abrasions and wrench marks after conduit is in place.
3. In lieu of the above, protect steel raceways with a minimum of ten (10) mil tape approved for the purpose and overlapped a minimum of one-half tape width to provide a minimum twenty (20) mil thickness.

G. No raceway may be installed in a concrete slab or members except with the permission of the Structural Engineer and with the written consent of the Owner.

1. Conduits embedded in structural concrete slabs shall have an outside diameter less than one third of the thickness of the concrete slab and shall be installed entirely within the center one third of the concrete slab.
2. Raceways embedded in concrete slabs shall be spaced not less than eight (8") inches on centers and as widely spaced as possible where they converge at panels or junction boxes.
3. In no case will installation of raceways be permitted to interfere with the proper placement of principal reinforcement.
4. Raceways running parallel to slab supports, such as beams, columns, and structural walls, shall be installed not less than twelve (12") inches from such supporting elements.
5. To prevent displacement during concrete pour of lift slab, saddle supports for conduit, outlet boxes, junction boxes, inserts, etc., shall be secured with suitable adhesives.

H. Non-metallic raceway installation shall conform to the following:

1. All joints are to be made by the solvent cementing method using the material recommended by the raceway manufacturer. To insure good joints, components shall be cleaned prior to assembly.
2. Raceway cut-offs shall be square and made by handsaw or other approved means which does not deform the conduit. Raceway shall be reamed prior to solvent cementing to couplings, adapters, or fittings.
3. Electrical devices which are served by PVC raceways shall be grounded by means of a ground wire pulled in the raceway.
4. Bends shall be made by methods that do not deform or damage the conduit. The radii of field bends shall not be less than those established by the N.E.C.
5. Raceway expansion fittings shall be provided where necessary. The position of the expansion fitting shall be adjusted proportional to the temperature at installation.
6. Raceway supports shall be installed, in such a manner, to allow the PVC conduit to slide through the supports as the temperature changes.
7. Elbows must be galvanized rigid steel, intermediate metallic conduit or concrete encased. Plastic conduit may only be used for exterior underground applications or circuits beneath slabs on grade. Provide galvanized rigid steel (GRS) radius bends and risers as conduits rise above grade or above floor slab.
8. Provide exterior underground conduit with metal detection strip.
9. Provide matching plastic fittings. Fittings shall meet the same standards and specifications as the conduit on which it is installed.
10. Joining and bending of conduit and installation of fittings shall be done only by methods recommended.
11. Provide conduit support spacing as recommended for the highest ambient temperature expected.
12. Provide interlocking conduit spacers for multiple runs of underground conduits installed in same trench.
13. Provide expansion couplings on long runs regardless of ambient temperatures. Determine amount of conduit expansion and contraction from published charts or tables.
14. Test workmanship by conducting a low-pressure air (3.0-5.0 psi) test after system is installed and cemented joints are set. Plug and block ends to prevent movement prior to pressurization. Check for leaks at all joints with a soap solution. Even low-pressure air can cause high thrust loads and caution must be observed. The test shall be observed by the architect, engineer or owner's representative, prior to backfill. All below grade conduit that could potentially drain water into electrical equipment (ie. Main electrical service located in basement below utility transformer) must be watertight.

I. Raceways in hung ceiling shall be run on and secured to slab or primary structural members of ceiling, not to lathing channels or T-bars, Z-bars, or other elements which are the direct supports of the ceiling panels. Secure conduit firmly to steel by clips and fittings designed for that purpose. Install as high as possible, but not less than 1'-0" above hung ceilings.

J. Exposed raceways shall be run parallel or at right angles with building lines.

K. Clear raceway of all obstructions and dirt prior to pulling in wires or cables. This shall be done with ball mandrel (diameter approximately 85% of conduit inside diameter) followed by close fitting wire brush and wad of felt, or similar material. This assembly may be pulled in together with, but ahead of, the cable being installed. All empty raceways shall be similarly cleaned. Clear any raceway which rejects ball mandrel.

3.3. OUTLET BOXES

A. Fit outlet boxes in finished ceilings or walls with appropriate covers, set flush with the finished surface. Where more than one switch or device is located at one point, use gang boxes and covers unless otherwise indicated. Sectional switch boxes or utility boxes will not be permitted. Provide Series "GW" (Steel City) tile box, or as accepted, or a four (4") inch square box with tile ring in masonry walls, which will not be plastered or furred. Where drywall material is utilized, provide plaster ring.

1. Provide outlet boxes of the type and size suitable for the specific application.
2. Where outlet boxes contain two (2) or more 277 volt devices, or where devices occur of different applied voltages, or where normal and emergency devices occur in same box, provide suitable barrier.
3. Install all wall mounted switch and receptacle boxes with bracing between two adjacent studs where rigid conduit is not used for circuiting. Box and receptacle shall not deflect on operation or insertion of plugs.

B. Install boxes and covers for wiring devices so that the wiring devices will be installed with a vertical orientation unless otherwise noted on the drawings.

C. The exact location of outlets and equipment is governed by structural conditions and obstructions, or other equipment items. When necessary, relocate outlets so that when fixtures or equipment are installed, they will be symmetrically located according to the room layout and will not interfere with other work or equipment. Verify final location of outlets, panels equipment, etc., with Architect.

D. Back-to-back outlets in the same wall, or "thru-wall" type boxes not permitted. Provide twelve (12") inch (minimum) spacing for outlets shown on opposite sides of a common wall to minimize sound transmission.

E. Provide twenty four (24") inch (minimum) horizontal spacing for outlets shown on opposite sides of a fire rated wall.

1. Provide listed fire putty pads around the each box to maintain fire rating, where aggregate area of boxes in wall exceeds maximum per code.

F. Install top of switch outlet boxes 48” above floor unless otherwise called for or required by wainscot, counter, etc. Install bottom of receptacle outlet boxes 16” above floor unless otherwise called for on drawings.

1. Adjust mounting heights to nearest masonry joint for minimum cutting in case of flush outlets.

3.4. JUNCTION AND PULL BOXES

A. Provide junction and pull boxes as indicated on the drawings and as required for the complete installation of the various electrical systems, and to facilitate proper pulling of wires and cables.

1. J-boxes and pull boxes shall be sized per electrical code minimum.
2. Boxes on empty conduit systems shall be sized as if containing conductors of #4 AWG.
3. Wiring systems required to have separate/independent raceways (See Section 3.2 above) shall also be provided with separate junction and pull boxes. These wiring systems may occupy the same outlet box only if a divider is installed between the wiring that is listed for this purpose.

B. Pull Box Spacing

1. Provide pull boxes so no individual conduit run contains more than the equivalent of four (4) quarter bends (360 degrees total).
2. Conduit Sizes 1-1/4" and Larger.
    a. Provide boxes to prevent cable or wire from being excessively twisted, stretched, or flexed during installation.
    b. Provide boxes for medium voltage cables so that maximum pulling tensions do not exceed cable manufacturer's recommendations.
    c. Provide support racks for boxes with multiple sets of conductors do not rest on any metal work inside box.
3. Conduit Sizes one (1") inch and smaller, low voltage wire and cable (maximum distances)
    a. 200 feet straight runs.
    b. 150 feet runs with one 90 degree bend or equivalent.
    c. 125 feet runs with two 90 degree bends or equivalent.
    d. 100 feet runs with three or four 90 degree bends or equivalent.

3.5. FLOOR BOXES

A. Prior to Concrete Pour

1. Firmly support boxes.
2. Adjust leveling screws to insure box covers are flush with finished floor.

3. Plug unused opening with proper fittings and seal joints with compound for exclusion of concrete and moisture.

B. After Concrete Pour

1. As soon as traffic is permitted on slab, remove any accumulation of water and foreign matter to avoid corrosion and rust.
2. Insure covers are flush with finished floor.
3. Install cover plates and accessories after floor finishing materials have been installed.

END OF SECTION 260533

SECTION 260553 – ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 260010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. DESCRIPTION OF WORK

A. A. Provide identification on all equipment, raceways, boxes and conductors.

PART 2 - PRODUCTS

2.1. NAMEPLATES

A. Nameplates shall be lamacoid plates with engraved upper-case letters and beveled edges.
    1. Stamped or embossed metal tags are not considered acceptable for this purpose.
B. Color:
    1. Normal-power equipment shall have white nameplates with black letters, enclosed by a black border.
    2. Nameplates for short circuit ratings and calculations shall be yellow with black letters, enclosed by black border.
C. All nameplates shall be engraved and must be secured with rivets, brass or cadmium plate screws. The use of Dymo tape or the like is unacceptable.
D. Nameplate inscriptions shall bear the name and number of equipment to which they are attached as indicated on the Drawings. The engineer reserves the right to make modifications in the inscriptions as necessary.
    1. Inscription letters shall be 1/2” in size.

2.2. CABLE TAGS AND WIRE IDENTIFICATION LABELS

A. Cable tags shall be flameproof secured with nylon ties.
B. Wire markers shall be preprinted cloth tape type or approved equivalent.

2.3. IDENTIFICATION LABELS

A. Acceptable Manufacturers
    1. W.H. Brady Company (Style A)
    2. Thomas & Betts Company (T&B), Style A.
    3. Seaton
B. Plasticized Cloth
    1. Non-conductive.
    2. Waterproof.
    3. Capable of withstanding continuous temperatures of 235 degrees F and intermittent temperatures to 300 degrees F.
    4. Overcoating for protection against oil, solvents, chemicals, moisture, abrasion and dirt.
C. Heavy, thermo-resistant industrial grade adhesive, for adhesion of label to any surface without curling, peeling or falling off.
D. Label Designations, Nominal System Voltages Applied to the covers of all medium and low voltage pull, splice and junction boxes.
E. Machine printed.
    1. Letters shall be 3/8” in size.

PART 3 - EXECUTION

3.1. INSTALLATION

A. Service Entrance Equipment
    1. Where electrical equipment (switchboard, panelboard, disconnect switch, etc.) is installed as service entrance equipment, contractor shall furnish and install a nameplate listing the following:

a. Equipment Short-Circuit Current Rating in amperes (RMS SYM), as indicated on the drawings.
b. Whether or not the equipment is fully or series-rated.
c. Available Fault Current in amperes. Contractor shall perform available fault current calculation (as outlined in Section 260520) to obtain available fault at Service Equipment.
d. Date fault current calculations were performed.

i. Example:

EQUIPMENT FULLY-RATED AT 65,000 AMPERES RMS SYM AVAILABLE FAULT CURRENT: 61,603 AMPERES DATE CALCULATED: 12/06/2011

B. Switchboards/ Distribution Panelboards.

1. Furnish and install a nameplate for each switchboard or distribution panelboard. Nameplate shall be engraved with the following information:

a. Top Line: Equipment identification as indicated on the Drawings.
b. Middle Line: Specific device or equipment where feeder originates.
c. Bottom Line: Equipment voltage, size, and phase as indicated on the drawings.
d. Example:

SWITCHBOARD SWDP1 FED FROM UTILITY COMPANY TRANSFORMER 208/120V, 1200A, 3-PHASE

2. Nameplate shall be mounted at the top of the incoming section.
3. Each switch / circuit breaker shall be provided with an identifying nameplate.

a. Main devices shall be identified as such. Where multiple mains are employed each switch shall be numbered. Inscription shall be "MAIN SWITCH" or "MAIN SWITCH NO. 1" et al.
b. Branch/feeder devices shall be identified with either the load served or a number corresponding to the furnished circuit directory.

C. Panelboards and Load Centers.

1. Furnish and install a nameplate for each panelboard and load center. Nameplate shall be engraved with the following information:

a. Top Line: Equipment identification as indicated on the Drawings.
b. Middle Line: Specific device or equipment where feeder originates.
c. Bottom Line: Equipment voltage, size, and phase as indicated on the drawings.
d. Example:

PANELBOARD LN1 FED FROM SWITCHBOARD SWDP1 IN ROOM #332 208/120V, 200A, 3-PHASE

2. Nameplate shall be mounted at the top of the panel.
3. After installations are complete, provide and mount under sturdy transparent shield in the directory frame of each panel door, a neat, accurate, and carefully typed directory properly identifying the lighting, receptacles, outlets, and equipment each overcurrent device controls.

a. Include on directory the panel or load center identification, the cable and raceway size of panel feeder, and the feeder origination point.

D. Disconnect Switches.

1. Furnish and install a nameplate for each disconnect switch engraved with the equipment designation which the disconnect serves and the panel and circuit the switch is fed from.

E. Disconnect Switches.

1. Furnish and install a nameplate for each disconnect switch engraved with the equipment designation which the disconnect serves.

a. Example:

AHU – 1
FED FROM PANEL LP-1 – 32

2. Nameplate shall be mounted at the top of the disconnect.

F. Motor Controllers.

1. Furnish and install a nameplate for each motor controller or combination motor controller for both individual motor controllers and those in a motor control center. Engraving must indicate the motor served and the type of service (e.g., AC-8-1st floor supply, EF-2 electric closet exhaust.)

G. Feeder Switches.

1. Furnish and install for each feeder switch including, but not limited to those in switchboards, switch and fuse panelboards, take-offs at bus ducts, motor control centers, multiple meter centers, etc., two (2) nameplates as follows:

   a. The first nameplate must be white background with red lettering. Engrave with the words "REPLACE ONLY WITH _____ FUSE." Engrave with proper fuse trade name and ampere rating (i.e. Bussman LPS-R 100).
   b. The second nameplate shall indicate the load served, the size and type of cable and raceway example:

      i. LP-4, LP-5, LP-6
      ii. 4#500 KCMILS-THW-CU-3-1/2"C

H. Remote Smoke Detector Lamps and Test Stations.

1. Furnish and install a nameplate on each remote smoke detector lamp and/or test station.
2. Engraving must indicate the location of the device to which the lamp is connected, as approved by the Engineer.

I. Switches.

1. Furnish and install an engraved nameplate for each switch, controlling loads that are not local to the switch. Engraving shall be as directed by the Engineer.

J. Pullboxes, Enclosures, and Cable Terminations.

1. Circuits rated over 40 Amp and all cables over 600V:

   a. Provide identification label with circuit numbers on enclosure cover.
   b. Furnish and install cable tags on each cable that enters a pullbox, enclosure, switchboard, and at terminations. Mark tags with type written inscription noting the load served, type and size of cable, and the overcurrent device protecting the cable.

K. Branch circuits:

1. Provide identification label with panel and circuit numbers on enclosure cover.
2. Identify each circuit with wire markers when enclosure label and wire colors do not provide enough information to identify each circuit without tracing.
3. Provide feeders and branch circuit home runs with plasticized wire marker indicating circuit number and power source. Provide feeders phase identification letter at each terminal point in addition to its circuit number.
4. 4 square box covers hidden above lay-in ceilings may be marked with indelible ink marker in lieu of using printed labels.

L. Fire Alarm Terminal Cabinets.

1. Furnish and install an approved nameplate on each fire alarm terminal cabinet.
2. Nameplates shall indicate floor and where multiple terminal cabinets are installed a prime designation for each cabinet (e.g. FATC-1A, FATC-1B).
3. Terminals shall be permanently identified in an approved manner.
4. Label all wiring.

M. Telecommunications System.

1. Each horizontal cable from a termination block or patch panel to a telecommunications outlet shall be labeled at both ends. Tags shall be consecutively numbered so that no two (2) cables have the same identification. In addition cable tag shall note the room number in which the data transmission outlet is

located.

2. Each backbone cable shall have a flameproof tag attached at both ends of the tag. Tags shall be consecutively numbered so that no two (2) cables have the same identification. Additional inscriptions shall be provided as directed by the Owner.
3. Patch panel ports shall be consecutively numbered so that no two (2) ports have the same number.
4. Furnish and install a clear typed label on each faceplate for each outlet and jack indicating cable per ANSI/TIA/EIA/606A standards and project nomenclature. Label materials and finish shall match style, font, color, etc as any adjacent receptacles.
5. Label shall be mounted at the top of the faceplate.

N. Warning Signs

1. Provide electrical equipment and accessible wiring enclosures operating at voltage above 240 volts with self-sticking polyester sign with wording and size conforming to ANSI Standard Z35.1-1964 and OSHA 19.0.144iii(2) Specifications “Danger High Voltage” warning sign and voltage marker applied to front door or cover of device or enclosure.
2. Provide large equipment such as transformers and main distribution equipment with self-sticking polyester sign with wording and size conforming to ANSI Standard Z35.1-1964 and OSHA 19.0.144iii(2) Specifications indicating all electrical characteristics.

O. Boxes

1. Provide identification labels for all low voltage and medium voltage pull, splice and junction boxes in main feeder and subfeeder runs, indicating nominal system voltage.
2. Apply labels after painting of boxes, conduits, and surrounding areas have been completed.
3. Clean surfaces before applying labels; clean aluminum surfaces with solvent wipe.
4. Apply labels on cover and minimum of one (1) fixed side; one (1) label visible from floor where boxes are Installed exposed.

END OF SECTION 260553

SECTION 260923 – LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1. SUMMARY

A. This Section includes the following lighting control devices:

1. Time switches.
2. Outdoor photoelectric switches.
3. Indoor occupancy sensors.
4. Lighting contactors.
5. Emergency shunt relay.

1.2. SUBMITTALS

A. Product Data: For each type of product indicated.
B. Field quality-control test reports.
C. Operation and maintenance data.

1.3. QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 PRODUCTS

2.1. TIME SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. GE
2. Intermatic, Inc.
3. Leviton.
4. Lithonia Lighting.
5. Paragon Electric Co.
6. Square D.
7. TORK.
8. Watt Stopper.

B. Electromechanical-Dial Time Switches: Type complying with UL 917.

1. Contact Configuration: SPST.
2. Contact Rating: 30-A inductive or resistive, 240-V ac.
3. Five subparagraphs below describe optional features.
4. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
5. Astronomic dial in first subparagraph below makes the time switch self-adjusting for seasonal changes and automatically adjusts on-off times as days grow shorter or longer.
6. Astronomic time dial.
7. Eight-Day Program: Uniquely programmable for each weekday and holidays.
8. Skip-a-day mode.
9. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.

2.2. OUTDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. GE
2. Intermatic, Inc.
3. Leviton.
4. Lithonia Lighting.
5. Paragon Electric Co.
6. Square D.
7. TORK.
8. Watt Stopper.

B. Description: Solid state, with DPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.

1. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-

off.
2. Time Delay: 15-second minimum, to prevent false operation.
3. Surge Protection: Metal-oxide varistor, complying with IEEE C62.41.1, IEEE C62.41.2, and IEEE 62.45 for Category A1 locations.
4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.

2.3. INDOOR OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper (Greengate)
2. Hubbell Lighting.
3. Leviton Mfg. Company Inc.
4. Philips Controls
5. Sensor Switch, Inc.
6. Steinel
7. Watt Stopper.

B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.

1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
4. Mounting:
    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
6. Bypass Switch: Override the on function in case of sensor failure.
7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; keep lighting off when selected lighting level is present.

C. PIR Type: Ceiling mounting; detect occupancy by sensing a combination of heat and movement in area of coverage.

1. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in..
2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot- high ceiling.

2.4. LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Products.
2. GE.
3. Hubbell Lighting.
4. Square D.
5. TORK.
6. Watt Stopper.

B. Description: Electrically operated and mechanically held, combination type with nonfused disconnect, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.

3. Enclosure: Comply with NEMA 250.
4. Provide with control and pilot devices as scheduled, matching the NEMA type specified for the enclosure. Provide with accessory module for 2-wire control as necessary for control.
5. The contactor shall have provisions for factory or field addition of:

    a. Four (4) N.O. or N.C. auxiliary contacts rated 6 amperes continuous at 600 volts.
    b. Single or double circuit, N.O. or N.C., 30 or 60 ampere 600 volt power-pole adder.
    c. Control-circuit fuse holder, one or two fuses.
    d. 0.2-60 second TDE or TDD timer attachment.
    e. Transient-suppression module for control circuit of 120 volts.

2.5. EMERGENCY SHUNT RELAY

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Lighting Control and Design, Inc.

B. Description: Normally closed, electrically held relay, arranged for wiring in parallel with manual or automatic switching contacts; complying with UL 924.

1. Coil Rating: 120 or 277 V as required.

PART 3 EXECUTION

3.1. SENSOR INSTALLATION

A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.
B. When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

3.2. CONTACTOR INSTALLATION

A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3. IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."

1. Identify controlled circuits in lighting contactors.
2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and contactors with a unique designation.

3.4. FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
2. Operational Test: Verify operation of each lighting control device, and adjust time delays.

B. Lighting control devices that fail tests and inspections are defective work.

END OF SECTION 260923

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SECTION 262416 – PANELBOARDS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 260010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

C. Field quality-control reports.
D. Operation and maintenance data.

1.3. QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
B. Comply with NEMA PB 1.
C. Comply with NFPA 70.

1.4. WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1. GENERAL

A. Provide panelboards as indicated in the panelboard schedule and where shown on the plans. Panelboards shall be equipped with fusible switches or thermal-magnetic, molded case circuit breakers as indicated on the schedules.

2.2. MANUFACTURERS

A. Equivalents by Eaton (Cutler-Hammer), Square D, GE, or ITE Siemens.

1. Equivalent Panelboards to those specified on the plans shall be considered as follows:

Cutler Hammer	Square D	GE	Siemens
Pow-R-Line 1A	NQOD	AQ	P1
Pow-R-Line 2A	NQOD	AE	P2
Pow-R-Line 3A	NF* / I-Line	AE* / Spectra	P3
Pow-R-Line 4B	I-Line	Spectra	P4

* Submitted equipment must be able to accommodate ALL breakers shown in panelboard schedules as branch-mounted devices. If unable to do so, provide distribution panelboard as noted.

2.3. PANELBOARDS

A. Bussing Assembly and Temperature Rise:

1. Panelboard bus structure and main lugs or main breaker shall have current ratings as shown on the panelboard schedule. Such ratings shall be established by heat rise tests with maximum hot spot temperature on any connector or bus bar not to exceed 50 degrees C rise above ambient. Heat rise tests shall be conducted in accordance with Underwriters Laboratories Standard UL 67.
2. Provide tin-finished copper bars full length of panel with rating listed in schedule. Bus bar connection to branch circuit breakers shall be “Phase Sequence” type designed and assembled so circuit breakers can be replaced without disturbing adjacent breakers or removing main bus or branch circuit connectors. Provide bus bars with wire lugs suitable for copper or aluminum conductors. Provide each panel with equipment tin finished copper grounding bus grounded to box and tin finished copper neutral bus insulated from box.

B. Integrated Equipment Short Circuit Rating

1. Each panelboard, as a complete unit, shall have a short circuit current rating equal to or greater than the integrated equipment rating as indicated in the schedules. This rating shall be established by testing with the overcurrent devices mounted in the panelboard. The short circuit tests on the overcurrent devices and on the panelboard structure shall be made simultaneously by connecting the fault to each overcurrent device with the panelboard connected to its rated voltage source. Method of testing shall be per Underwriters Laboratories Standard UL 67. The source shall be capable of supplying the specified panelboard short circuit current or greater. Panelboards shall be marked with their maximum short circuit current rating at the supply voltage and shall be UL listed.

C. Cabinet

1. Panelboard assembly shall be enclosed in a steel cabinet. The rigidity and gauge of steel to be as specified in UL Standard 50 for cabinets. The size of wiring gutters shall be in accordance with UL Standard 67. Provide branch circuit panelboard cabinets with latch and tumbler-type lock on door of trim. Doors over 48” long shall be equipped with three-point latch and vault lock. All locks shall be keyed alike. Endwalls shall be removable. Fronts shall be of code gauge steel. Gray baked enamel finish electrodeposited over cleaned phosphatized steel. Fusible panelboards and large distribution circuit breaker panelboards shall not be provided with doors.

D. Safety Barriers

a. The panelboard interior assembly shall be dead front type with panelboard front removed. Main lugs or main breakers shall have barriers on five sides. The barrier in front of the main lugs shall be hinged to a fixed part of the interior. The end of the bus structure opposite the mains shall have barriers.

E. Ul Listing

a. Panelboards shall be listed by Underwriters Laboratories and shall bear the UL label. When required, panelboards shall be suitable for use as service equipment.

2.4. OVERCURRENT PROTECTIVE DEVICES

A. Main Overcurrent Protection Device

1. The main device shall be an electronic trip molded case standard function 80% rated circuit breaker(s) or thermal magnetic molded case circuit breaker(s.

B. Arc Energy Reduction Systems

1. Manufacturer shall provide an approved means of Arc Energy Reduction on all overcurrent protective devices rated 1200A or higher, or demonstrate the overcurrent protective device has a clearing time of 0.07 seconds or less at the available arcing current.
2. Manufacturer shall provide documentation showing the method chosen [above] is set to operate at a value below the available arcing current.

C. Branch Circuit Breakers

1. Branch circuit breakers shall be quick-make, quick-break with trip indication. Circuit breakers shall operate both manually for normal switch functions and automatically under overload and short circuit conditions. They shall provide circuit and self-protection when applied within their rating. Operating mechanisms shall be entirely trip free so that contacts cannot be held closed against a short circuit. Operating handle of circuit breaker shall open and close all poles of a multipole breaker simultaneously. Conforming to NEMA Standards Publications No. AB1-1964 and be approved by UL. Circuit breaker shall have a thermal magnetic trip unit for each pole for inverse time delayed overload protection and an instantaneous magnetic element for short circuit protection. Multiple pole trip elements shall operate a common internally connected trip bar to open all poles in case of overload or

short circuit through any one pole.

2. Provide arc-fault protection circuit breakers for all sleeping rooms and other areas required by code.

2.5. LOAD CENTERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Load Centers: Comply with UL 67.

C. Mains: Circuit breaker or main lugs, as scheduled.

D. Branch Overcurrent Protective Devices: Plug-in circuit breakers, replaceable without disturbing adjacent units.

E. Provide Arc Fault Circuit Interrupter circuit breakers for all branch circuits that supply 125-volt, single-phase, 15- and 20- ampere outlets installed in bedrooms, family rooms, dining rooms, closets, hallways, similar rooms or where otherwise required by Code. Breaker shall be listed to provide protection of the entire branch circuit.

F. Provide combination GFCI/Arc Fault Circuit Interrupter circuit breakers as scheduled.

G. Conductor Connectors: Mechanical type for main, neutral, and ground lugs and buses.

2.6. METERING EQUIPMENT

A. Residential metering equipment

1. MULTI-METERING shall be furnished floor mounted and wall attached at locations as shown on the drawings.
2. Metering shall be UL listed. Panelboards identified for use as service equipment are to be labeled for this application. Coordinate with local utility.
3. Meter Units shall be EZ Meter Pak by Square D Company. Equivalent by G.E., Siemens, Cutler Hammer.

B. Enclosures

1. Enclosures shall be constructed of formed and welded code gauge galvanized steel NEMA Type 3R with baked enamel finish electrodeposited over cleaned phosphatized steel.
2. No device disassembly is to be required before mounting.
3. All devices must be bonded together with bolted connections.
4. All compartments containing unmetered circuits shall be provided with a sealing means.

C. Interior construction

1. All components except for branch plug-in units shall be factory assembled and all current carrying parts shall be plated bus bars.
2. Individual units shall be constructed with an integral sliding one bolt joint-pak assembly for a completely bussed meter center. This single bolt is to be a VISI-TITE bolt for tightening without a torque wrench.
3. Meter Sockets shall be 7 jaw, 200A or 400A as shown on the drawings.
4. Sockets shall be rated 200 or 320 ampere continuous duty.
5. Meter sockets shall be field installable through 200A.

D. Bussing

1. The multi-metering equipment through bus shall be tin-plated aluminum. The bussing shall be of sufficient cross-sectional area to meet UL Standard 891 for temperature rise. The through bus shall extend the full length of the equipment and be 100% rated throughout the line-up. Tapered bus is not acceptable. There shall be provisions for future splicing of additional sections from either end. The neutral bus shall also be 100% rated. The ground bus shall be sized per UL Standard 891, and of the same material as the through bus. Bus connections shall be bolted with grade 5 bolts and conical spring washers.

E. Main disconnect devices

1. The main disconnect shall be an electronic trip circuit breaker.

F. Branch molded case circuit breakers

1. Circuit breakers shall be thermal magnetic trip, with an integral crossbar to provide simultaneous opening of all poles in multi-pole circuit breakers.
2. Breakers shall have an overcenter, tripfree, toggle-type operating mechanism with quick-make, quick-

break action and positive handle indication.
3. Handles shall have “ON” and “OFF” and “Tripped” positions.
4. Circuit breakers shall be UL listed in accordance with UL standard 489 with current ratings as noted on the plans. Interrupting ratings shall be selected to provide the required short circuit current rating.

G. Short circuit current rating

1. 65,000 ampere rms symmetrical short circuit current ratings shall be provided. This rating shall be established by manufacturer testing of a representative meter center with branch overcurrent devices installed.
2. The entire multi-metering equipment shall be suitable for operation at the specified available fault current. The equipment shall be labeled to indicate the maximum available fault current rating, taking into account the structure, bussing, main disconnects, and tenant main disconnects.

PART 3 EXECUTION

3.1. EXAMINATION

A. Examine panelboards before installation. Reject panelboards that are moisture damaged or physically damaged.
B. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. INSTALLATION

A. Store, handle, and install panelboards and accessories per manufacturer’s recommendations.
B. Secure the assembly in place.
C. Provide 3½” housekeeping pad where two or more conduits penetrate floor or when equipment is floor/ground mounted.
D. Wall-mounted equipment:

1. Mount bottom of trim a minimum of 24” above finish floor. Maintain accessibility to overcurrent devices per NEC. Where both conditions cannot be met, consult with engineer on mounting height of equipment.
2. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
3. Where flushed mounted, the fire integrity of the wall in which it is installed must be maintained.
4. Where flush mounted provide (2)2” conduits from the can to above an accessible ceiling and terminate with a minimum 8”x8” junction box located in a concealed manner.

E. Neatly arrange branch circuit wires and tie together in each gutter with Thomas & Betts nylon "Ty-Raps", or approved equal at minimum 4 inch intervals.
F. Plug all knockouts removed and not utilized.
G. Install overcurrent protective devices and controllers not already factory installed.
H. Install filler plates in unused spaces.

3.3. IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
B. Panelboard Nameplates: Label each panelboard compartment with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
C. Device Nameplates: Label each disconnecting and overcurrent protective device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
D. For panelboards (and distribution panelboards where labeling of individual breakers is not possible or practical), provide a typed circuit directory for same as follows:

1. Panels shall have branch circuit directory holders with clear plastic cover.
2. Provide neatly typed list of branch circuit loads corresponding to branch circuit numbers. Handwritten directories are not acceptable.
3. For remodel work or changes, trace circuits to determine loads and provide new updated directory.

3.4. FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, and feeder.
2. Test continuity of each circuit.

C. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5. ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
B. Set field-adjustable circuit-breaker trip ranges as indicated in the coordination study.

3.6. LOAD BALANCE

A. 30 days after occupancy provide record ampacity loads for each panelboard by phase.
B. Adjust circuit and phase loading so that each phase is within 25% of other phases if possible.
C. Update circuit directory with new typewritten directory with any circuit changes for balance of loads.
D. Update any labels on equipment, receptacles etc to any circuit changes due to balancing.

3.7. TOUCH UP AND CLEANING

A. Vacuum all backboxes clean of debris after installation and prior to contract closeout.
B. Touch up scratch marks, etc. with matching paint.

3.8. OBSERVATIONS

A. All panel fronts shall be removed by the Contractor for observation of the panel interiors by the Engineers.
B. Panel fronts shall be removed when directed by the Engineer/Architect for observation and reinstalled immediately after the observations.

END OF SECTION 262416

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SECTION 262726 – WIRING DEVICES

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 260010.
B. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
C. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.3. QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
B. Comply with NFPA 70.

PART 2 PRODUCTS

2.1. GENERAL

A. Manufacturers

1. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

a. Eaton Wiring Devices; (may be listed below and/or submitted as Eaton, Cooper, Arrow Hart, or Crouse-Hinds).
b. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
c. Leviton Mfg. Company Inc. (Leviton).
d. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2. All devices shall be from the same manufacturer.

B. Finishes

1. Color: Wiring device catalog numbers in Section Text do not designate device color.

a. Wiring Devices Connected to Normal Power System: White, unless otherwise indicated or required by NFPA 70 or device listing.

i. Color shall be coordinated and verified with Architect and owner.

2.2. STRAIGHT BLADE RECEPTACLES

A. General Requirements for Convenience Receptacles

1. Unless otherwise modified below, all receptacles shall comply with the following:
2. Commercial / Common Areas: 125 V, 20 A
3. Residential / Dwelling Unit Areas: 125 V, 15 A
4. Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
5. Multiple types of receptacles may be required of a single device (Ex.: a Hospital-Grade GFCI receptacle), as indicated on the plans and in the execution section below. Where such a device is required, it shall meet the requirements of all applicable sections below.
6. Products: Subject to compliance with requirements, provide one of the following:

a. Refer to list of approved manufacturers in general section.
b. Receptacle model/series(all manufacturers): 5361 (single), 5362 (duplex).

7. Residential/Dwelling Unit Area Products: Subject to compliance with requirements, provide one of the following:

a. Eaton; TR270.
b. Hubbell; RR15TR.
c. Leviton; T5320.
d. Pass & Seymour; 3232TR.

B. GFCI Receptacles

1. Straight blade, feed or non-feed-through type.
2. Include indicator light that is lighted when device is tripped.
3. Products: Subject to compliance with requirements, provide one of the following:
    a. Cooper; SGF20.
    b. Hubbell; GFRST20.
    c. Leviton; G5362.
    d. Pass & Seymour; 2097.
4. Where devices are shown labeled as GFI on drawings provide GFCI receptacle (feed-through devices are not acceptable unless otherwise noted, or with written permission from the engineer).
    a. Devices labeled as GFIP on the drawings may be protected as a feed-through device.
    b. Multiple GFCI receptacles within dwelling units, where shown on the plans to be on the same circuit, may be protected with a single GFCI receptacle.

C. Weather-Resistant Receptacles

1. Receptacles shall UL-listed as weather-resistant.
2. Receptacles shall be identified with an “WR” on the receptacle face.
3. Products: Refer to General Requirements for Convenience Receptacles. WR receptacles shall be of same series.

D. Tamper-Resistant Receptacles

1. Tamper-Resistant Receptacles shall be safety type, “childproof,” duplex, 3 wire, ground type.
2. Products: Refer to General Requirements for Convenience Receptacles. TR receptacles shall be of same series.

2.3. SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.
B. Switches, 120/277 V, 20 A:
1. Products: Subject to compliance with requirements, provide decorator rocker-style switches:
    a. Cooper; 76_ Series, commercial spec grade switches. Single pole, two pole, three way and four way.
    b. Equivalent Hubbell, Leviton, Pass & Seymour
C. Pilot Light Switches, 20 A:
1. Products: Subject to compliance with requirements, provide decorator rocker-style switches:
    a. Cooper; 76_ Series, commercial spec grade switches. Single pole, two pole, three way and four way.
    b. Equivalent Hubbell, Leviton, Pass & Seymour
2. Description: Wired to indicate when switch is "ON."

2.4. WALL-BOX DIMMERS

A. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters.
B. Control: Continuously adjustable slider; with single-pole or three-way switching. Comply with UL 1472.
C. Incandescent Lamp Dimmers: 120 V; control shall follow square-law dimming curve. On-off switch positions shall bypass dimmer module.
1. 600 W; dimmers shall require no derating when ganged with other devices.
2. 2000 W; dimmers where required by load.
D. Dimmer Switches for LED fixtures: Modular; compatible with dimming drivers in fixture(s); if other than 0-10V dimming is provided, verify dimmer is compatible with driver for full range of dimming (100-10%).

2.5. OCCUPANCY SENSORS

A. Wall-Switch Sensors:
1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    a. Cooper; 6111 for 120 V, 6117 for 277 V.
    b. Hubbell; WS1277.
    c. Leviton; ODS 10-ID.

d. Pass & Seymour; WS3000.
e. Steinel; IL WLS 1.
f. Watt Stopper (The); PW-101.

2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft..

B. Long-Range Wall-Switch Sensors:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

a. Hubbell; ATP1600WRP.
b. Leviton; ODWWV-IRW.
c. Pass & Seymour; WA1001.
d. Steinel; IL WLS 1
e. Watt Stopper (The); CX-100.

2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 110-degree field of view, with a minimum coverage area of 1200 sq. ft..

2.6. SPECIAL PURPOSE DEVICES

A. Provide where indicated, specified or as required other appropriate NEMA configured devices appropriate for such equipment as thru-wall units manufactured by the same manufactures.

2.7. WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Vinyl, with color matching respective device.
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with lockable in-use cover.
C. Damp-Location, Damp Location Cover Plates: NEMA 250, spring loaded and gasketed, die-cast aluminum.

2.8. FLOOR SERVICE FITTINGS

A. Type: Modular, flush-type, dual-service units suitable for wiring method used.
B. Compartments: Barrier separates power from voice and data communication cabling.
C. Service Plate: solid brass with satin finish.
D. Power Receptacle: NEMA WD 6 configuration 5-20R, gray finish, unless otherwise indicated.
E. Voice and Data Communication Outlet: Two modular, keyed, color-coded, RJ-45 Category 5e jacks for UTP cable.

2.9. SINGLE AND MULTIPLE STATION (120V) DETECTORS

A. Smoke Detectors:

1. Detector shall comply with the following:

a. UL 217 (Standard for Sinlge and Muliple Station Smoke Alarms)
b. Suitable for residential occupancies per NFPA 101

2. Detector shall be a dual-sensor (combination photoelectric and ionization detection) model.
3. Operate at 120V ac with 9-V dc battery as the secondary power source. Provide with "low" or "missing" battery chirping-sound device.
4. Auxiliary Relays: Provide as required.
5. Test Switch: Push to test; simulates smoke at rated obscuration.
6. Tandem Connection: Allow tandem connection of number of indicated detectors; alarm on one detector shall actuate notification on all connected detectors.
7. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
8. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
9. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.

10. Where indicated on plans, provide Audible (Sounder) and/or Visual Base(s) for detector(s).

B. Combination Smoke/Carbon Monoxide Detectors:

1. Same as above requirements for smoke detectors, except as modified below:
2. Smoke detection may be by a photoelectric sensor only.
3. Comply with UL 2034 (Standard for Single and Multiple Station Carbon Monoxide Alarms).

C. Audible (Sounder) Bases:

1. Listed to UL 268, 464, & 2075.
2. Base shall include the following selectable tones (as required):

a. Smoke: ANSI Temporal 3
b. Carbon Monoxide: Temporal 4

D. Visible Base:

1. Shall include a 177-cd strobe.

PART 3 EXECUTION

3.1. INSTALLATION

A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
B. Coordination with Other Trades:

1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

D. Receptacle Types:

1. The following receptacle types shall be furnished in lieu of “standard” 120V, 15 or 20 amp receptacles at all of the following locations, regardless of plan designation:

a. Refer to the National Electrical Code (NEC), for definitions of all locations listed below.

2. GFCI Receptacles:

a. Within the following locations in dwelling units:

i. Bathrooms
ii. Garages
iii. Crawl Spaces and Unfinished Areas of Basements
iv. Above-counter receptacles in Kitchens
v. Where located within 6’-0” of a sink.
vi. Laundry Areaas
vii. Where installed to serve a dishwasher.

b. Bathrooms / Locker Rooms
c. Kitchens (unless circuit is provided with GFCI protection at the circuit breaker)
d. Rooftops
e. Outdoors
f. Where located within 6’-0” of a sink.
g. Garages, Service Bays, etc.
h. Unfinished areas.

3. Weather-Resistant Receptacles:

a. In all damp or wet locations.

4. Tamper-Resistant Receptacles:

a. All devices within dwelling/resident units
b. Exceptions:

i. Receptacles located more than 7’ above the floor.
ii. Receptacles located behind an appliance that is not easily moved.

E. Device Installation:

1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
10. Wall plates shall not support wiring devices. Provide wiring device with accessories as required to properly install devices and wall plates.
11. All devices shall be flush-mounted except as otherwise noted on the drawings.
12. Locations

a. Comply with layout drawings for general location; contact Owner's Representative for questions about locations and mounting methods.
b. Relocate outlets obviously placed in a location or manner not suitable to the room finish.
c. Avoid placing outlets behind open doors.
d. Align devices vertically and horizontally. Device plates shall be aligned vertically with tolerance of 1/16". All four edges of device plates shall be in contact with the wall surface.

13. Mounting Heights as indicated on the Drawings and according to ADA requirements.
14. Ganging of Switches - provide barriers between ganged 277 volt switches of different phases.
15. Power Outlets - install power outlets complete with back boxes, where installed in existing buildings or extensions of existing buildings. Coordinate phase connections for rotating equipment with connections in existing building.
16. Install device plates on all outlet boxes. Provide blank plates for all empty, spare and boxes for future devices.
17. Caulk around edges of outdoor device plates and boxes when rough wall surfaces prevent a raintight seal. Use caulking material as approved by the Architect/Engineer.
18. Emergency/normal power devices and/or 277V/120V devices are not to occupy the same box. Where same are shown on plans to be ganged, provide separate boxes immediately adjacent to each other.

F. Receptacle Orientation:

1. Install ground pin of vertically mounted receptacles up.

G. Device Plates:

1. Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
2. Provide matching blank wall plates to cover outlet or junction boxes intended for future devices.
3. Provide matching blank wall plates with 4 port knock outs at all telephone, data, and tele/data outlet locations. Also provide with matching blankouts in each port.
4. Where wall plates for special devices are available only from manufacturer of device, provide designs and finishes equivalent to above specification.
5. Verify with Architect finish of any plate where it may be apparent a special finish or color should have been specified.

H. Switches

1. Where switches are indicated to be installed near doors, corner walls, etc., mount same not less than 2

inches and not more than 18 inches from trim. Verify exact locations with the Architect.
2. Carefully coordinate the location of switches to insure locations at the strike side of doors.
3. Furnish and install an engraved legend for each switch that controls exhaust fans, motors, equipment systems, etc., not located within sight of the controlling switch.

I. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

J. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.

K. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

3.2. IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3. FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.

B. Tests for Convenience Receptacles:

1. Test for correct wire terminations (no open ground, neutral, or hot).
2. Test for correct polarity (no hot/ground reverse or hot/neutral reverse).
3. Verify GFCI devices are operating properly.
4. Using the test plug, verify that the device and its outlet box are securely mounted.

END OF SECTION 262726

SECTION 262813 – FUSES

PART 1 GENERAL

1.1. SUBMITTALS

A. First paragraph below is defined in Division 01 Section "Submittal Procedures" as an "Action Submittal."
B. Product Data: For each type of product indicated.
C. Paragraph below is defined in Division 01 Section "Submittal Procedures" as an "Informational Submittal."
D. Operation and maintenance data.

1.2. QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
B. Comply with NEMA FU 1 for cartridge fuses.
C. Comply with NFPA 70.

PART 2 PRODUCTS

2.1. FUSES

A. PRODUCT

1. Provide fuses by Bussman or Gould Shawmut.
2. Provide fuses of same characteristics as scheduled to insure selective coordination of power system.
3. Fuses 601 amp and larger shall be U/L Class L with minimum four (4) seconds time delay at 500% rating.
4. Fuses 600 amp and below shall be U/L Class J, RK-1 or RK-5 as scheduled time delay sized as shown on drawings or schedules.
5. Special temperature conditions, motors, motor loads or other conditions requiring other types or sizes of fuses must be reviewed by the Contracting Officer. Fuse reducers are not permitted.

PART 3 EXECUTION

3.1. INSTALLATION

A. Install fuses only after installation is complete and final tests and inspections have been made. Label fuses, switches and other fused devices with warning labels affixed in prominent location indicating type and size of fuse installed and fuse manufacturer’s catalog number.
B. Furnish Owner with spare fuses of each size and type installed on job as follows:

1. 601 Amps or Larger - three (3) of each size and type
2. 600 Amps or Less - 10% with minimum of three (3) of each size and type

C. For fuse types and ampacities, see plans.
D. Provide spare fuse cabinet with three shelves.
E. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

END OF SECTION 262813

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SECTION 262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 260010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.
B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Field quality-control reports.
D. Operation and maintenance data.

1.3. QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1. DISCONNECT SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton (Cutler-Hammer)
2. General Electric Company
3. Siemens
4. Square D

B. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Lugs: Suitable for number, size, and conductor material.
4. Service-Rated Switches: Labeled for use as service equipment.

2.2. FUSIBLE SWITCHES

A. Refer to disconnect switches for all requirements in addition to the following.
B. Switches shall be furnished with clips or bolt pads to accommodate indicated fuses.
C. Fuse holders shall be completely accessible from front of switch and fuses shall be installed so that the label may be easily read from the front and without removing the fuse.
D. Accessories:

1. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.

2.3. MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton (Cutler-Hammer)
2. General Electric Company
3. Siemens
4. Square D

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Electronic Trip Circuit Breakers (where indicated on drawings or elsewhere in this specification): Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.
4. Ground-fault pickup level, time delay, and I2t response.

E. Features and Accessories (where called for or required):

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Suitable for number, size, trip ratings, and conductor material.
3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
6. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.

2.4. ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor Locations: NEMA 250, Type 3R.
3. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 EXECUTION

3.1. INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
D. Install fuses in fusible devices.
E. Comply with NECA 1.

3.2. IDENTIFICATION

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.3. FIELD QUALITY CONTROL

A. Perform tests and inspections.
B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit

breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262816

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SECTION 262913 – ENCLOSED CONTROLLERS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 260010.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Product Data: For each type of enclosed controller.
B. Shop Drawings: For each enclosed controller. Include dimensioned plans, elevations, sections, details, and required clearances and service spaces around controller enclosures.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Field quality-control reports.
D. Operation and maintenance data.

1.3. QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1. MOTOR STARTERS

A. Provide motor starters rated in accordance with NEMA and as specified and shown on plans.

1. Equivalents by: G.E., Cutler Hammer, or I.T.E. Siemens, Square D.
2. Install starters in locations as shown on plans, installation shall be in strict accordance with NEC, and manufacturer's installation requirements.

B. MANUAL MOTOR CONTROL (1 HP Maximum)

1. Provide 300 volt, 60 cycle, AC manually operated motor starting switch meeting current NEMA Standards with proper NEMA enclosure required by starter location and environment.
2. Starter shall have heavy silver alloy contacts with quick-make, quick-break mechanism manually operated by toggle switch.
3. Thermal unit shall be melting alloy type, resettable, one-piece interchangeable construction.
4. Provide starter with all accessories such as pilot light, H.O.A. or two speed switches required to provide control sequence shown on drawings or specified. Selector switches contact shall have same ampere rating as starter switch.

PART 3 EXECUTION

3.1. INSTALLATION

A. Wall-Mounted Controllers: Install enclosed controllers on walls with tops at uniform height, and with disconnect operating handles not higher than 79 inches above finished floor, unless otherwise indicated, and by bolting units to wall or mounting on lightweight structural-steel channels bolted to wall. For controllers not at walls, provide freestanding racks complying with Division 26 Section "Hangers and Supports for Electrical Systems."
B. Install heaters in thermal overload relays. Select heaters based on actual nameplate full-load amperes after motors have been installed.
C. Comply with NECA 1.

3.2. IDENTIFICATION

A. Identify enclosed controllers, components, and control wiring. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved nameplate.
3. Label each enclosure-mounted control and pilot device.

3.3. CONTROL WIRING INSTALLATION

A. Install wiring between enclosed controllers and remote devices[and facility's central control system]. Comply

with requirements in Division 26 Section "Control-Voltage Electrical Power Cables."

B. Bundle, train, and support wiring in enclosures.
C. Connect selector switches and other automatic-control selection devices where applicable.

1. Connect selector switches to bypass only those manual- and automatic-control devices that have no safety functions when switch is in manual-control position.
2. Connect selector switches with enclosed-controller circuit in both manual and automatic positions for safety-type control devices such as low- and high-pressure cutouts, high-temperature cutouts, and motor overload protectors.

3.4. FIELD QUALITY CONTROL

A. Perform tests and inspections.
B. Acceptance Testing Preparation:

1. Test insulation resistance for each enclosed controller, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

C. Tests and Inspections:

1. Inspect controllers, wiring, components, connections, and equipment installation. Test and adjust controllers, components, and equipment.
2. Test insulation resistance for each enclosed-controller element, component, connecting motor supply, feeder, and control circuits.
3. Test continuity of each circuit.
4. Verify that voltages at controller locations are within plus or minus 10 percent of motor nameplate rated voltages. If outside this range for any motor, notify Architect before starting the motor(s).
5. Test each motor for proper phase rotation.
6. Perform each electrical test and visual and mechanical inspection stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
7. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
8. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Enclosed controllers will be considered defective if they do not pass tests and inspections.
E. Prepare test and inspection reports. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5. ADJUSTING

A. Set field-adjustable switches and overload-relay pickup and trip ranges.
B. Adjust the trip settings of MCPs and thermal-magnetic circuit breakers with adjustable instantaneous trip elements. Initially adjust to six times the motor nameplate full-load ampere ratings and attempt to start motors several times, allowing for motor cooldown between starts. If tripping occurs on motor inrush, adjust settings in increments until motors start without tripping. Do not exceed eight times the motor full-load amperes (or 11 times for NEMA Premium Efficient motors if required). Where these maximum settings do not allow starting of a motor, notify Architect before increasing settings.

3.6. DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain enclosed controllers.

END OF SECTION 262913

SECTION 264300 – SURGE PROTECTION DEVICES

PART 1 GENERAL

1.1. SCOPE

A. The Contractor shall furnish and install the Surge Protective Device (SPD) equipment having the electrical characteristics, ratings, and modifications as specified herein and as shown on the contract drawings. To maximize performance and reliability and to obtain the lowest possible let-through voltages, the ac surge protection shall be integrated into electrical distribution equipment such as switchgear, switchboards, panelboards, busway (integrated within bus plug), or motor control centers. Refer to related sections for surge requirements in:

1.2. RELATED SECTIONS

A. Reference Section 260010.
B. Section 262413 – Switchboards
C. Section 262416 – Panelboards

1.3. SUBMITTALS

A. The following information shall be submitted to the Engineer:

1. Provide verification that the SPD complies with the required ANSI/UL 1449 3rd Edition listing by Underwriters Laboratories (UL) or other Nationally Recognized Testing Laboratory (NRTL). Compliance may be in the form of a file number that can be verified on UL's website or on any other NRTL's website, as long as the website contains the following information at a minimum: model number, SPD Type, system voltage, phases, modes of protection, Voltage Protection Rating (VPR), and Nominal Discharge Current (I_n).

B. Where applicable the following additional information shall be submitted to the engineer:

1. Descriptive bulletins
2. Product sheets

C. The following information shall be submitted for record purposes:

1. Final as-built drawings and information for items listed in Section 1.04 and shall incorporate all changes made during the manufacturing process

1.4. QUALIFICATIONS

A. The manufacturer of the assembly shall be the manufacturer of the major components within the assembly.
B. For the equipment specified herein, the manufacturer shall be ISO 9001 or 9002 certified.
C. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
D. The SPD shall be compliant with the Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC.
E. SPD units and all components shall be designed, manufactured, and tested in accordance with the latest applicable UL standard (ANSI/UL 1449 3rd Edition).

1.5. DELIVERY, STORAGE AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of manufacturer's instructions shall be included with the equipment at time of shipment.

1.6. OPERATION AND MAINTENANCE MANUALS

A. Operation and maintenance manuals shall be provided with each SPD shipped.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Eaton / Cutler-Hammer products
B. Siemens
C. Square D
D. GE
E. The listing of specific manufacturers above does not imply acceptance of their products that do not meet the specified ratings, features, and functions. Manufacturers listed above are not relieved from meeting these specifications in their entirety. Products in compliance with the specification and manufactured by others not

named will be considered only if pre-approved by the Engineer ten (10) days prior to bid date.

2.2. VOLTAGE SURGE SUPPRESSION – GENERAL

A. Electrical Requirements

1. Unit Operating Voltage – Refer to drawings for operating voltage and unit configuration.
2. Maximum Continuous Operating Voltage (MCOV) – The MCOV shall not be less than 115% of the nominal system operating voltage.
3. The suppression system shall incorporate thermally protected metal-oxide varistors (MOVs) as the core surge suppression component for the service entrance and all other distribution levels. The system shall not utilize silicon avalanche diodes, selenium cells, air gaps, or other components that may crowbar the system voltage leading to system upset or create any environmental hazards.
4. Protection Modes – The SPD must protect all modes of the electrical system being utilized. The required protection modes are indicated by bullets in the following table:

	Protection Modes			
Configuration	L-N	L-G	L-L	N-G
Wye	●	●	●	●

5. Nominal Discharge Current (I_n) – All SPDs applied to the distribution system shall have a 20kA I_n rating regardless of their SPD Type (includes Types 1 and 2) or operating voltage. SPDs having an I_n less than 20kA shall be rejected.
6. ANSI/UL 1449 3rd Edition Voltage Protection Rating (VPR) – The maximum ANSI/UL 1449 3rd Edition VPR for the device shall not exceed the following:

Modes	208Y/120
L-N; L-G; N-G	700
L-L	1200

B. SPD Design

1. Maintenance Free Design – The SPD shall be maintenance free and shall not require any user intervention throughout its life. SPDs containing items such as replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.
2. Balanced Suppression Platform – The surge current shall be equally distributed to all MOV components to ensure equal stressing and maximum performance. The surge suppression platform must provide equal impedance paths to each matched MOV. Designs incorporating replaceable SPD modules shall not be accepted.
3. Electrical Noise Filter – Each unit shall include a high-performance EMI/RFI noise rejection filter. Noise attenuation for electric line noise shall be up to 50 dB from 10 kHz to 100 MHz using the MIL-STD-220A insertion loss test method. Products unable able to meet this specification shall not be accepted.
4. Internal Connections – No plug-in component modules or printed circuit boards shall be used as surge current conductors. All internal components shall be soldered, hardwired with connections utilizing low impedance conductors.
5. Monitoring Diagnostics – Each SPD shall provide the following integral monitoring options:

    a. Protection Status Indicators - Each unit shall have a green / red solid-state indicator light that reports the status of the protection on each phase.

        i. For wye configured units, the indicator lights must report the status of all protection elements and circuitry in the L-N and L-G modes. Wye configured units shall also contain an additional green / red solid-state indicator light that reports the status of the protection elements and circuitry in the N-G mode. SPDs that indicate only the status of the L-N and L-G modes shall not be accepted.
        ii. For delta configured units, the indicator lights must report the status of all protection elements and circuitry in the L-G and L-L modes.
        iii. The absence of a green light and the presence of a red light shall indicate that damage has occurred on the respective phase or mode. All protection status indicators must indicate the actual status of the protection on each phase or mode. If power is removed from any one phase, the indicator lights must continue to indicate the status of the protection on all other phases and protection modes.

Diagnostics packages that simply indicate whether power is present on a particular phase shall not be accepted.

b. Remote Status Monitor – The SPD must include Form C dry contacts (one NO and one NC) for remote annunciation of its status. Both the NO and NC contacts shall change state under any fault condition.

c. Audible Alarm and Silence Button – The SPD shall contain an audible alarm that will be activated under any fault condition. There shall also be an audible alarm silence button used to silence the audible alarm after it has been activated.

d. Surge Counter – The SPD shall be equipped with an LCD display that indicates to the user how many surges have occurred at the location. The surge counter shall trigger each time a surge event with a peak current magnitude of a minimum of 50 ± 20A occurs. A reset pushbutton shall also be standard, allowing the surge counter to be zeroed. The reset button shall contain a mechanism to prevent accidental resetting of the counter via a single, short-duration button press. In order to prevent accidental resetting, the surge counter reset button shall be depressed for a minimum of 2 seconds in order to clear the surge count total.

i. The ongoing surge count shall be stored in non-volatile memory. If power to the SPD is completely interrupted, the ongoing count indicated on the surge counter's display prior to the interruption shall be stored in non-volatile memory and displayed after power is restored. The surge counter's memory shall not require a backup battery in order to achieve this functionality.

6. Overcurrent Protection

a. The unit shall contain thermally protected MOVs. These thermally protected MOVs shall have a thermal protection element packaged together with the MOV in order to achieve overcurrent protection of the MOV. The thermal protection element shall disconnect the MOV(s) from the system in a fail-safe manner should a condition occur that would cause them to enter a thermal runaway condition.

7. Fully Integrated Component Design – All of the SPD's components and diagnostics shall be contained within one discrete assembly. SPDs or individual SPD modules that must be ganged together in order to achieve higher surge current ratings or other functionality shall not be accepted.

8. Safety Requirements

a. The SPD shall minimize potential arc flash hazards by containing no user serviceable / replaceable parts and shall be maintenance free. SPDs containing items such as replaceable modules, replaceable fuses, or replaceable batteries shall not be accepted. SPDs requiring any maintenance of any sort such as periodic tightening of connections shall not be accepted. SPDs requiring user intervention to test the unit via a diagnostic test kit or similar device shall not be accepted.

b. SPDs designed to interface with the electrical assembly via conductors shall require no user contact with the inside of the unit. Such units shall have any required conductors be factory installed.

2.3. SYSTEM APPLICATION

A. The SPD applications covered under this section include distribution and branch panel locations, busway, motor control centers (MCC), switchgear, and switchboard assemblies. All SPDs shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category C, B, and A environments.

B. Surge Current Capacity – The minimum surge current capacity the device is capable of withstanding shall be as shown in the following table:

Minimum surge current capacity based on ANSI / IEEE C62.41 location category			
Category	Application	Per Phase	Per Mode
B	Distribution Panelboards)	160 kA	80 kA
A	Branch Locations (Panelboards, MCCs, Busway)	120 kA	60 kA

C. SPD Type – all SPDs installed on the line side of the service entrance disconnect shall be Type 1 SPDs. All SPDs installed on the load side of the service entrance disconnect shall be Type 1 or Type 2 SPDs.

2.4. LIGHTING AND DISTRIBUTION PANELBOARD REQUIREMENTS

A. The SPD application covered under this section includes lighting and distribution panelboards. The SPD units shall be tested and demonstrate suitability for application within ANSI/IEEE C62.41 Category B environments.

1. The SPD shall be included and mounted within the panelboard by the manufacturer of the panelboard.
2. The SPD shall be of the same manufacturer as the panelboard.
3. The SPD shall not limit the use of through-feed lugs, sub-feed lugs, and sub-feed breaker options.
4. SPDs shall be installed immediately following the load side of the main breaker. SPDs installed in main lug only panelboards shall be installed immediately following the incoming main lugs.
5. The panelboard shall be capable of re-energizing upon removal of the SPD.
6. The SPD shall be interfaced to the panelboard via a direct bus bar connection. Alternately, an SPD connected to a 30A circuit breaker for disconnecting purposes may be installed using short lengths of conductors as long as the conductors originate integrally to the SPD. The SPD shall be located directly adjacent to the 30A circuit breaker.
7. The complete panelboard including the SPD shall be UL67 listed.

PART 3 EXECUTION

3.1. FACTORY TESTING

A. Standard factory tests shall be performed on the equipment under this section. All tests shall be in accordance with the latest version of NEMA and UL standards.

3.2. INSTALLATION

A. The Contractor shall install all equipment per the manufacturer's recommendations and the contract drawings.

3.3. WARRANTY

A. The manufacturer shall provide a full ten (10) year warranty from the date of shipment against any SPD part failure when installed in compliance with manufacturer's written instructions and any applicable national or local code.

END OF SECTION 264300

SECTION 265000 – LIGHTING

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 260500.
B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Product Data:

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
6. Photometric data and adjustment factors based on laboratory tests

B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.
C. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, signed by product manufacturer.
D. Field quality-control test reports.
E. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

PART 2 - PRODUCTS

2.1. INSPECTION

A. Prior to installation of luminaires Electrical Contractor shall inspect luminaire and verify unit meets or exceeds specifications, is new and unused without damage or defect and is suitable for the intended service.
B. See architectural and electrical plans for luminaire locations, coordinate installation with other trades. At the completion of the project all luminaires shall be aligned, level and cleaned to the satisfaction of the A/E.

2.2. EQUIVALENT MANUFACTURERS

A. The following light fixture manufacturers are generally approved equals to those manufacturers listed in the Lighting Fixture Schedule on the drawings. The approval herein no way relieves the contractor of meeting all specification requirements. All light fixtures substituted for fixtures specified on drawings must conform in materials, dimensions, appearance, performance, and be of equal quality to the fixture specified and described in the Lighting Fixture Schedule. Fixture manufacturers not listed here must be submitted and approved a minimum of 10 days prior to bid.
B. Provide luminaires by the following manufacturers:
C. Downlights:

1. Category 1: (Only Category 1 fixtures may be substituted for Category 1 fixtures specified on the drawings). Calculite, Edison Price, Focal Point, Kirlin, Kurt Versen, Rambusch, RSA, USA Lighting, USAI Lighting
2. Category 2: (Category 1 or Category 2 fixtures may be substituted for Category 2 fixtures specified on the drawings). Elite, Halo, Hubbell, Indy, Intense, Lightolier, Lithonia, Marko, Nulite, Pathway, Prescolite, Portfolio, Spectrum, Williams, Zumtobel

D. LED/Fluorescent Troffer Type: Columbia, Cooper (Metalux), Daybrite, Elite, Finelite, Focal Point, Lithonia, Williams

1. Equivalent troffers shall be considered the following: Columbia (PS Series), Cooper (Metalux GC Series), Daybrite (SP Series), Elite (OT Series), Finelite (HPR Series), Lithonia (SP Series), Williams (50 Series)

E. Undercounter: Columbia, Color Kinetics, Daybrite, Elite, Fail-Safe, Lithonia, Metalux, Nulite, Viscor Lighting, WAC, Williams
F. Strip Fluorescents: Birchwood, Columbia, Daybrite, Elite, ILP, Lithonia, Metalux, Paramount, Prudential,

Utopia Lighting, Williams

G. Linear/Tubes: A Light, Corelite, Finelite, Focal Point, Ledalite, Linear Lighting, LiteControl, Mercury Architectural Lighting, Metalumen, Peerless, PMC, Precision, Prudential, Utopia Lighting, Williams, Zumtobel
H. Specialty Lights: Advent, Baselite, Bega, Beta Calco, Casey Architectural, Cole, Crenshaw Lighting, Design Plan, Engineered Lighting Products, Focal Point, G Lighting, iGuzzini, Impact Lighting, Interlux, Juno, Justice Design, Kramer, Louis Poulson, Lighting Services Inc., Neoray, Prudential, Sharper, SPI, Manning, MP Lighting, Sistemalux, Sterner, Tivoli, Trend Lighting, Trimblehouse, Ultra Lights, Visa, Visual Lighting Technologies, WAC, Winona, Zaneen, Zumtobel
I. Indirect: Ametrix, Elliptipar, Engineered Lighting Products, Focal Point, LiteControl, SPI, Zumtobel
J. Industrial: ABS Lighting, Crouse Hinds, Daybrite, Gardco, G.E., Holophane, Hubbell, Lumark, Kim, Lithonia, SPI, Williams
K. Exit Signs and Emergency Lights: Beghelli, Chloride, Concealite, Devine, Dual-Lite, EELP, Elite, Emergi-Lite, Evenlite, Exitronix, Fail-Safe, Hubbell, Lithonia, Prescolite, Surelites, Crouse Hinds, Williams.
L. Security/Vandal Resistant: Daybrite, Eclipse, Failsafe, Holcor, Kenall, Kirlin, L.C. Doane, Moldcast.
M. Hazardous Locations: Appleton, Chloride, Cross-Hinds, Daybrite, Dialight, Dual-Lite, Halo, Hubbell, Kirlin, L.C. Doane, Paramount, Phoenix
N. Outdoor: ABS Lighting, Antique Street Lights, Architectural Area Lighting, Bega, Beta Calco, Daybrite, Devine, Excelsior, Gardco, G.E., Hadco, Hubbell, Holophane, Hydrel, Invue, Kim, King Luminaire, Lithonia, LSI Lighting Systems, Lumark, Lumec, Lumiere, Lumenton, McGraw-Edison, McPhilben, Ruud, Sterner, Stonco, Sun Valley Lighting, US Architectural, Vista Pro, Williams.
O. Track Lighting: Alfa, Bruck, Elite, Halo, Intense, Lithonia, Lightolier, Lighting Services Inc., Lite Lab, Marko, Prescolite
P. LED lamps and Modules: Philips, General Electric, Osram/Sylvania, Cree, Nichia.
Q. LED Power Supplies: Osram/Sylvania, General Electric, Philips.

2.3. LUMINAIRES

A. Provide luminaires complete with lamps and accessories required for hanging. Contractor shall insure that lamps, reflector lens and trim are clean at time of final inspection. Mount recessed luminaires with trim flush to ceilings, free of gaps or cracks.
B. Coordinate mounting of ceiling mounted luminaires with General Contractor. Where additional supports are required due to luminaire location or weight, electrical contractor shall provide supports, unless otherwise specified under ceiling specifications.
C. Consult architectural plans and existing conditions where applicable for ceiling types and provide surface and recessed lighting fixtures with appropriate mounting components and accessories. Verify mounting requirements prior to ordering and shop drawing submission.
D. All fixtures and components mounted in areas lower than 8’-0” or in mechanical, electrical or service type areas subject to circulation of staff or maintenance shall be coordinated prior to installation so as to minimize damage or injury. Any devices or fixtures mounted without coordination/notification with architect that become hazards to walk paths or subject to damage shall be moved at no expense to the owner at the satisfaction of the architect/engineer. (ie. if a fixture can be located a short distance away that avoids a beam or prevents it from being mounted 3” above a persons head that should be coordinated prior to installation)
E. Fixtures mounted in fire rated ceilings shall be provided and installed with fire rated enclosures to maintain ceiling integrity. Provide engineered products by EZ-Barrier, Tenmat or similar products or provide enclosures fabricated in accordance with building code and UL requirements. Maintain all fixture required heat sink and other clearances.

2.4. LED LIGHTING SYSTEMS

A. LED components, lamps, drivers, and fixtures shall comply with: PCC 47 CFR Part 15; UL 8750; ANSI/NEMA Standards C78.377, NEMA SSL-1, C82.77, IESNA Standards TM-16-05, RP-16, LM-79, LM-80 and TM-21.
B. The LED module itself and all its components must not be subject to mechanical stress.
C. Assembly must not damage or destroy conducting paths on the circuit board.
D. Installation of LED modules (with power supplies) shall adhere to all applicable electrical and safety standards.
E. Correct polarity shall be clearly identified.
F. LED module must be protected from unbalanced voltage drop, and/or overload.
G. Ensure that the power supply is of adequate power to operate the load.
H. Install system according to manufacturer’s heat sinking parameters.
I. For applications involving exposure to humidity and dust, the module shall be protected by a fixture or housing with a suitable protection glass. The module shall be protected against condensation water by treatment with an appropriate circuit board conformal coating. The conformal coating should have the following features.

1. Optical transparency
2. UV resistance
3. Thermal expansion properties matching those of the module (15-30 x 10-6cm/cm/K)

4. Low permeability of steam for all climate conditions
5. Resistance against corrosive environments

J. The LED module shall be operated with an electronically stabilized power supply offering protection against short circuits overload and overheating.
K. All drivers used for supplying power to LED arrays in lighting fixtures shall be by the light fixture manufacturer.
L. Drivers shall be integral to the fixture unless otherwise shown or specified.

PART 3 - EXECUTION

3.1. LUMINAIRES

A. All light fixtures shall be cleaned and free of all construction debris. Install units as shown and detailed on the plans and per manufacturers' directions.
B. Reference luminaire schedule on plans for specific luminaire, lamp, and ballast requirements.
C. Reinstall any fixtures called out for relocation or remounting in renovation areas as though they are new fixtures. Make all provisions to properly mount and support existing fixtures being reused.
D. Luminaires submitted must meet or exceed specified luminaire in performance and construction and appearance. Provide luminaires at each location shown on drawings. Luminaires shall be in accordance with type designation on drawings.

3.2. ADJUSTMENTS

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
B. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
C. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
D. Adjust the aim of luminaires in the presence of the Architect.

3.3. FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 265000

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SECTION 265100 – INTERIOR LIGHTING

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 260010.
B. Reference Section 260500 for general requirements of all light fixtures.
C. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS

2.1. LUMINAIRES

A. Provide luminaires complete with lamps and accessories required for hanging. Contractor shall insure that lamps, reflector lens and trim are clean at time of final inspection. Mount recessed luminaires with trim flush to ceilings, free of gaps or cracks.
B. Coordinate mounting of ceiling mounted luminaires with General Contractor. Where additional supports are required due to luminaire location or weight, electrical contractor shall provide supports, unless otherwise specified under ceiling specifications.
C. Consult architectural plans and existing conditions where applicable for ceiling types and provide surface and recessed lighting fixtures with appropriate mounting components and accessories. Verify mounting requirements prior to ordering and shop drawing submission.
D. Fixtures mounted in fire rated ceilings shall be provided and installed with fire rated enclosures to maintain ceiling integrity. Provide engineered products by EZ-Barrier, Tenmat or similar products or provide enclosures fabricated in accordance with building code and UL requirements. Maintain all fixture required heat sink and other clearances.
E. Provide troffer luminaires with the following devices wherever possible and not specified otherwise on the luminaire schedule: cam latches, 100% door gasketing, post fabrication painted finish, t-bar clips, lens clips, suspension tabs, and a minimum of 0.125” lens.

2.2. LAMPS

A. Lamps shall be lamp types recommended by luminaire manufacturer. Lamp no fixtures above manufacturers recommended maximum wattages.

2.3. EMERGENCY LED DRIVER

A. Emergency LED driver specified herein is by Iota (CP Series). Approved equals by Bodine.

1. The emergency driver shall accommodate an LED load with a forward voltage requirement ranging from 10 to 60 VDC.
2. The output voltage sensing shall be automatic and instantaneous with a resulting, inversely-proportional current to maintain constant power to the LED array with an output tolerance of +/- 3%.
3. The unit shall supply the rated load for a minimum of 1 1/2 hours or to 87 1/2% of rated battery terminal voltage.
4. The output power to the LED load during emergency operation shall be held constant (refer to plans for wattage) from minute one throughout the entire emergency run time resulting in no loss or degradation of the light source during emergency operation.
5. The unit shall be furnished with an electronic, AC-lockout circuit which will connect the battery when the AC circuit is activated, and an electronic brownout circuit which will enable a transfer to emergency operation when utility power dips below an acceptable level.

B. Installation

1. Emergency drivers shall be UL-listed for use with respective LED array and/or UL-listed for field installation. Where drivers are only listed for use with a respective LED array, they shall be installed integral to the fixture by the fixture manufacturer.
2. Maximum remote mounting distance of the emergency driver shall be 50-feet

C. Driver: Constant Power emergency LED driver system as indicated on the plans. The emergency driver system shall be UL class 2 certified in accordance with UL 1310 and shall be UL listed for use in damp locations with a temperature range of 0° to 55° C.
D. AC input: Two-wire, universal voltage capable 120 thru 277 VAC, 50/60 Hz and be UL Classified to Category Control Number (CCN) FTBR, Emergency Lighting and Power Equipment, and FTBV, Emergency Light-Emitting-Diode Drivers for field installation.
E. Battery: Self-contained, high-temperature, sealed, maintenance-free nickel cadmium battery rated for a 10-year service life.

F. Charger: two-stage charging system which samples the battery in relation to its temperature, state of charge and input voltage fluctuations. The charger shall be current limited, temperature compensated, short-circuit protected with reverse polarity protection. The unit shall achieve a full recharge in 24-hours.
G. Protection: A low voltage battery disconnect (LVD) circuit shall be provided and will disconnect the load and circuitry from the battery when it reaches approximately 80 to 85% of its nominal terminal voltage, preventing a non-recoverable, deep-discharge condition as well as equipment initialization failure when utility power is restored.
H. Housing: NEMA 250, Type 1 enclosure.
I. Test Push Button: Illuminated push-to-test switch.
J. Provide 5-year warranty.

PART 3 - EXECUTION

3.1. LUMINAIRES

A. Luminaire supports shall comply with the latest edition of the NEC Sections 410-30 and 410-36. Provide luminaire securing clips or otherwise securely fasten fixtures to ceiling grid. At least two support wires shall be connected from the structure above to each troffer style light fixture.

3.2. INSTALLATION

A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
B. All light fixtures shall be cleaned and free of all construction debris. Install units as shown and detailed on the plans and per manufacturers' directions.
C. Support for Lighting Fixtures in or on Grid-Type Suspended Ceilings: Use grid as a support element.

1. Install a minimum of two ceiling support system rods or wires for each fixture. Locate not more than 6 inches from lighting fixture corners.
2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
4. Install at least two independent support rods or wires from structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.
5. Fixtures shall not be supported by the ceiling structure only without being installed in a ceiling listed, designed and installed for proper support of fixtures. Cables, clips, etc may not be omitted without documentation of ceiling capacity and design and installation is listed for such use and as applied for the project.

D. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

E. Air-Handling Lighting Fixtures: Install with dampers open and ready for adjustment.
F. Adjust aimable lighting fixtures to provide required light intensities
G. Recessed luminaires installed in the building thermal envelope shall be sealed to limit air leakage between conditioned and unconditioned spaces. All recessed luminaires shall be IC-rated and labeled as having an air leakage rate not more than 2.0 cfm (0.944 L/s) when tested in accordance with ASTM E 283 at a 1.57 psf (75 Pa) pressure differential. All recessed luminaires shall be sealed with a gasket or caulk between the housing and the interior wall or ceiling covering.
H. Recessed luminaires installed in rated assemblies shall be installed per UL listing requirements to maintain the rating of the construction. Provide sheet rock enclosures or other UL listed manufactured assemblies to maintain rating of construction and listing of fixtures for heat dissipation and clearances.

END OF SECTION 265100

SECTION 265600 – EXTERIOR LIGHTING

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 260010.
B. Reference Section 265000 for general requirements of all light fixtures.
C. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS

2.1. POLES AND SUPPORT COMPONENTS, GENERAL REQUIREMENTS

A. Structural Characteristics: Comply with AASHTO LTS-4.

1. Wind-Load Strength of Poles: Adequate at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of speed indicated in Part 1 "Structural Analysis Criteria for Pole Selection" Article, with a gust factor of 1.3.
2. Strength Analysis: For each pole, multiply the actual equivalent projected area of luminaires and brackets by a factor of 1.1 to obtain the equivalent projected area to be used in pole selection strength analysis.

B. Luminaire Attachment Provisions: Comply with luminaire manufacturers' mounting requirements. Use stainless-steel fasteners and mounting bolts, unless otherwise indicated.
C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.

1. Materials: Shall not cause galvanic action at contact points.
2. Anchor Bolts, Leveling Nuts, Bolt Caps, and Washers: Hot-dip galvanized after fabrication, unless stainless-steel items are indicated.
3. Anchor-Bolt Template: Plywood or steel.

D. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete."

2.2. STEEL POLES

A. Poles: Comply with ASTM A 500, Grade B, carbon steel with a minimum yield of 46,000 psig; 1-piece construction up to 40 feet in height with access handhole in pole wall.

1. Mounting Provisions: Butt flange for bolted mounting on foundation or breakaway support.

B. Steel Mast Arms: [Single-arm] [Truss] [Davit] type, continuously welded to pole attachment plate. Material and finish same as pole.
C. Brackets for Luminaires: Detachable, cantilever, without underbrace.

1. Adapter fitting welded to pole and bracket, then bolted together with stainless-steel bolts.
2. Cross Section: Tapered oval, with straight tubular end section to accommodate luminaire.
3. Match pole material and finish.

D. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.
E. Steps: Fixed steel, with nonslip treads, positioned for 15-inch vertical spacing, alternating on opposite sides of pole; first step at elevation 10 feet above finished grade.
F. Grounding and Bonding Lugs: Welded 1/2-inch threaded lug, complying with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.
G. Cable Support Grip: Wire-mesh type with rotating attachment eye, sized for diameter of cable and rated for a minimum load equal to weight of supported cable times a 5.0 safety factor.
H. Factory-Painted Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Color shall be as selected by Architect.

2.3. POLE ACCESSORIES

A. Base Covers: Manufacturers' standard metal units, arranged to cover pole's mounting bolts and nuts. Finish same as pole.

PART 3 - EXECUTION

3.1. EXTERIOR POLE AND GROUND MOUNTED FIXTURE INSTALLATIONS

A. POLE INSTALLATION

1. Align pole foundations and poles for optimum directional alignment of luminaires and their mounting provisions on the pole.
2. See Evaluations for structural- and soil- engineering coordination.
3. Concrete Pole Foundations: Set anchor bolts according to anchor-bolt templates furnished by pole manufacturer.
4. Foundation-Mounted Poles: Mount pole with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.
    a. Grout void between pole base and foundation. Use nonshrink or expanding concrete grout firmly packed to fill space.
    b. Install base covers, unless otherwise indicated.
    c. Use a short piece of 1/2-inch-diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.
5. Raise and set poles using web fabric slings (not chain or cable).

B. BOLLARD LUMINAIRE INSTALLATION

1. Align units for optimum directional alignment of light distribution.
2. Install on concrete base with top 4 inches above finished grade or surface at bollard location. Cast conduit into base, and shape base to match shape of bollard base. Finish by troweling and rubbing smooth.

C. INSTALLATION OF GROUND-MOUNTED FLOODLIGHT LUMINAIRES

1. Floodlights shall be mounted by stanchion or other similar accessory furnished with fixture – see fixture schedule and details for same.
    a. Mounting of floodlights supported from grade by conduit only (may also be referred to as “junction box” method) is not acceptable.
2. Install on concrete base with top 4 inches above finished grade or surface at luminaire location. Cast conduit and mounting provisions into base, and finish by troweling and rubbing smooth.

D. CORROSION PREVENTION

1. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.
2. Steel Conduits: Comply with Division 26 Section "Raceway and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch- thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

E. GROUNDING

1. Ground metal poles and support structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."
    a. Install grounding electrode for each pole, unless otherwise indicated.
    b. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.
2. Ground nonmetallic poles and support structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."
    a. Install grounding electrode for each pole.
    b. Install grounding conductor and conductor protector.
    c. Ground metallic components of pole accessories and foundations.

END OF SECTION 265600

END OF DIVISION 260000

DIVISION 27
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SECTION 270500 – COMMON WORK FOR COMMUNICATIONS

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Division 26 specifications govern the construction methods, materials and other aspects related to electrical work contained in these Division 27 specifications.

B. Reference

1. Section 260010 - Electrical Provisions
2. Section 260011 - Basic Electrical Materials And Methods
3. Section 260013 - Project Coordination
4. As well as other Division 26 Sections for any other electrical requirements and provisions.

C. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 270500

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SECTION 271100 – COMMUNICATIONS EQUIPMENT ROOM FITTINGS

PART 1 GENERAL

1.1. SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies, and location and size of each field connection.
2. Equipment racks and cabinets: Include workspace requirements and access for cable connections.
3. Grounding: Indicate location of grounding bus bar and its mounting detail.

C. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.

1.2. QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

1. Layout Responsibility: Preparation of Shop Drawings shall be under the direct supervision of RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.
3. Field Inspector: Currently registered by BICSI as RCDD to perform the on-site inspection.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
C. Telecommunications Pathways and Spaces: Comply with TIA/EIA-569-A.
D. Grounding: Comply with ANSI-J-STD-607-A.

1.3. PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install equipment frames and cable trays until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and work above ceilings is complete.

1.4. COORDINATION

A. Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.

1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
2. Record agreements reached in meetings and distribute them to other participants.
3. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.

PART 2 PRODUCTS

2.1. PATHWAYS

A. Cable Support: NRTL labeled. Cable support brackets shall be designed to prevent degradation of cable performance and pinch points that could damage cable. Cable tie slots fasten cable ties to brackets.

1. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
2. Support brackets with cable tie slots for fastening cable ties to brackets.
3. Lacing bars, spools, J-hooks, and D-rings.
4. Straps and other devices.

B. Cable Trays:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cable Management Solutions, Inc.
b. Cablofil Inc.
c. Cooper B-Line, Inc.
d. Cope - Tyco/Allied Tube & Conduit.
e. GS Metals Corp.

2. Cable Tray Materials: Metal, suitable for indoors and protected against corrosion by electroplated zinc galvanizing, complying with ASTM B 633, Type 1, not less than 0.000472 inch thick.

a. Basket Cable Trays: 6 inches wide and 2 inches (50 mm) deep. Wire n exceed 2 by 4 inches (50 by 100 mm).
b. Ladder Cable Trays: Nominally 18 inches wide, and a rung spacing of 12 inches.

C. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems

1. Outlet boxes shall be no smaller than 2 inches (50 mm) wide, 3 inches (75 mm) high, and 2-1/2 inches (64 mm) deep.

2.2. BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96.

2.3. GROUNDING

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
B. Telecommunications Main Bus Bar:

1. Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
2. Ground Bus Bar: Copper, minimum 1/4 inch thick by 4 inches wide with 9/32-inch holes spaced 1-1/8 inches apart.
3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

C. Comply with ANSI-J-STD-607-A.

2.4. LABELING

A. Comply with TIA/EIA-606-A and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

PART 3 EXECUTION

3.1. ENTRANCE FACILITIES

A. Contact telecommunications service provider and arrange for installation of demarcation point, protected entrance terminals, and a housing when so directed by service provider.
B. Install underground pathways complying with recommendations in TIA/EIA-569-A, "Entrance Facilities" Article.
C. Install underground entrance pathway complying with Division 26 Section "Raceway and Boxes for Electrical Systems.

3.2. INSTALLATION

A. Comply with NECA 1.
B. Comply with BICSI TDMM for layout and installation of communications equipment rooms.
C. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A-7.
D. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

3.3. FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping."Comply with TIA/EIA-569-A, Annex A, "Firestopping."
B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.4. GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.
B. Comply with ANSI-J-STD-607-A.
C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.
D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.5. IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.

B. See Division 27 Section "Communications Horizontal Cabling" for additional identificatic Evaluations for discussion of TIA/EIA standard as it applies to this Section.Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration.
C. Labels shall be preprinted or computer-printed type.

END OF SECTION 271100

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SECTION 271300 - COMMUNICATIONS CABLING AND EQUIPMENT

PART 1 GENERAL

1.1. SCOPE OF WORK

A. Provide engineering, labor, materials, apparatus, tools, equipment, and transportation as required to make a complete working communication cabling system installation as specified and indicated

B. Provide a complete telecommunications infrastructure cabling system including:

1. Support systems in the IT Room/Computer Room.
2. Inside plant UTP station cabling, terminations, and outlets.
3. Cable identification tags and system labeling.
4. Conduits and boxes.
5. Telecommunications grounding system.
6. Submittals.
7. Testing.
8. As-built Documents.
9. Warranty.

1.2. REFERENCES

A. Conform to the following:

1. National Electrical Code.
2. National, State, Local and any other binding building and fire codes.
3. Underwriter's Laboratories (UL): Applicable listing and ratings.
4. ANSI/TIA/EIA-568 Commercial Building Telecommunications Cabling Standard – latest current edition.
5. ANSI/TIA/EIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces – latest current edition.
6. ANSI/TIA/EIA-606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings – latest current edition.
7. NECA/BICSI 568-2006 Installing Commercial Building Telecommunications Cabling.

1.3. SYSTEM DESCRIPTION

A. General

1. The telecommunication cabling encompasses the communications infrastructure, and horizontal cabling systems.

B. IT Room/Computer Room

1. Provide LAN (network) equipment racks and modular patch panels in LAN (network) rack to support the cable terminations.

C. Horizontal Distribution

1. Provide horizontal cabling from the IT Room to wall mounted outlets, stand-alone workstations, floor outlets, and modular workstations. Provide each data outlet indicated with one Category 6 cable.

1.4. SUBMITTALS

A. Refer to Section 26 for additional submittal requirements

B. Submit detailed drawings of the IT Room if the proposed installation layout differs from the construction documents. Minimum scale: 1/4" = 1'-0". Revised telecommunication equipment layouts must be approved prior to release of order for equipment and prior to installation.

C. Submit detailed drawings of the cable routing, labeling and device locations. Minimum scale: 1/8" = 1'-0". Layouts must be approved prior to release of order for equipment and prior to installation.

D. Submit the following information for review and approval prior to start of construction.

1. Catalog information for all cables and connectors indicating conformance with NEC, UL, TIA/EIA listings, certifications and specifications.
2. Catalog information for all support equipment and systems, e.g. cable tray, patch panels, etc., showing proof of conformance with relevant NEC, UL, & TIA/EIA listings, certifications and specifications.
3. Catalog information for cable identification tags.

E. Submit the following information for review and approval at the completion of construction:
   1. Test reports.
   2. As-built drawings.
   3. O & M manuals.

1.5. QUALITY ASSURANCE

A. General
   1. Install complete system in a neat, high quality manner acceptable to the district and in conformance with applicable codes and data standards.
   2. Provide new materials of current manufacturer, of highest grade, and without defects of any kind.
   3. Only products and applications listed in this Division may be used on the project.

1.6. PRODUCT DELIVERY AND HANDLING

A. Delivery
   1. Do not deliver telecommunication cabling system components to the site until protected space is available.
   2. Replace and return damaged equipment to manufacturer at no cost to the Owner.

B. Handling
   1. Handle in accordance with manufacturer's written instructions.
   2. Prevent component damage, breakage, denting and scoring. Do not install damaged equipment.

1.7. COORDINATION

A. Coordinate layout and installation of communications equipment with Owner's telecommunications and LAN equipment and service suppliers. Coordinate service entrance arrangement with local exchange carrier.
   1. Meet jointly with telecommunications and LAN equipment suppliers, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
   2. Record agreements reached in meetings and distribute them to other participants.
   3. Adjust arrangements and locations of distribution frames, cross-connects, and patch panels in equipment rooms to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.

PART 2 PRODUCTS

2.1. GENERAL

A. Provide a continuous single cable, homogeneous in nature for every cable run. Splices are not permitted.

2.2. CABLE

A. Horizontal Category 6 Unshielded Twisted Pair (UTP) Cable
   1. Provide cable suitable for indoor installation.
   2. Provide cable with 4 twisted pairs of insulated copper conductors per cable, 24 AWG solid copper, fully insulated with retardant low-smoke thermoplastic material, plenum NEC rated and UL listed as such.
   3. Color code twisted pairs individually, within color coded bundles, to industry standards (ANSI/ICEA Publication S-80-576, and EIA-230).
   4. Comply with TIA/EIA-568, Revision C, 2009 performance requirements for Category 6 UTP cabling.
   5. Provide cable with blue jacket.
   6. Manufacturer
      i. AMP: Category 6 UTP cable
      ii. Belden: Datatwist 2400
      iii. Berk-Tek: LANmark-6
      iv. Commscope: Media 6 cable
      v. Mohawk: 6 LAN cable
      vi. Superior Essex: Series 77

2.3. LAN EQUIPMENT RACK

A. Provide LAN equipment rack(s) and accessories from one manufacturer.

B. Provide LAN equipment rack(s) conforming to TIA/EIA standards with the following features and characteristics and accessories:

1. 19-inch wide, wall-mounted, as indicated, high strength aluminum construction, EIA – 310-D.
2. Loading capacity: 1,400 pounds (635 kg).
3. 19” rack mounting rails with TIA/EIA hole pattern.
4. Equipment mounting hardware: 20 sets for each rack.
5. Vertical cable management.
6. Horizontal cable management, top and bottom.
7. Equipment shelves: None.
8. Grounding lug.
9. Baked-polyester powder coat finish, black.
10. Manufacturers (two-post rack)
    i. Chatsworth CPI:
    ii. Hoffman:
    iii. Hubbell Premise:
    iv. Panduit:

2.4. PATCH PANELS

A. Horizontal Cabling Patch Panel (DCR)

1. One-piece steel construction, modular or punch-down type, suitable for rack mounting, with factory-applied black baked enamel finish, with devices, junction fittings and other matching accessories as required for a complete Category 6 system and per UL 1863.
2. 48-port in 568A configuration. Quantity as required to terminate all data cable runs to data jacks.

2.5. PATCH CABLES

A. Provide two (2) 7’ Cat 6 patch cables for each data jack installed.

2.6. CONNECTORS

A. Category 6 Modular Connectors

1. 8 position modular connector, Category 6 certified, universal label coded for T568A and T568B wiring schemes.
2. Manufacturer
    a. AMP: SL Series, gray.
    b. Panduit: Mini-Com TX6 Series, gray.
    c. Or as approved.

2.7. DATA OUTLETS

A. Provide outlet box, minimum 63-mm (2-1/2 inches) deep and faceplate with number of connection ports as indicated for wall mounted applications.

B. Provide thermoplastic faceplates for wall mounted applications.

C. Provide faceplates for millwork and furniture mounted applications, color as directed by Architect.

D. Faceplate Manufacturer

1. Wall Mounted: Ortronics faceplate, or as approved.

E. Wall Phones

1. Provide a stainless steel keystone wall mount telephone plate with Category 6 jack as specified.

2.8. STRUCTURED MEDIA CABINET

A. Provide structured media cabinet. Typical each unit. Leviton or equal.

B. Media cabinet to include:

1. 1 x 8 telephone splitter
2. 1 x 6 video distribution module for coaxial cable.

3. Surge suppression
4. Fiber termination.
5. Flush cover.
6. All necessary mounting hardware and brackets.

C. Provide 20” wide enclosure for recess mounting in standard 4” wall. Height of panel as required to accommodate necessary components and cabling.

2.9. CABLE TELEVISION

A. Provide and install coxial cable, wall outlets, splitters and connectors as required for cable television.
1. Cable shall be RG-6/U 75-Ohm Coaxial cable with 95 percent braided copper shield and 18 AWG solid copper center conductor. Belden # 9290 or approved equal.
2. Cable shall be plenum rated where installed in return air plenum.

2.10. CABLE MANAGEMENT AND SUPPORT

A. J-Hook Cable Support System
1. Provide J-hooks rated to support Category 6 cable and optical fiber cable, mounted 1500-mm (5-feet) on-center for support of horizontal cabling. Do not exceed 40 percent fill ratio.
2. Provide J-hooks with galvanized steel construction and 90 degree rolled safety edges.
3. Provide latched retainers to contain cables within the hook area.
4. Provide J-hooks with a static load capacity of 30 pounds per hook and fastener hole that accepts 6-mm (1/4-inch) bolts.
5. Manufacturer
i. ERICO: CADDY Cablecat
ii. B-Line: Cable Hook System

2.11. BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches.

2.12. GROUNDING

A. Comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

B. Telecommunications Main Bus Bar:
1. Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
2. Ground Bus Bar: Copper, minimum 1/4 inch thick by 2 inches wide with 9/32-inch holes spaced 1-1/8 inches apart.
3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

C. Comply with ANSI-J-STD-607-A.

2.13. LABELS

A. Horizontal Cables
1. Provide self-laminating adhesive labels on both ends of cables, machine printable with a laser printer suitable for cable diameters installed.
2. Printable Area: 50-mm (2-inch) by 12-mm (1/2-inch).
3. Color: White.
4. Manufacturer:
i. Panduit #PLL-40-Y3-1, ivory

B. Faceplates
1. Provide faceplate labels for all outlet faceplates, machine printable with a laser printer.
2. Color: Gray
3. Manufacturer:
i. Panduit #CPPLF-5

C. Outlets and Patch Panel

1. Provide labels for data cable termination locations, machine printable with a laser printer.
2. Color: Gray
3. Manufacturer:
    i. Panduit #PLL-22-PO-1W

2.14. MISCELLANEOUS COMPONENTS

A. Velcro Cable Ties
1. Provide Velcro cable ties, plenum or non-plenum rated as appropriate for the installation, in the same color as the cable to which it is being applied, 18-mm (¾-inch) with a minimum 50-mm (2-inch) overlap.
2. Manufacturers:
    i. Panduit HLSP Series (Plenum rated)
    ii. Panduit HLS Series (Non-plenum rated).

PART 3 EXECUTION

3.1. GENERAL

A. Install work in a neat, high quality manner and conform to applicable federal, state and local codes.
B. Repair or replace work completed by others that is defaced or destroyed.
C. Install cables in a manner to protect the cable from physical interference or damage.
D. Do not exceed manufacturer's minimum allowance for bend radius of the cable.
E. Do not exceed manufacturer's maximum allowance for pulling tension on cable.
F. Ground all racks and other such components per manufacturer's requirements.

3.2. ENTRANCE FACILITIES

A. Contact telecommunications service provider and arrange for installation of demarcation point, protected entrance terminals, and a housing when so directed by service provider.
B. Install underground pathways complying with recommendations in TIA/EIA-569-A, "Entrance Facilities" Article.
C. Install underground entrance pathway complying with Division 26 Section "Raceway and Boxes for Electrical Systems. “

3.3. INSTALLATION

A. Horizontal Cable
1. Terminate cables with T568A wiring configuration. All terminations must be the same wiring configuration.
2. Terminate data cable in accordance to manufacturer’s instructions and TIA/EIA-568 standard installation practices.
3. Support station cables outside the DCR at 1500-mm (5-feet) on-center using J-hook cable hangers.
4. Do not exceed 90 meters (300-feet) in length from the termination at the user’s faceplate to the termination at the IT room.
5. Enter LAN rack from the top.
6. Provide a minimum of 150-mm (six-inches) of slack sheathed cable behind each station outlet faceplate. Coil the slack cable inside the junction box or raceway as per the cabling manufacturer's installation standards.
7. Route data cables in cable tray in the IT room and from cable tray to the LAN rack and terminate with specified jack into patch panel. Do not support cables to the outside of the cable tray
8. Coil any excess cable in the IT room in an extended loop or figure-8 in the cable tray.
9. Route cables a minimum of 150-mm (6-inches) away from power sources to reduce interference from EMI.
10. Install cables with sufficient bending radius so as not to break or kink, shear or damage binders, or to interfere with transmission in any way.
11. Neatly dress and organize cables in the cable tray. Bundle cables sequentially into groups of 12. Wrap every 600-mm (24-inches) with Velcro cable ties. Do not tightly bundle cables together. Fasten cable to cable tray via Velcro-type straps.
12. Route cable homeruns, parallel and perpendicular to building structure allowing for bending radius, and along corridors for ease of access. Do not route cables through an adjacent space if a corridor borders

at least one wall of the room.

13. Provide permanent machine generated labels on each end of the cable no more than 100-mm (4-inches) from the edge of the cable jacket.
14. Terminate cables in patch panels with Category 6 modular connectors.

B. LAN Equipment Racks
1. Install rack in a secure manner per manufacturer's recommendations and as indicated.
2. Install seismic restraints for LAN racks in accordance with manufacturer's recommendations for seismic zones 3 and 4 or as required by local building code.

C. Patch Panels
1. Install Category 6 patch panels into LAN equipment rack.

D. Outlets and Connectors
1. Provide station outlets with connectors.
2. Provide permanent machine generated clear laminated labels on the front of each faceplate or surface box.

3.4. FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping."Comply with TIA/EIA-569-A, Annex A, "Firestopping."

B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.5. GROUNDING

A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. Comply with ANSI-J-STD-607-A.

C. Locate grounding bus bar to minimize the length of bonding conductors. Fasten to wall allowing at least 2-inch (50-mm) clearance behind the grounding bus bar. Connect grounding bus bar with a minimum No. 4 AWG grounding electrode conductor from grounding bus bar to suitable electrical building ground.

D. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.6. RECORDS

A. Labeling
1. Label the telecommunications system components in conformance with TIA/EIA-606 Administration Standards, including, but are not limited to, the following:
i. Cables (both ends)

B. Permanently mark cable ends with machine-generated or stenciled (not handwritten) wrap-around labels with a self-laminating feature.

C. Permanently mark components, such as racks and patch panels, with machine-generated labels.

3.7. TESTING

A. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check for proper tightness of all electrical connections and in accordance with manufacturer's recommended values.

B. Local Area Network:
1. Testing and Acceptance:
a. Contractor shall provide a thorough testing program for the cabling system. The testing shall be done in accordance with TIA/EIA TSB-95, Level II E performance. All cables shall be tested.
b. All cable lengths shall be recorded as part of the test records.
c. All testing shall be tested with a Category 6 rated cable tester. Contractor shall provide, as part of the system documentation, the type and manufacturer of the test equipment used.
d. All test faults shall be corrected and re-tested.
e. Two (2) copies of the test results shall be provided to the Owner as part of the project documentation. Test results shall be recorded on a floppy disk in a format determined by the Owner.
f. The Owner may choose to randomly check testing results for a sample number of cables. This final acceptance testing shall be conducted by the Contractor and the Owner. Prior to this testing, Contractor shall provide procedures and operating instructions for the test equipment.

3.8. PROJECT CLOSE-OUT

A. Submit prior to final acceptance of System:

1. Test results
    i. Provide test results as herein before specified.
2. Manuals for testing, operation and training including:
    i. 11”x17” prints of record drawings as described above.
    ii. Manufacturer's original catalog information sheets for each component provided under this Section.
    iii. Provide manuals in a white, 3-ring binder with front cover and spine clear pockets for insertion of the manual name and project information. Manual shall be indexed with individual dividers.

END OF SECTION 271300

SECTION 271500 - TELEPHONE/DOOR ENTRY SYSTEM

PART 1 GENERAL

1.1. SCOPE

A. The telephone entry controller shall be designed to communicate over ordinary, voice-grade telephone lines or no phone line/bill system. A visitor shall be able to call a resident's telephone via a directory and keypad to gain access through a locked gate or door. The tenant shall be able grant access to the visitor by pressing a key on the tenant's telephone. The controller shall have nonvolatile memory to manage 140 user telephone numbers and store event transactions.

1. The controller can operate either as a single access point or be fully integrated within an access control network consisting from one to 256 access points.
2. Up to ten telephone entry controllers shall be able to share one telephone line.
3. Field programmable via the keypad
4. The controller shall be equipped with a two-wire, half duplex, RS-485 communication protocol for communicating with access control entry points within the network.
5. The controller shall use a LCD screen for a tenant directory and message indicator. Paper directory for up to 140 names.
6. The controller shall utilize a touch-tone dialing method.
7. Hands-free voice communication shall be standard with the option to equip the controller with a standard telephone handset.
8. The controller enclosure construction shall be weather resistant.
9. Package design will allow surface or flush mounting or mounting within a hooded back box.
10. If the controller is using a modem, the modem shall communicate at 9600 BPS.

1.2. SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data for system components. Include dimensioned plans and elevations showing minimum clearances and installed features and devices. Include list of materials and equipment.

C. Wiring diagrams from manufacturer differentiating between factory- and field-installed wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Indicate components for both field and factory wiring.

D. System operation description covering this specific Project including method of operation and supervision of each type of circuit and sequence of operations for all system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.

E. Operating instructions for mounting at the controller

F. Operation and maintenance data for inclusion in Operating and Maintenance Manual specified in Division 1. Include data for each type product, including all features and operating sequences. Include recommendations for spare parts to be stocked at the site. Provide the names, addresses, and telephone numbers of service organizations that carry stock of repair parts for the system to be furnished.

G. Product certification signed by the manufacturer of the access control system components certifying that their products comply with indicated requirements.

H. Record of field tests of system.

PART 2 PRODUCT

2.1. EQUIPMENT

A. Telephone/Door Entry System shall be Mircom MUS-3140K or equivalent Entraguard.

B. Overall Specifications: The telephone entry controller shall comply with the following specifications and offer selected options.

C. A. Controller Specifications - Controller enclosure dimensions and specification shall be for semi-flush mounting. Furnish with back box and trim ring. Maximum dimensions to be 20"H x 14"W x 4"D. Hooded Mount, 16-gauge metal back box. Lockable and vandal resistant. Finish as directed by Architect.

D. B. Controller Power and Environmental Specifications - Controller shall meet the following power and environmental requirements:

1. Voltage Input: 24 VAC transformer with optional standby power) +/- 10%
2. Current Draw: Less than 1 amp.

3. Power Consumption: Nominal 12 watts.
4. Operating Temperature: Oº - 140º F (-18º - 60º C).

E. C. Input and Output Specifications - Controller shall meet the following minimum Input and Output specifications:
   1. Outputs:
      a. Two nonprogrammable SPDT Dry Circuit Closures.
      b. Two auxiliary programmable SPDT Dry Circuit Closures.
      c. Closure contact Rating: 1 amp at 24 Volts.
   2. Inputs:
      a. Normally Closed (NC) Door Switch Input.
      b. Normally Open (NO) Request To Exit Input.
      c. Normally Open (NO) Auxiliary Input.

F. Keypad Specifications – Keypad design shall be a mechanical, vandal resistant, impact resistant and weatherproof water sealed 4 X 4 keypad designed for use in the most demanding public and outdoor environments. Operational life of the keypad shall be a minimum of four million cycles per key. Specification must meet the following minimum standards and features:
   1. Weatherproof, water sealed to class IP-67 standard.
   2. Ten numeric push-button keys.
   3. Scroll key (2) for directional scrolling of the LCD display of the tenant enrollment list.
   4. Audio volume control key.
   5. A call keys for initiating calls to the tenant.
   6. Clear (Clr) key to re-start a command.
   7. An asterisk (*) function key
   8. Solid-state illumination---no incandescent lighting.
   9. Built-in ESD (voltage surge) protection.

G. Operational Specifications - The telephone entry controller shall have, as a minimum requirement, a visual message and directory display with a directory scrolling and an audio volume control.
   1. LCD Display:
      a. Two line, 20 character, back-lit display.
      b. Three programmable 80 character, 20 character per line revolving message screen.
      c. Up and down scrolling keys with cursor indicator for pointing to tenant name.
      d. Tenant name displayed by scrolling or direct dial code input with option to block tenant name display.
      e. Fifteen-character name truncated to 13 characters with a six-digit dial code.
   2. Audio Control:
      a. Adjustable, linear volume control
      b. Circular control volume key.
      c. Speaker vandal protection hole grid.
      d. Mylar speaker with superior sound quality.

H. Feature Set - The telephone entry controller shall have as standard the minimum feature set:
   1. Field programmable via the keypad
   2. Nonvolatile memory for storing events on a first-in, first-out basis.
   3. Capacity to manage 140 tenant dial codes.
   4. Programmable dial codes from one to four digits.
   5. Programmable telephone numbers up to 15-digit numbers.
   6. PBX operation.
   7. Built-in surge protection.
   8. Code breaking protection.
   9. Tone dialing.
   10. Alarm shunt and alarm output.
   11. Two Programmable Form C relay outputs

I. Optional Features - The telephone entry controller must offer the following optional features:
   1. Postal Lock provision.
   2. TDD option.

3. Braille keypad provision.
4. Local or Wide area network communication (LAN or WAN) with adapter.
5. Flush or hooded mounting option.
6. Hands free or handset audio communication.

PART 3 EXECUTION

3.1. WARRANTY

A. The manufacturer shall ensure that the equipment is free from defects in design, material, manufacturing and operation.
B. The factory shall provide a warranty to repair or replace its equipment that fails as the result of normal usage.
C. Warranty period is two years from the purchase date.
D. User is responsible for freight costs to the factory.
E. For items under warranty, the manufacturer will bear the cost for freight to return the equipment to the user.
F. The manufacturer is not responsible for damage due to shipping or user mishandling.

3.2. EQUIPMENT INSTALLATION

A. Furnish and install a complete Telephone/Door Entry System as described herein and as shown on the plans; to be wired, connected, and left in first class operating condition. Include sufficient control unit(s), annunciator(s), power supplies, wiring, terminations, electrical boxes, and all other necessary material for a complete operating system.

END OF SECTION 271500

END OF DIVISION 270000

DIVISION 28
TABLE OF CONTENTS

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SECTION 280500 – COMMON WORK FOR ELECTRONIC SAFETY & SECURITY

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Division 26 specifications govern the construction methods, materials and other aspects related to electrical work contained in these Division 28 specifications.

B. Reference

1. Section 260010 - Electrical Provisions
2. Section 260011 - Basic Electrical Materials And Methods
3. Section 260013 - Project Coordination
4. As well as other Division 26 Sections for any other electrical requirements and provisions.

C. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 280500

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SECTION 284605 – CONDUCTORS/CABLES FOR ELECTRONIC SAFETY & SECURITY

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Section 280500
B. Division 26 Sections for other electrical requirements and provisions.
C. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2. SUMMARY

A. Section Includes:

1. Fire alarm wire and cable.

1.3. SUBMITTALS

A. Product Data: For each type of wire/cable to be installed.

1.4. QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.5. PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 PRODUCTS

2.1. PATHWAYS

A. Support of Open Cabling: NRTL labeled for support of cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Lacing bars, spools, J-hooks, and D-rings.
3. Straps and other devices.

B. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.

2.2. FIRE ALARM WIRE AND CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Honeywell Cable
2. Belden
3. West Penn Wire
4. Allied Wire and Cable

B. General Wire and Cable Requirements:

1. NRTL listed and labeled as complying with NFPA 70, Article 760.
2. Generally, cable insulation color shall be red. Refer to Part 3, Execution for further direction.

C. Signaling Line Circuits:

1. Areas/cables requiring Level 0 or Level 1 Survivability (per NFPA 72):

a. Unshielded twisted pair (UTP), minimum No. 16 AWG unless larger size recommended by system manufacturer.

2. Areas/cables requiring Level 2 or Level 3 Survivability (per NFPA 72):

a. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a 2-hour rating.
b. UTP Cable (per C.1) where installed in a rated enclosure (chase, etc.)

D. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.

PART 3 EXECUTION

3.1. INSTALLATION OF PATHWAYS

A. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." for installation of conduits and wireways.

3.2. FIRE ALARM WIRING INSTALLATION

A. Comply with NECA 1 and NFPA 72.
B. Wiring Method:

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system where exposed. This system shall not be used for any other wire or cable.

    a. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.

3. Fire-Rated Cables: Use of 2-hour, fire-rated fire alarm cables, NFPA 70, Types MI and CI, is permitted.
4. Signaling Line Circuits: Power-limited fire alarm cables may be installed in the same cable or raceway as signaling line circuits.

C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
E. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red. Generally cabling shall be red.
F. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.
G. Wiring to Remote Alarm Transmitting Device: 1-inch (25-mm) conduit between the fire alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.3. CONNECTIONS

A. Comply with requirements in Division 28 Section "Fire Detection and Alarm" for connecting, terminating, and identifying wires and cables.

3.4. GROUNDING

A. For low-voltage wiring and cabling, comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems."

3.5. IDENTIFICATION

A. Identify system components, wiring, and cabling. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.6. FIELD QUALITY CONTROL

A. Perform tests and inspections.

END OF SECTION 284605

SECTION 284611 – FIRE SENSORS AND DETECTORS

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Section 280500
B. Section 284620 for existing fire alarm systems
C. Section 284621 for new fire alarm systems
D. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Product Data: For each type of product indicated.
B. Refer to fire alarm system section for additional requirements.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Devices specified herein shall be by the same manufacturer and/or family as the fire alarm system control panel.

2.2. SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
3. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
5. Integral Visual-Indicating Light: LED type indicating detector has operated.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Remote test/indicator switch(es).
7. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.3. NON-SYSTEM SMOKE DETECTORS

A. Refer to Section 262726 – Wiring Devices.

2.4. HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.
B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg Fper minute unless otherwise indicated.

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F.

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

PART 3 EXECUTION

3.1. EQUIPMENT INSTALLATION

A. Smoke- or Heat-Detector Spacing:

1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
3. Smooth ceiling spacing shall not exceed 30 feet.
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to NFPA 72.
5. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.
6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture.
7. Fire alarm panels and power extenders: Provide smoke detectors above all panels and components as required by NFPA.

B. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.
C. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.
D. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.
E. Provide wire guards over all indicating devices or devices subject to damage in gymnasium or similar spaces.

3.2. IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.3. FIELD QUALITY CONTROL

A. Refer to general fire alarm system requirements.

END OF SECTION 284611

SECTION 284612 – OTHER INITIATING DEVICES

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Section 280500
B. Section 284620 for existing fire alarm systems
C. Section 284621 for new fire alarm systems
D. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Product Data: For each type of product indicated.
B. Refer to fire alarm system section for additional requirements.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Devices specified herein shall be by the same manufacturer and/or family as the fire alarm system control panel.

2.2. MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key- or wrench-operated switch.
3. Indoor Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.
4. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

2.3. ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.
B. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall or to circuit-breaker shunt trip for power shutdown.
C. Provide same at all waterflow and/or tamper switches, and as otherwise required to furnish a complete and operational system.

1. Exact locations shall be coordinated with fire sprinkler contractor.

PART 3 EXECUTION

3.1. EQUIPMENT INSTALLATION

A. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.
B. Device Location-Indicating Lights: Locate in public space near the device they monitor.

3.2. IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.3. FIELD QUALITY CONTROL

A. Refer to general fire alarm system requirements.

END OF SECTION 284612

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SECTION 284613 – OTHER FIRE ALARM DEVICES

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Section 280500
B. Section 284620 for existing fire alarm systems
C. Section 284621 for new fire alarm systems
D. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Product Data: For each type of product indicated.
B. Refer to fire alarm system section for additional requirements.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Devices specified herein shall be by the same manufacturer and/or family as the fire alarm system control panel.

2.2. MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.

1. Electromagnet: Requires no more than 3 W to develop 25-lbf holding force.
2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
3. Rating: 24-V ac or dc.

B. Material and Finish: Match door hardware.

2.3. REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Flush cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

PART 3 EXECUTION

3.1. EQUIPMENT INSTALLATION

A. Magnetic door holders shall be powered from fire alarm system.
B. Refer to fire alarm system section for door holder operation.
C. Annunciator: Install with top of panel not more than 54 inches above the finished floor.

3.2. IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.3. FIELD QUALITY CONTROL

A. Refer to general fire alarm system requirements.

END OF SECTION 284613

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SECTION 284621 – DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Section 280500
B. Section 284611 for detection devices
C. Section 284612 for other initiating devices
D. Section 284613 for other fire alarm devices
E. Section 284623 for notification devices
F. Section 284624 for central station monitoring equipment
G. Division 26 Sections for other electrical requirements and provisions.
H. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2. SYSTEM DESCRIPTION

A. Noncoded, addressable system, with multiplexed signal transmission, dedicated to fire-alarm service only.
B. Provide all components required for a complete fire alarm system as shown on plans and as necessary to comply with adopted codes and to coordinate with other trades on the project.

1.3. SUBMITTALS

A. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:

    a. Trained and certified by manufacturer in fire-alarm system design.
    b. NICET-certified fire-alarm technician, Level III minimum.

B. Product Data: For each type of product indicated.
C. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.

1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
2. Include voltage drop calculations for notification appliance circuits.
3. Include battery-size calculations.
4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
5. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
6. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

D. Delegated-Design Submittal: For smoke and heat detectors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Drawings showing the location of each smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the detector.
2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72.

E. Qualification Data: For qualified Installer.
F. Field quality-control reports.
G. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name

and include the following:

a. Frequency of testing of installed components.
b. Frequency of inspection of installed components.
c. Requirements and recommendations related to results of maintenance.
d. Manufacturer's user training manuals.
e. Manufacturer's required maintenance related to system warranty requirements.
f. Abbreviated operating instructions for mounting at fire-alarm control unit.
g. Copy of NFPA 25.

H. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.4. QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level III technician.
C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.
D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.5. SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.
B. Technical Support: Beginning with Substantial Completion, provide software support for two years.
C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Simplex
2. Notifier
3. Siemens Building Technologies, Inc.
4. EST (Edwards)
5. Autocall
6. Gamewell-FCI
7. Silent Knight
8. Kidde

2.2. SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Automatic sprinkler system water flow.
5. Heat detectors in elevator shaft and pit.
6. Fire-extinguishing system operation.
7. Fire standpipe system.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm-notification appliances.
2. Identify alarm at the fire-alarm control unit and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Unlock electric door locks in designated egress paths.
5. Release fire and smoke doors held open by magnetic door holders.
6. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.

7. Disable all fans required to be shut down by code requirements including HVLS fans.
8. Recall elevators to primary or alternate recall floors.
9. Activate emergency lighting control.
10. Activate emergency shutoffs for gas and fuel supplies.
11. Record events in the system memory.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Duct smoke detectors.
2. Valve supervisory switch.
3. Low-air-pressure switch of a dry-pipe sprinkler system.
4. Elevator shunt-trip supervision.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at fire-alarm control unit.
4. Ground or a single break in fire-alarm control unit internal circuits.
5. Abnormal ac voltage at fire-alarm control unit.
6. Break in standby battery circuitry.
7. Failure of battery charging.
8. Abnormal position of any switch at fire-alarm control unit or annunciator.
9. Fire-pump power failure, including a dead-phase or phase-reversal condition.
10. Low-air-pressure switch operation on a dry-pipe or preaction sprinkler system.

E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators.

2.3. FIRE-ALARM CONTROL UNIT

A. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.

a. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
b. Include a real-time clock for time annotation of events on the event recorder and printer.

2. System Capacity:

a. Supports up to 100 addressable points as standard.
b. Expandable with optional loop expansion modules.

3. Addressable control circuits for operation of mechanical equipment.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 2 line(s) of 40 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

C. Circuits:

1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class A.

a. Install no more than 50 addressable devices on each signaling line circuit.

2. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class B.

a. Install no more than 50 addressable devices on each signaling line circuit.

D. Elevator Recall:

1. Smoke detectors at the following locations shall initiate automatic elevator recall.

a. Elevator lobby detectors except the lobby detector on the designated floor.
b. Smoke detector in elevator machine room.

c. Smoke detectors in elevator hoistway.

2. Elevator lobby detectors located on the designated recall floors shall be programmed to move the cars to the alternate recall floor.
3. Water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.

a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.

E. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke barrier walls shall be connected to fire-alarm system.
F. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.
G. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.

1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.

H. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries: Sealed lead calcium.

I. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

PART 3 EXECUTION

3.1. EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.
B. Equipment Mounting: Install fire-alarm control unit on finished floor with tops of cabinets not more than 72 inches above the finished floor.
C. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 72 inches above the finished floor.
D. Power Extenders: Located in electrical closets, mechanical spaces or otherwise in unobtrusive locations. Extenders in shell spaces shall be located in unobtrusive locations and not in locations that will conflict with future buildout. Provide smoke detectors above panels.

3.2. CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Division 08 Section "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Alarm-initiating connection to smoke-control system (smoke management) at firefighter smoke-control system panel.
2. Alarm-initiating connection to elevator recall system and components.
3. Alarm-initiating connection to activate emergency lighting control.
4. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
5. Supervisory connections at valve supervisory switches.
6. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
7. Supervisory connections at elevator shunt trip breaker.
8. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
9. Supervisory connections at fire-pump engine control panel.

3.3. IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.4. GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.5. FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction.
B. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.
    a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
    b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

C. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
D. Fire-alarm system will be considered defective if it does not pass tests and inspections.
E. Prepare test and inspection reports.
F. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
G. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

END OF SECTION 284621

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SECTION 284623 – FIRE ALARM NOTIFICATION APPLIANCES

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Section 280500
B. Section 284620 for existing fire alarm systems
C. Section 284621 for new fire alarm systems
D. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Product Data: For each type of product indicated.
B. Refer to fire alarm system section for additional requirements.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Devices specified herein shall be by the same manufacturer and/or family as the fire alarm system control panel.

2.2. GENERAL REQUIREMENTS

A. Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.
2. Audio notification appliances located in sleeping spaces (as defined by NFPA) shall produce a low-frequency (520 hz) audible signal.
3. Mounting: Wall mounted unless otherwise indicated.
4. Mounting Faceplate: Factory finished. Coordinate red or white color of device with architect.

2.3. AUDIBLE NOTIFICATION REQUIREMENTS

A. Chimes, Low-Level Output: Vibrating type, 75-dBA minimum rated output.
B. Chimes, High-Level Output: Vibrating type, 81-dBA minimum rated output.
C. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.

2.4. VISIBLE NOTIFICATION REQUIREMENTS

A. Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.

1. Rated Light Output:
    a. 15/30/75/110 cd, selectable in the field.
2. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
3. Flashing shall be in a temporal pattern, synchronized with other units.
4. Strobe Leads: Factory connected to screw terminals.

PART 3 EXECUTION

3.1. EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for notification devices.
B. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.
C. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling.
D. Provide wire guards over all indicating devices or devices subject to damage in gymnasium or similar spaces.

3.2. IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.3. FIELD QUALITY CONTROL

A. Refer to general fire alarm system requirements.

END OF SECTION 284623

SECTION 284624 – FIRE ALARM INTERFACES TO REMOTE MONITORING

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Section 280500
B. Section 284620 for existing fire alarm systems
C. Section 284621 for new fire alarm systems
D. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

A. Product Data: For each type of product indicated.
B. Refer to fire alarm system section for additional requirements.

PART 2 PRODUCTS

2.1. MANUFACTURERS

A. Equipment specified herein shall be by the same manufacturer and/or family as the fire alarm system control panel, or listed for use with same.

2.2. DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.
B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture one telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.
C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply or loss of power.
5. Low battery.
6. Abnormal test signal.
7. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.
F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.3. FIRE ALARM WIRELESS/CELLULAR COMMUNICATOR

A. Communicator shall be acceptable for reporting to remote central station and shall comply with UL 864 and be listed and labeled by an NRTL.
B. Communicator may be used as a sole communications method or as part of multiple communications technologies in conjunction with the DACT.

1. Cellular signal shall operate on 2G, 3G, or 4G networks.

C. Self-Test: Conducted automatically as required by adopted version of NFPA 72.

PART 3 EXECUTION

3.1. EQUIPMENT INSTALLATION

A. Comply with NFPA 72

3.2. CONNECTIONS

A. Make connections from control panel and/or DACT to supervisory station.

1. Connection to station shall be by two of the following methods:

   a. Dedicated telephone line (POTS / Plain Old Telephone Service)
   b. IP (including Voice over IP)
   c. Cellular

2. Connection methods shall comply with all applicable sections of NFPA 72 (edition as adopted by state and/or local AHJ) and local/state fire marshal requirements.

3.3. IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.4. FIELD QUALITY CONTROL

A. Refer to general fire alarm system requirements.

END OF SECTION 284624

SECTION 285300 – AREA OF RESCUE/REFUGE ASSISTANCE SYSTEMS

PART 1 GENERAL

1.1. RELATED DOCUMENTS

A. Reference Section 260500 for Electrical Provisions as well as Section 260510 and other Division 26 Sections for other electrical requirements and provisions.
B. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SYSTEM DESCRIPTION

A. Furnish, install, and wire all equipment associated with the installation of an Audio-Visual Rescue Assistance Signal System to comply with ADA requirements. This work shall include a main annunciator panel, remote call stations, power supply, outlet boxes, cables and wiring as shown on the drawings and as specified herein
B. Section Includes: Furnish, install, and wire all equipment associated with the installation of a Digital Area of Refuge/Area of Rescue Assistance Signal System designed for IBC-2012 and ADA (Americans with Disabilities Act) requirements. This work shall include a main control panel, optional remote control panels, an internal modem, optional proprietary field switches for systems over 8 zones, remote call stations, power supply(s), outlet boxes, cables and wiring as shown on the drawings and as specified herein.

1.3. SUBMITTALS

A. General: Data sheets on all equipment being provided as well as recommended cable types. Internal control cabinet drawings showing internal block diagram connections shall be provided. Wiring diagrams showing typical field wiring connections, as well as single line floor plan indicating equipment locations, cable routings and quantities.
B. Product Data: Submit product data, including manufacturer's (Specifications-Data) product sheet, for specified products.
C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including anchorage and accessories. Include cabling diagrams, wiring diagrams, station installation details, and equipment cabinet details.
D. Quality Assurance Submittals: Submit the following:

1. Test Reports: Certified test reports showing compliance with specified performance characteristics.
2. Manufacturer's Instructions: Manufacturer's installation instructions.
3. Manufacturer's Field Reports: Manufacturer's field reports specified herein.

E. Closeout Submittals: Submit the following:

1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section.
2. Warranty: Warranty documents specified herein.

F. Project Closeout

1. A one-year maintenance contract offering continued factory authorized service of this system shall be provided as part of this contract.
2. The contractor shall furnish manufacturer's manuals of the completed system including individual specifications sheets, schematics, inter-panel and intra-panel wiring diagrams.
    a. All information necessary for the proper maintenance and operation of the system must be included.
    b. Provide four copies.
3. As built drawings that include changes to wiring, wiring designations, junction box labeling, and other pertinent information shall be supplied upon completion of the project.
4. Provide a minimum of two (2) hours of in-service training with the system.
    a. These sessions shall be broken into segments that will facilitate the training of the system users in operating station equipment.
    b. Operating manuals and user’s guides shall be provided at the time of training.

1.4. WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.
B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

1. Warranty Period: [Specify term.] years commencing on the Date of Substantial Completion.
   All materials and installation shall be guaranteed to be free of defects in material and workmanship for one year after final acceptance of installation and tests.

1.5. INSTALLATION STANDARDS

A. The system shall be installed in accordance with the IBC-2009 and ADA (Americans with Disabilities Act) requirements.
B. The completed system shall be in compliance with state and local electrical codes.
C. All wiring shall test free from grounds and shorts.
D. Install according to the manufacturer's wiring diagrams.
E. The Digital Emergency Communications System requires installation by factory trained authorized dealers/distributors, in accordance with ANSI/NFPA 70 National Electrical Code. and NFPA 72 Fire Alarm Code.
F. Properly trained personnel, familiar with Telecommunications Industry Associations 568 TIA/EIA standard, are required for proper installation. Failure to terminate the wiring correctly will cause damage to the system and void the warranty.
G. The Digital Emergency Communication System shall be installed in a controlled, indoor dry environment, with temperatures maintained between 55°F and 95°F.

PART 2 PRODUCT

2.1. SYSTEM OPERATIONS

A. Furnish, install, and place into operation a Digital Rescue Assistance System as indicated on the drawings and as specified herein.
B. A common control panel shall be provided at the main building entrance or other location as authorized by local authority or the fire department where shown on the drawings to indicate light and tone signals from multiple remote call stations and allow voice communication. Optionally, up to four secondary panels can also be installed throughout the building to allow alternate locations to respond to a call for assistance.

1. When the system is operational, a LED signals power on.
2. When the remote call station switch is activated, a one shot tone is made at the call station and a LED is lit that is steady. The call is displayed digitally on the control panel(s) with a tone along with a display of the call and its location on a 40-character LCD four line display.
3. When the alarm signal is answered by the control panel, the remote call station is signaled by the LED flashing that voice communication is initiated.
4. Voice communication with the remote call station can then be initiated from the control panel via a handset.
5. External modem connection to a public telephone system shall be provided after a programmable time delay.
6. The system shall poll (supervise) all the call stations, control panels and field switches on a continuous basis at least every 200 seconds to identify line faults and defective equipment. Faults will be alerted and displayed at the control panel(s).

2.2. RESCUE ASSISTANCE-AUDIO/VISUAL EQUIPMENT

A. Manufacturer:

1. Cornell Communications, Inc.
2. Siemens Building Technologies, Inc.
3. Simplex.
4. Notifier
5. Farenhyt

2.3. RESCUE ASSISTANCE-DIGITAL SYSTEM AND COMPONENTS

A. Equipment

1. This system shall consist of multiple remote call stations, which will communicate with one to five control panels and have access to an analog "POTS" telephone line for external alarm notification and two-way voice communication. Expansion Switches will also be utilized when the number of call stations exceeds eight.
2. The digital communication system shall be based on Ethernet/CobraNet technology. It consists of four primary components, a Control Panel, Call Station(s), Expansion Switch(es) and Power Supplies. In any given system there will be at least one Control Panel and between one and 255 Call Stations. The system will support a maximum of five Control Panels. For larger systems, Expansion Switches may be used. The Expansion Switch is based on the Control Panel hardware design. The Control Panel and Expansion Switch are eight port proprietary switches. The Control Panel and/or Expansion Switches power the

Remote Call Stations. The system interconnects using standard CAT-5 cable. The Ethernet restriction of 100m of cable between a Control Panel and/or Expansion Switch and endpoint applies.

3. System also requires (1) Pair #16 AWG, stranded, non-shielded cable, from the PS to the Control Panels/Switches for power and (1) Pair #22 AWG, stranded, non-shielded cable, circulating from the PS to all the Power Detect (J9) connections on the Control Panel.

B. Control Panel(s)

1. When the system is operational, a LED signals power on. When the system is operating in battery power mode a different LED will be on.
2. The main control panel shall be a CORNELL Model A-4800M or remote control panel shall be a CORNELL Model A-4800R, with capacity for 255 zones utilizing Ethernet/CobraNet technology. The panel can be surface mounted at the Main Fire Department Entrance to the building or other location as authorized by the local authority or fire department.
    a. Verify locations with the Local Fire Marshal and the Architect.
3. A LCD display shall display the first three zones in alarm status. Up to 255 zones can be seen via a scroll button.
    a. Each zone alarm will be identified by a building identifier, the floor location, and the description of the area.
    b. In the case of an electrical fault: a system fault LED light on the control panel shall illuminate, the fault location will be shown on the LCD display and the alarm shall emit a repeating sound.
4. An audible alarm shall be mounted on the annunciator panel, which will emit a minimum sound level of 90 db at 30 cm when a remote zone station calls.
    a. Depressing the select zone switch will answer a call and open the intercom line to the first zone displayed. You can talk to the zone via the handset, which operates in full duplex mode.
    b. Depressing the select switch again will end the call, change the call status to answered, move the next call to the first line of the display, which allows you to repeat step 4 above answering the next call.
    c. If you desire to review all calls: press the scroll button to step through the list of calls.
5. The control panel shall have operating directions as well as both alarm and voice mute buttons.
6. The power supply shall be a 24VDC emergency battery backup, CORNELL model B-5243B or B-5248A. Additional power supplies may be required for larger systems.
7. The internal modem will place a call to a designated location via a dedicated Analog “POTS” telephone line to notify them of the alarm after a user programmed delay to allow for local response.
8. The system will be configured via a USB flash drive and laptop computer.
9. Raw call data can be optionally logged via the RS-232 terminal interface to a device such as a laptop or desktop computer.

C. Remote Call Stations

1. The remote call station shall be CORNELL Model 4800V, with a momentary switch, microphone, and loudspeaker utilizing Ethernet/CobraNet technology.
2. The station shall have hands free voice communication with the control panel.
3. The station shall have silk-screened operating instructions.
4. The Cornell Model 4800V shall be Vandal Resistant. The standard two gang mounting plate can be flush or surface mounted and incorporates heavy-duty switches and speakers along with stainless steel plates.

D. Field Switches

1. The field switch shall be CORNELL Model ES-4808 with 8 ports utilizing Ethernet/CobraNet proprietary technology.

2.4. SOURCE QUALITY

A. Source Quality: Obtain rescue assistance equipment and system from a single manufacturer.

PART 3 EXECUTION

3.1. MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation.

3.2. EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other

sections, are acceptable for product installation in accordance with manufacturer's instructions.

3.3. INSTALLATION

A. Cabling Requirements

1. Wiring from the control panel to secondary control panels, field switches and the call stations shall be industry standard CAT-5 cable.
2. Power requires (1) Pair #16 AWG, stranded, non-shielded cable, from the PS to the Control Panels/Switches for power and (1) Pair #22 AWG, stranded, non-shielded cable, circulating from the PS to all of the Power Detect (J9) connections on the Control Panel.
3. Verify cable types with the Rescue Assistance System Manufacturer.

B. Rescue Assistance Signal System - Audio/Visual Installation

1. Complete system shall be installed in strict accordance with manufacturer's recommendations.
2. Wiring shall be installed in raceways throughout the building.

    a. Conduit, if required, shall be 1/2" minimum. Depending upon local building codes, plenum rated or fire rated cable may be required.

3.4. FIELD QUALITY REQUIREMENTS

A. Site Tests (Post Installation Testing): Checkout final connections to the system shall be made by a factory technician authorized by the manufacturer of the products installed.

1. Factory authorized technicians shall demonstrate operation of the complete system and each major component to the staff.
2. System field wiring diagrams shall be provided to the subcontractor by the manufacturer prior to installation.

B. Inspection: Perform a complete functional test of the system upon completion of the installation and instruct the staff in the operation and maintenance of the system.

3.5. CLEANING

A. Cleaning: Repair or replace damaged installed products. Remove construction debris from project site and legally dispose of debris.

END OF SECTION 285300

END OF DIVISION 280000

SECTION 31 10 00
SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, and abandoning site utilities in place.
7. Temporary erosion and sedimentation control.

1.3 DEFINITIONS

A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.

D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, public roadway, and site improvements that establishes preconstruction conditions that might be

misconstrued as damage caused by site clearing or other construction. Documentation area shall include all onsite area and a minimum of 40 feet beyond the grading limits on all sides.

1. Use sufficiently detailed photographs or video recordings.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.6 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises.

C. Utility Locator Service: Notify Missouri One Call for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

E. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."

1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Verify that trees, shrubs, and other vegetation to remain and that protection zones have been identified and enclosed in accordance with the plans.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

A. Protect trees and plants remaining on-site in accordance with the plans.

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by the Owner.

3.4 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.

1. Arrange with utility companies to shut off indicated utilities.

B. Locate, identify, and disconnect utilities indicated to be abandoned in place.

C. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's written permission.

D. Excavate for and remove underground utilities indicated to be removed.

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.

2. For all trees, shrubs, or other woody vegetation indicated to be removed, remove the entire stump and associated root ball and roots.
3. Remove all organic material offsite, except for topsoil.
4. Chip removed tree branches and remove offsite.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth 6 inches (average) in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

1. Limit height of topsoil stockpiles in accordance with City of Lee’s Summit requirements.
2. Do not stockpile topsoil within protection zones.
3. Stockpile surplus topsoil to allow for respreading deeper topsoil.
4. Dispose of surplus topsoil on-site if quantities exceed respreading deeper topsoil areas, in areas coordinated with the Owner.
5. Do not remove topsoil offsite.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable soil, obstructions, demolished materials including pavement, and waste materials including trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 10 00

SECTION 31 20 00
EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Geotechnical Report dated March 15, 2021, prepared by Engineering Surveys & Services. A copy of the report is included within the Project Manual.

1.2 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
3. Excavating and backfilling for buildings and structures.
4. Subbase course for concrete walks, and pavements.
5. Subbase course and base course for asphalt paving.
6. Subsurface drainage backfill for walls and trenches.
7. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Requirements:

1. Section 311000 "Site Clearing" for site stripping, grubbing, stripping, and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
2. Section 329200 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Owner. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Owner. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

F. Fill: Soil materials used to raise existing grades.

G. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material 3/4 cu. yd. (0.57 cu. m) or more in volume that exceed a standard penetration resistance of 100 blows/2 inches (97 blows/50 mm) when tested by the project geotechnical testing agency, according to ASTM D 1586.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete walk.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.4 SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Warning tapes.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D 2487.
2. Laboratory compaction curve according to [ASTM D 698] [ASTM D 1557].

C. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.6 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Utility Locator Service: Notify “Missouri One Call” for area where Project is located before beginning earth-moving operations.

C. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in the Civil Plans, project SWPPP, and Section 311000 "Site Clearing" are in place.

1.7 SITE BALANCE

A. Project shall be constructed to the grades and elevations shown in the project plans.

1. Include temporary storage and delayed hauling because of site constraints, construction staging, and construction schedule.
2. Contractor shall coordinate with engineer to balance earthwork on site without import or export.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soils which meet structural fill material requirements, per the project geotechnical report.

C. Unsatisfactory Soils: Low density, low strength, pumping, rutted soils and soils which do not meet structural fill material requirements, per the project geotechnical report.

1. Unsatisfactory soils also include satisfactory soils not maintained within optimum moisture content allowances per the geotechnical report, at time of compaction.
2. Soils that fail proof roll tests.

D. Subbase Material: Subbase material shall meet the crushed stone base MoDOT requirements of Section 1007 of the current Missouri Standards for Highway Construction, Type 5.

E. Engineered Fill: Soil or granular fill containing sufficient fines to establish a moisture/density relationship.

F. Bedding Course: Per ASTM C33 #67 or approved equal.

2.2 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

A. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Architect. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; and soil, boulders, and other materials not classified as rock or unauthorized excavation.

    a. Intermittent drilling; blasting, if permitted; ram hammering; or ripping of material not classified as rock excavation is earth excavation.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended as bearing surfaces.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 6 inches (300 mm) each side of pipe or conduit, or as indicated on the drawings.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
1. Excavate trenches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trench Bottoms: Excavate trenches 4 inches (100 mm) deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

1. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

E. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

3.8 SUBGRADE INSPECTION

A. Notify Owner when excavations have reached required subgrade.

B. If Owner determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes) to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph (5 km/h).
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Owner, and replace with compacted backfill or fill as directed.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Owner, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by the Owner.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Owner.

3.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
2. Adhere to all City of Lee’s Summit soil stockpile requirements.
3. Soil material that is not intended to be used elsewhere onsite shall be removed from the site within 2 weeks of excavation.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring, bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings with lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa).

D. Trenches under Vehicular Pavement: Place and compact backfill of Subbase material to the bottom of the roadway pavement and a minimum 1 foot beyond edge of pavement in all directions.

E. Backfill voids with satisfactory soil while removing shoring and bracing.

F. Place and compact initial backfill of engineered fill, free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the pipe or conduit.

   a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

G. Warning Tape: Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.13 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use satisfactory soil material.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within optimum moisture content as indicated in the project geotechnical report.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content as indicated in the project geotechnical report.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under building slabs, compact each layer of backfill or fill soil material at least 95 percent.
2. Under walkways, structures, steps, and pavements, compact each layer of backfill or fill soil material at least 95 percent.
3. Under natural grass turf or landscaped areas, compact each layer of backfill or fill soil material at least 95 percent to achieve bottom topsoil layer elevation, topsoil surface material shall be compacted to at least 80 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at least 95 percent.

3.16 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch (25 mm).
2. Walks: Plus or minus 1/2 inch (13 mm).
3. Pavements: Plus or minus 1/2 inch (13 mm).

3.17 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course under pavements and walks as follows:

1. Shape subbase course to required crown elevations and cross-slope grades.
2. Place subbase course 6 inches (150 mm) or less in compacted thickness in a single layer.
3. Place subbase course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
4. Compact subbase course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.18 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place drainage course 6 inches (150 mm) or less in compacted thickness in a single layer.
3. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.19 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

C. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:

1. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length but no fewer than two tests.
2. Paved areas, sidewalks, and other potential structural areas: At each compacted backfill layer, at least one test for every 3,600 square feet, but in no case fewer than 3 tests per lift.

D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.20 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by the Engineer; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and materials, including unsatisfactory soil for fill placement on Owner’s property, as directed by the Owner.

B. Remove trash, waste materials, and debris, and legally dispose of them off Owner's property.

END OF SECTION 31 20 00

SECTION 32 12 16
ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Hot-mix asphalt paving.
2. Asphalt surface treatments.

1.3 DEFINITION

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.

1. Job-Mix Designs: For each job mix proposed for the Work. All mix designs shall be less than 18 months old.

B. Qualification Data: For qualified manufacturer and Installer.

C. Material Certificates: For each paving material, from manufacturer.

D. Material Test Reports: For each paving material, less than 18 months old.

E. Wheel Stops: Manufacturer information including intended installation procedure.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of the current MoDOT Standard Specifications for Highway Construction for asphalt paving work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Prime Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
2. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
4. Asphalt Base Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.
5. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Type 5 Aggregate: Per the current MoDOT Standard Specifications for Highway Construction.

2.2 ASPHALT MATERIALS

A. All asphalt material shall conform to the current MoDOT Standard Specifications for Highway Construction.

B. Water: Potable.

2.3 AUXILIARY MATERIALS

A. Herbicide: Commercial chemical for weed control, registered by the EPA. Provide in granular, liquid, or wettable powder form.

B. Sand: ASTM D 1073 or AASHTO M 29, Grade Nos. 2 or 3.

2.4 MIXES

A. Hot-Mix Asphalt: Per the current MoDOT Standard Specifications for Highway Construction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph (5 km/h).
2. Proof roll with a pneumatic tired loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Owner, and replace with compacted backfill or fill as directed.

C. Proceed with paving only after unsatisfactory conditions have been corrected.

D. Verify that utilities, traffic loop detectors, and other items requiring a cut and installation beneath the asphalt surface have been completed and that asphalt surface has been repaired flush with adjacent asphalt prior to beginning installation of imprinted asphalt.

3.2 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.20 gal./sq. yd. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

C. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.3 HOT-MIX ASPHALT PLACING

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt base course per current MoDOT Standard Specifications for Highway Construction.

B. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.4 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.5 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Minimum Asphaltic Course Density: At least 98 percent of reference laboratory density according to ASTM D 6927.
2. Minimum Bituminous Course Density: At least 95 percent of reference lab density according to ASTM D 6927.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.6 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch (13 mm).
2. Surface Course: Plus 1/4 inch (6 mm), no minus.

B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:

1. Base Course: 1/4 inch (6 mm).
2. Surface Course: 1/8 inch (3 mm).
3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch (6 mm).

C. The paving tolerances noted above do not control in regards to site accessibility, and providing accessible routes in accordance with the American with Disabilities Act of 1990 and the 2010 ADA Standards for Accessible Design. Accessible routes shall meet the following:

1. Sidewalks shall not exceed 5% (1'-0" in 20'-0") slope with a 2% (1'-0" in 50'-0") cross-slope and shall be 5' wide except as noted on site plan.
2. Parking areas for accessible spaces and access isles shall not exceed a 2% (1'-0" in 50'-0") in any direction.
3. Ramps shall not exceed 8.33% (1'-0" in 12'-0") slope with a 2% (1'-0" in 50'-0") cross-slope and shall be 5' wide except as noted on site layout plan.
4. All sidewalk intersections shall have a 5' x 5' landing at 1/4" per 1' max slope in all directions.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field testing, frequency, and methods may vary as determined by and between the Owner and the Owner’s Testing Agency.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. Asphaltic surface and base courses shall be randomly cored at a minimum rate of 1 core per 10,000 square feet of paving, but not less than 3 cores in light duty areas and 3 cores in heavy-duty areas shall be obtained. Asphaltic concrete pavement samples shall be tested for conformance with mix design.

E. Immediately replace and compact hot-mix asphalt where core tests were taken.

F. Thickness Test: Measure thickness of each core sample taken. The thickness of the course or the combined courses shall meet or exceed the indicated thickness. Where the deficiency exists, remove the affected pavement area and replace it with new pavement or, at discretion of Owner, correct deficient paving thickness with tack coat and minimum 1-in overlay.

G. Field density test for in-place materials:

1. Density test shall be conducted on each core sample taken in accordance with ASTM D1188 or D2726 as applicable.
2. In-place density tests by nuclear method in accordance with ASTM D2950 shall also be taken as necessary to assure the specified density is obtained. Nuclear density shall be correlated with ASTM D1188 or D2726.

H. Check all pavement for ponding area. Correct all areas to drain via method acceptable by Owenr.

I. Remove and replace unacceptable areas as directed by Owner.

J. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.8 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow milled materials to accumulate on-site.

END OF SECTION 32 12 16

SECTION 32 13 13
CONCRETE PAVING

PART 1 - **GENERAL**

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Driveways.
2. Roadways.
3. Parking lots.
4. Curbs and gutters.
5. Walks.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Other Action Submittals:

1. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Qualification Data: For qualified ready-mix concrete manufacturer.

D. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Welded wire fabric.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Joint fillers.

E. Material Test Reports: For each of the following:

1. Aggregates.
   a. Testing data within past 6 months indicating absence of deleterious expansion of concrete due to alkali-aggregate reactivity.
   b. Gradation Tests.
   c. All standard MoDOT aggregate tests.
   d. MoDOT acceptance letters of aggregate to quarry for similar uses with this project. Letters shall be less than 2 years old.

1.5 QUALITY ASSURANCE

A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

B. ACI Publications: Comply with ACI 301 (ACI 301M) unless otherwise indicated.

1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

1. Use flexible or uniformly curved forms for curves with a radius of 100 feet (30.5 m) or less. Do not use notched and bent forms.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

A. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, fabricated from galvanized-steel wire into flat sheets.

B. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420) plain-steel bars. Cut bars true to length with ends square and free of burrs.

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C150, Type I or II Portland cement.

B. Normal-Weight Aggregates: ASTM C 33, certified to meet MoDOT Type D Rock Per MoDOT Section 1005 “Aggregate for Concrete”, uniformly graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: Potable and complying with ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.4 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Axim Italcementi Group, Inc.; Caltexol CIMFILM.
b. BASF Construction Chemicals, LLC; Confilm.
c. ChemMasters; Spray-Film.
d. Conspec by Dayton Superior; Aquafilm.
e. Dayton Superior Corporation; Sure Film (J-74).
f. Edoco by Dayton Superior; BurkeFilm.
g. Euclid Chemical Company (The), an RPM company; Eucobar.
h. Kaufman Products, Inc.; VaporAid.
i. Lambert Corporation; LAMBCO Skin.
j. L&M Construction Chemicals, Inc.; E-CON.

k. Meadows, W. R., Inc.; EVAPRE.
l. Metalcrete Industries; Waterhold.
m. Nox-Crete Products Group; MONOFILM.
n. Sika Corporation, Inc.; SikaFilm.
o. SpecChem, LLC; Spec Film.
p. Symons by Dayton Superior; Finishing Aid.
q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
r. Unitex; PRO-FILM.
s. Vexcon Chemicals Inc.; Certi-Vex EnvioAssist.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Available Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Anti-Hydro International, Inc.; A-H Curing Compound #2 DR WB.
b. ChemMasters; Safe-Cure Clear.
c. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
d. Euclid Chemical Company (The), an RPM company; Kurez W VOX.
e. Kaufman Products, Inc.; Thinfilm 420.
f. Lambert Corporation; AQUA KURE - CLEAR.
g. L&M Construction Chemicals, Inc.; L&M CURE R.
h. Meadows, W. R., Inc.; 1100-CLEAR SERIES.
i. Nox-Crete Products Group; Resin Cure E.
j. SpecChem, LLC; PaveCure Rez.
k. Symons by Dayton Superior; Resi-Chem Clear.
l. Tamms Industries, Inc., Euclid Chemical Company (The); TAMMSCURE WB 30C.
m. Vexcon Chemicals Inc.; Certi-Vex Enviocure 100.

2.5 RELATED MATERIALS

A. Joint Fillers: Resilient premolded bituminous impregnated fiberboard units complying with ASTM D994, D1751, D2628; FS HH-F-341, Type II Class A.

B. Joint Sealants: ASTM C920, non-priming, pourable, self-leveling polyurethane.

C. Water repellent and chloride screen: Prosoco Saltguard WB, or approved equal.

2.6 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301 (ACI 301M), for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that meet or exceed requirements.

B. Proportion mixtures to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 4000 psi (27.6 MPa).

2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm). A maximum of 8 inches with admixtures.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content: 6 percent plus or minus 1.5 percent for 3/4-inch (19-mm) nominal maximum aggregate size.

D. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use plasticizing and retarding admixture in concrete as required for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

E. Cementitious Materials: Limit percentage by weight of cementitious materials other than portland cement according to ACI 301 (ACI 301M) requirements for concrete exposed to deicing chemicals.

2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction. Limit vehicle speed to 3 mph (5 km/h).
2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch (13 mm) according to requirements in Division 31 Section "Earth Moving."

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.5 JOINTS

A. General: Form expansion, sawed or premolded strip, and keyed construction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.
2. Install as indicated in the project civil plans.

B. Keyed Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
2. Construct joints in accordance with details as shown in Plans.

C. Expansion Joints: Locate expansion joints as shown and detailed in the civil plans and as follows:

1. Locate expansion joints at intervals of 150 feet maximum each way unless otherwise indicated.
2. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Sawed or Premolded Strip Joints: Provide a joint plan for approval by Owner. Joint spacing shall not exceed 15 feet maximum. Panels shall be cut such that panels are nearly square and do not exceed 1.4 length to width ratio.

1. Construct joints for depth equal to at least 1/3 of the concrete thickness.
2. Sawed Joints: Form joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3-mm-) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/8-inch (3-mm) radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

F. Joint Fillers: Extend joint filler full-width and depth of joint, and not less than ½-inch or more than 1-inch below finished surface where joint sealer is indicated. Furnish joint filler in 1-piece lengths for full width being placed, wherever possible. Where more than 1 length is required, lace or clip joint filler sections together.

G. Joint sealants: Joints shall be sealed with approved exterior pavement joint sealants and shall be installed in accordance with manufacturer's recommendations.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 (ACI 301M) requirements for measuring, mixing, transporting, and placing concrete.

E. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

F. Consolidate concrete according to ACI 301 (ACI 301M) by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating dowels and joint devices.

G. Screed paving surface with a straightedge and strike off.

H. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

I. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

J. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

K. Cold-Weather Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306R-10 and the following:

1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

L. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

3.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306R-10 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by curing compound as follows:

1. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas that have been subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

F. Apply water repellent and chloride screen Prosoco Saltguard WB as directed by manufacturer to the following locations:

1. New sidewalks and accessible ramps.
2. New concrete landings, stairs, and patios at exterior doors.

3.9 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 and as follows:

1. Elevation: 3/4 inch (19 mm).
2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/2 inch (13 mm).
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches (13 mm per 300 mm) of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch (25 mm).
6. Vertical Alignment of Dowels: 1/4 inch (6 mm).
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches (6 mm per 300 mm) of dowel.
8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.

B. The paving tolerances noted above do not control in regards to site accessibility, and providing accessible routes in accordance with the American with Disabilities Act of 1990 and the 2010 ADA Standards for Accessible Design. Accessible routes shall meet the following:

1. Sidewalks shall not exceed 5% (1'-0" in 20'-0") slope with a 2% (1'-0" in 50'-0") cross-slope.
2. Parking areas for accessible spaces and access isles shall not exceed a 2% (1'-0" in 50'-0") slope in any direction.
3. Ramps shall not exceed 8.33% (1'-0" in 12'-0") slope with a 2% (1'-0" in 50'-0") cross-slope.
4. All sidewalk intersections shall have a 5' x 5' landing with a 2% (1/4" in 1') max slope in all directions.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 50 cu. yd. (38 cu. m) or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when it is 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of four standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test one specimen at seven days, two specimens at 28 days and hold one specimen in reserve for future testing, if needed.

    a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

D. Test results shall be reported in writing to Owner, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Sonoscope or other nondestructive device may be permitted by Owner but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Owner.

G. Concrete paving will be considered defective if it does not pass tests and inspections.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Prepare test and inspection reports.

3.11 REPAIRS AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Owner.

B. Drill test cores, where directed by Owner, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 13 13

SECTION 32 13 73
CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cold-applied joint sealants.

B. Related Sections:

1. Division 32 Section "Concrete Paving" for constructing joints in concrete pavement.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated. Indicate sealant color.

B. Pavement Joint Plan: Include the following information:

1. Plan with all joint locations and joint types for all concrete areas.
2. Joint-sealant manufacturer and product name for each joint type.
3. Base plan on concrete pavement joint detail in civil plans.

C. Product Certificates: For each type of joint sealant and accessory, from manufacturer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Installer shall be adequately trained and experienced to install per Manufacturer's published installation requirements.

B. Source Limitations: Obtain each type of joint sealant from single source from single manufacturer.

1.5 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
2. When joint substrates are wet.
3. Where joint widths are less than or greater than those allowed by joint-sealant manufacturer for applications indicated.

4. Where contaminants capable of interfering with adhesion have not yet been removed from joint areas.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

B. Colors of Exposed Joint Sealants: Concrete gray.

2.2 COLD-APPLIED JOINT SEALANTS

A. Single-Component, Nonsag, Silicone Joint Sealant for Concrete: ASTM D 5893, Type NS.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Crafco Inc., an ERGON company; RoadSaver Silicone.
b. Dow Corning Corporation; 888.
c. Pecora Corporation; 301 NS.

B. Single-Component, Self-Leveling, Silicone Joint Sealant for Concrete: ASTM D 5893, Type SL.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Crafco Inc., an ERGON company; RoadSaver Silicone SL.
b. Dow Corning Corporation; 890-SL.
c. Pecora Corporation; 300 SL.

C. Single-component, non-priming, gun-grade, Nonsag, Urethane, Elastomeric Joint Sealant: ASTM C920, Type S, Grade NS, Class 35, for Use NT, M, A, T, O, and I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. MasterSeal NP 1

D. Single-component, non-priming, self-leveling, Traffic-Grade, Urethane Joint Sealant for Concrete: ASTM C 920, Type S, Grade P, Class 35, for Use T, M, NT, A, and O.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. MasterSeal SL 1.

2.3 JOINT-SEALANT BACKER MATERIALS

A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.

2.4 PRIMERS

A. Primers: Do no use products that require primers.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions. Joints shall be free of all debris, dirt, etc, and shall have clean, fully exposed concrete on all sides.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install joint-sealant backings of kind indicated to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of joint-sealant backings.
2. Do not stretch, twist, puncture, or tear joint-sealant backings.
3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place joint sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:

1. Remove excess joint sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING

A. Clean off excess joint sealant or sealant smears adjacent to joints as the Work progresses, by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

3.6 PAVEMENT JOINT SEALANT SCHEDULE

A. Per Pavement Joint Plan submitted by Contractor and approved by Engineer.

B. Per concrete pavement joint detail in civil plans.

END OF SECTION 32 13 73

SECTION 32 13 80
PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Painting and marking of pavements and curbs.

1.2 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO)

1. AASHTO M248 - Ready-Mixed White and Yellow Traffic Paints.

B. ASTM International (ASTM)

1. ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness by Notched Gauges.

C. Federal Specifications (FS)

1. FS A-A-2886 - Paint, Traffic, Solvent Based (supersedes FS TT-P-85 and FS TT-P-115, Type I).
2. FS TT-P-1952 - Paint, Traffic and Airfield Marking, Waterborne.

1.3 SUBMITTALS

A. Product Data: For each pavement marking product. Include technical data and tested physical and performance properties.

1.4 PROJECT CONDITIONS

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize flagmen, barricades, warning signs, and warning lights as required.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 deg F (12.8 deg C), and not exceeding 95 deg F (35 deg C).

1.5 QUALITY ASSURANCE

A. Use trained and experienced personnel in applying the products and operating the equipment required for properly performed work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Paint shall be waterborne or solvent borne, colors as shown or specified herein. Pavement marking paints shall comply with applicable state and local laws enacted to ensure compliance with Federal Clean Air Standards. Paint materials shall conform to the restrictions of the local Air Pollution Control District.

B. Waterborne Paint: Paints shall conform to FS TT-P-1952,

C. Solvent Borne Paint: Paint shall conform to FS A-A-2886 or AASHTO M248. Paint shall be non-bleeding, quick-drying, and alkyd petroleum base paint suitable for traffic-bearing surface and be mixed in accordance with manufacture's instructions before application for colors White, Yellow, Blue, and Red.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the work area and correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Sweep and clean surface to eliminate loose material and dust.

B. New pavement surfaces shall be allowed to cure for not less than 30 days before application of marking materials.

3.3 APPLICATION

A. Apply two coats of paint at manufacturer's recommended rate, without addition of thinner, with maximum of 100 square feet per gallon or as required to provide a minimum wet film thickness of 15 mils and dry film thickness of 7 ½ mils per coat. Paint shall be applied for a total dry film thickness of 15 mils. Apply with mechanical equipment to produce uniform straight edges. At sidewalk curbs and crosswalks, use straightedge to ensure uniform, clean, and straight stripe.

B. Install pavement markings according to manufacturer's recommended procedures for the specified material.

C. Following items shall be painted with colors noted below:

1. Pedestrian Crosswalks: White
2. Fire Lanes: Red if curbs are indicated to be marked in Civil Construction Plans.

3. Lane Striping where separating traffic moving in opposite directions: Yellow
4. Lane Striping where separating traffic moving in the same direction: White
5. ADA Symbols: Blue
6. ADA parking space markings: Blue as shown on the Civil Construction Plans.
7. Parking Stall Striping: Yellow

D. See the Civil Site Plans for additional striping colors.

3.4 FIELD QUALITY CONTROL

A. Inspection: After the paint has thoroughly dried, visually inspect the entire application and touch up as required to provide clean, straight lines and surfaces throughout.

3.5 CLEANING

A. Waste materials shall be removed at the end of each workday. Upon completion of the work, all containers and debris shall be removed from the site. Paint spots upon adjacent surfaces shall be carefully removed by approved procedures that will not damage the surfaces and the entire job left clean and acceptable.

END OF SECTION 32 13 80

SECTION 328400 - PLANTING IRRIGATION

PART 1 - GENERAL

A. Related Documents

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

B. Description: Provide an underground irrigation system as specified in the areas indicated in the project civil site plans. The work includes:

1. Automatic irrigation system including piping, fittings, sprinkler heads and accessories.
2. Pumps, valves, backflow preventers, and fittings.
3. Controllers, control wires.
4. Testing.
5. Excavating and backfilling irrigation system work.
6. Provide two hose bibs installed in a valve access box tied into irrigation system. Location of hose bibs shall be directed by Owner.
7. The irrigation system shall have a rain sensor shutoff switch.
8. Contractor shall provide an operating manual for the irrigation system to the Owner and Property Management.
9. Contractor shall provide an “as-built” irrigation system layout to the Owner and Property Management.

C. Performance Requirements

1. Irrigation zone control shall be automatic operation with controller and automatic control valves.
2. Location of Sprinklers and Specialties: Maintain 100 percent irrigation coverage of areas indicated.
3. Delegated Design: Design 100 percent coverage irrigation system using performance requirements and design criteria indicated.
4. Minimum Working Pressures: The following are minimum pressure requirements for piping, valves, and specialties unless otherwise indicated:
   a. Irrigation Main Piping: 200 psi.
   b. Circuit Piping: 150 psi.

PART 2 - QUALITY ASSURANCE

A. Installer's Qualifications: Minimum of 3 years experience installing irrigation systems of comparable size.F

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Submit manufacturer's product data and installation instructions for each of the systems components.

C. Coordination Drawings: Irrigation systems, drawn to scale, on which components are shown and coordinated with each other, using input from Installers of the items involved. Also include adjustments necessary to avoid plantings and obstructions such as signs and light standards. Include piping layout and details illustrating location and types of sprinkler heads, valves, control systems and wiring and list of fittings. Include water meter sizing.

D. Drawing to scale of water meter and backflow preventer in separate pits with all valves and tap to main indicated.

E. Manufacturer product data for pits and all components.

F. Wiring Diagrams: For power, signal, and control wiring.

G. Zoning Chart: Show each irrigation zone and its control valve.

H. Controller Timing Schedule: Indicate timing settings for each automatic controller zone.

I. Field quality-control reports.

D. Upon irrigation system acceptance, submit written operating and maintenance instructions for sprinklers, controllers, and automatic control valves. Provide additional format and contents as directed by the Owner.

1. Submit as-built drawings of all installed irrigation systems. Legibly mark drawings to record actual construction.

PART 4 - PROJECT CONDITIONS

A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:

1. Notify Owner no fewer than two days in advance of proposed interruption of water service.
2. Do not proceed with interruption of water service without Owner's written permission.

B. Protect existing trees, plants, lawns and other features.

C. Promptly repair damage to adjacent facilities caused by irrigation system work operations. All repairs shall be made at the Contractor's expense.

D. The exact locations of piping, sprinkler beads, valves, and other components shall be acceptable to the Owner.

E. Minor adjustments in system layout will be permitted to clear existing fixed obstructions. The final system layout shall be acceptable to the Owner.

PART 5 - MATERIALS

A. General:

1. Provide only new materials, without flaws or defects and of the highest quality of their specified class and kind.

B. Plastic Pipe, Fittings and Connections:

1. Polyvinyl Chloride Pipe: ASTM D2241, rigid, un-plasticized PVC, extruded from virgin parent material. Provide pipe homogeneous throughout and free from visible cracks, holes, foreign materials, blisters, wrinkles and dents.

a. Irrigation Sleeving - Schedule 40.

b. Irrigation Piping - 200 PSI PVC pipe.

C. Electrical Control Wire:

1. Electrical control and ground wire: Type UF 600 volt AWG control cable #16 or larger (#14 - 1 UL F single strand).

D. Backflow preventer to have bronze modular body construction, Celcon check seats, stainless steel trim and durable tight seating rubber disc. Equipment to have gate valves and test cocks. To meet standards: ASSE #1015, AWWA C506-78, CSA B64.5, FOCCHR of USC.

E. Valves to be minimally pressure noted at 200 PSI, electric, globe type, corrosion resistant glass filled nylon with self-cleaning nylon screen, brass flow control stem, manual external bleed, stainless steel studs and flange nuts.

F. Rotor Pop - up Sprinklers - full or part circle shall be a single nozzle, water lubricated, turbine drive type with internal impact speed reduction. The part circle sprinkler shall have adjustable arc coverage from 30 degrees to 360 degrees (full circle) setting. Arc adjustment shall have a non-strippable drive mechanism and a pressure activated, multi-function, soft elastomer wiper scale that positively seals against the nozzle flange.

G. Spray Heads: Double swing joints at all heads, to include 2 feet of black linear low density polyethylene material with wall thickness of .100 inch and maximum operating pressure of 80 PSI at 110 degrees Fahrenheit to be used in conjunction with 2 thermoplastic barbs.

H. Spray heads to have multi-function wiper seal, stainless steel retract spring, adjustable flow, filter screen. All heads to be pop-up type.

I. Timer to be electronic type with minimum of 7 stations, 1 to 23 automatic starts per day, 14-day calendar dial for every day, weatherproof plastic cabinet, master on-off switch, reset circuit breaker. 2.1 A holding - 3.0 A break, UL listed and tested, multi valve station capacity.

J. Water meters shall be obtained from the City of Lee’s Summit. Contractor shall be responsible for all fees associated with irrigation meter installation and acceptance by the City of Lee’s Summit.

K. Obtain backflow preventers and pits as detailed in the Civil Site Plans. All aspects of system shall be acceptable by the City of Lee’s Summit.

PART 6 - ACCESSORIES

A. Pipe Trench Fill: Clean soil free of stones, foreign matter, organic material and debris. Abrasive materials with a fractional coefficient to wear away or damage the pipes outer surface shall not be used as fill in pipe trenches.

B. Low Voltage Wire Connectors: Socket seal type wire connectors and waterproof sealer (Rainbird ST-03 UL wire connector PT-SF sealant), or equal.

C. Valve Access Boxes: Tapered enclosure of rigid plastic material comprised of fibrous components chemically inert and unaffected by moisture corrosion and temperature changes. Provide lid of same material, green in color.

PART 7 - INSTALLATION

A. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending

C. Earthwork: Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

D. Install all irrigation lines with a minimum cover of 12 inches based on finished grades.

E. Piping Installation:

1. Install piping at minimum uniform slope of 0.5 percent down toward drain valves.
2. Install piping free of sags and bends.
3. Install groups of pipes parallel to each other, spaced to permit valve servicing.
4. Install fittings for changes in direction and branch connections.
5. Install underground thermoplastic piping according to ASTM D 2774 and ASTM F 690.
6. Install expansion loops in control-valve boxes for plastic piping.
7. Lay piping on solid subbase, uniformly sloped without humps or depressions.
8. Install PVC piping in dry weather when temperature is above 40 deg F (5 deg C). Allow joints to cure at least 24 hours at temperatures above 40 deg F (5 deg C) before testing.
9. Flush dirt and debris from piping before installing sprinklers and other devices.

F. Sprinklers, Fittings, Valves and Accessories:

1. Locate sprinkler heads to assure proper coverage of indicated areas.
2. Install in-ground control valves in a valve access box as necessary for a complete system.
3. Install valve access boxes on a suitable base of gravel to provide a level foundation at a proper grade and to provide drainage of the access box.
4. Seal threaded connections on both sides of control valves with Teflon tape of approved plastic joint type compound.

G. Control Wiring:

1. Install electrical control cable in the piping trenches wherever possible. Place the wire in the trench adjacent to the pipe. Install wire with slack to allow for thermal expansion and

contraction. Expansion joints in wire may be provided at 200-foot intervals by making 5-6 turns of the wire around a piece of 1/2 inch pipe instead of slack. Where necessary to run wire in a separate trench, provide a minimum cover of 12 inches.

2. Provide sufficient slack (15-16 turns of wire around a pencil) at site connections at remote control valves in control boxes, and at all wire splices to allow raising the valve bonnet of splice to the surface without disconnecting the wires when repair is required.

H. Sleeves:

1. Install pipe sleeves under existing concrete or asphalt surface by boring. Where piping is to be located under paved areas which are adjacent to turf areas, install the piping in the turf areas.

I. Control System Installation:

1. Install all control systems interior in locations indicated in Civil site and MEP plans.
2. Install control cable in same trench as irrigation piping and beside piping. Provide conductors of size not smaller than recommended by controller manufacturer. Install cable in separate sleeve under paved areas.

J. Install all meters, backflow preventers, and pits per City of Lee's Summit requirements.

K. Connections: Comply with all City of Lee's Summit requirements.

PART 8 - FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, operate controllers and automatic control valves to confirm proper system operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Any irrigation product will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

D. Adjust settings of controllers.

E. Adjust automatic control valves to provide flow rate at rated operating pressure required for each sprinkler circuit.

F. Adjust sprinklers and devices, except those intended to be mounted aboveground, so they will be flush with, or not more than [1/2 inch (13 mm)] <Insert value> above, finish grade

G. Adjust sprinklers after installation for proper and adequate distribution of the water over the coverage pattern. Adjust for the proper arc of coverage.

H. Test and demonstrate the controller by operating appropriate day, hour, and station selection features and required to automatically start and shut down irrigation cycles to accommodate vegetation and weather conditions.

PART 9 - DISPOSAL OF WASTE MATERIAL

A. Stockpile, haul from site, and legally dispose of waste materials, including unsuitable excavated materials, rocks, trash, and debris.

PART 10 - ACCEPTANCE

A. Test and demonstrate to the Owner the satisfactory operation of the system, free of leaks.

B. Instruct the Owner's designated personnel in the operation of the system, including adjustment of sprinklers, controllers, valves, pump controls and moisture sensing controls.

C. Obtain approval of water meter/backflow preventer system by the City of Lee’s Summit.

D. Upon acceptance, the Owner will assume operation and maintenance of the system.

PART 11 - CLEANING

A. Perform cleaning during installation of the work and upon completion of the work. Remove from site all excess materials, soil, debris and equipment.

END OF SECTION 328400

SECTION 32 92 00 - TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Hydroseeding.

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

D. Planting Soil: Existing, on-site topsoil meeting the definition in Section 31 10 00 Site Clearing, stockpiled during grading operations and not heavy compacted.

E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 REQUIRED SUBMITTALS

A. Qualification Data: For landscape Installer.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1. Certification of each seed mixture for turfgrass sod. Include identification and location of source and name and telephone number of supplier.

C. Product Certificates: For fertilizers, from manufacturer.

D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

E. Product specifications and certifications for Hydroseed. Include identification and location of source and name and telephone number of supplier.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf during a calendar year.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
2. Experience: Three years' experience in turf installation in addition to requirements in Section 014000 "Quality Requirements."
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
4. Pesticide Applicator: State licensed, commercial.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

1.8 FIELD CONDITIONS

A. Planting Restrictions: Plant during one of the following periods..

1. Spring Planting: March 15 to May 15.
2. Fall Planting: September 1 to October 20.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 FERTILIZERS

A. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

2.2 HYDROSEEDING

A. Provide fresh, clean, new-crop seed complying with tolerance for purity and germination established by Official Seed Analysts of North America. Provide Seed of grass species, proportions and minimum percentages of purity, germination, and maximum percentage of weed seed, as specified.

B. Hydraulic Mulch: HydraCM matrix by North American Green, or approved equal. See Appendix for product specification.

C. Permanent Grass Seed Mix, Proportioned by weight as follows:

1. 85 percent tall turf type fescue cultivars (Festuca arundinacea variety).
2. 15 percent perennial ryegrass (Lolium perenne).

D. Temporary Grass Seed Mix, Proportioned by weight as follows:

1. 50 percent wheat.
2. 50 percent oats.

2.3 PESTICIDES

A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
3. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas, structures, pavement pads, etc. from hydroseeding overspray.
2. Protect grade stakes set by others until directed to remove them.

3.3 TURF AREA PREPARATION

A. Placing Planting Soil: To thickness and grades indicated in civil plans. Provide light compaction only per Section 31 20 00 Earth Moving.

1. Reduce elevation of planting soil to allow for soil thickness of sod.

B. Kill and remove all existing weeds.

C. Verify all areas match the grading plan in the civil plans and provide positive drainage as intended in the plans.

D. Rake all areas smooth with no bumps, depressions, rills, or eroded areas deeper than ½ inch.

E. Remove all objects on the surface (typically rocks, roots, trash, broken concrete, etc.) larger than 2” in any dimension. Fill depressions left with topsoil.

F. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

G. Before planting, obtain Owner's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

H. Place fertilizer at a rate of 7 lbs/1000 sq. ft. or as recommended by manufacturer.

3.4 HYDROSEEDING

A. Hydroseeding: Mix specified permanent grass seed mix, temporary grass seed mix, and HydraCM per manufacturer's written requirements Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Permanent grass seed mix shall be mixed so 215 lb/acre is applied.
2. Temporary seed mix shall be mixed so 10 lb/acre is applied.
3. Spray-apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that HydraCM component is deposited at not less than 3000-lb/acre dry weight.

3.5 TURF MAINTENANCE

A. Protection: Protect the area against traffic or other use by placing warning signs, fences, and erecting any barricades that may be required before or immediately after sowing is completed.

B. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

C. Watering: Install and maintain water trucks, temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches (100 mm).

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water turf with fine spray at a minimum rate of 1 inch (25 mm) per week unless rainfall precipitation is adequate.
3. Onsite water may be used once the water lines are constructed and functional. Coordinate usage with Owner.

D. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

1. Mow areas outside the track to a height of 3 to 4 inches.
2. Mow areas inside the track to a height of 2 to 3 inches.

E. Turf Postfertilization: Apply slow-release fertilizer after initial mowing and when grass is dry.

1. Apply fertilizer at a rate of at least 7 lb/1000 sq. ft. of turf area.

3.6 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Owner:

1. Satisfactory Seeded Turf: A healthy, uniform, recently mowed, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 3 by 3 inches.
2. All turf areas shall be smooth, free of debris, rocks, sticks, voids, etc, and shall be easily and comfortably mowable. This includes areas around all items that are intended to be mowed over like utility pullboxes/hand holes, valve covers, grated inlets, manholes, etc.

B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

C. Obtain approval of satisfactory turf for all areas by Owner.

3.7 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents according to manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.8 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove waste material, trash, and debris, and legally dispose of them off Owner's property.

C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout maintenance period and remove as approved by Owner.

3.9 MAINTENANCE SERVICE

A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than the following periods:

1. Seeded Turf: As long as required until satisfactory turf is established and approved by Owner.

END OF SECTION 32 92 00

SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Plants.
2. Tree stabilization.
3. Tree-watering devices.
4. Landscape edgings.

1.3 DEFINITIONS

A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than sizes indicated; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than sizes indicated.

D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than the minimum root spread according to ANSI Z60.1 for type and size of plant required.

E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.

F. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.

G. Finish Grade: Elevation of finished surface of planting soil.

H. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.

I. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

J. Planting Area: Areas to be planted.

K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

L. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

M. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.

N. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.

O. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 COORDINATION

A. Coordination with Turf Areas: Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.

1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
2. Plant Photographs: Include color photographs in digital format of each required species and size of plant material as it will be furnished to Project. Take photographsthe truem an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:

1. Manufacturer's certified analysis of standard products.
2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.

C. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

D. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
2. Experience: Five years' experience in landscape installation in addition to requirements in Section 014000 "Quality Requirements."
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
4. Personnel Certifications: Installer's **p**ersonnel assigned to the Work shall have certification in one of the following categories from the Professional Landcare Network:

    a. Landscape Industry Certified Technician - Exterior.
    b. Landscape Industry Certified Horticultural Technician.

5. Pesticide Applicator: State licensed, commercial.

B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

1. Selection of plants purchased under allowances is made by Architect, who tags plants at their place of growth before they are prepared for transplanting.

C. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.

1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip.
2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

D. Plant Material Observation: Engineer may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Engineer may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Engineer of sources of planting materials seven days in advance of delivery to site.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

C. Deliver bare-root stock plants within 24 hours of digging. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting. Transport in covered, temperature-controlled vehicles, and keep plants cool and protected from sun and wind at all times.

D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

E. Handle planting stock by root ball.

F. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F (16 to 18 deg C) until planting.

G. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

H. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

I. Deliver plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Heel-in bare-root stock. Soak roots that are in less than moist condition in water for two hours. Reject plants with dry roots.
2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
3. Do not remove container-grown stock from containers before time of planting.
4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.10 FIELD CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.
b. Structural failures including plantings falling or blowing over.

2. Warranty Periods: From date of Substantial Completion.

a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.
b. Ground Covers, Biennials, Perennials, and Other Plants: 9 months.
c. Annuals: 2 months.

3. Include the following remedial actions as a minimum:

a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.
d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing

trunks; cut-off limbs more than 3/4 inch (19 mm) in diameter; or with stem girdling roots are unacceptable.

2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

D. Labeling: Label each plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.

E. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

F. Annuals: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery.

2.2 FERTILIZERS

A. Planting Tablets: Tightly compressed chip-type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.

1. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.

2.3 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Shredded hardwood or Pine straw, as directed by owner.
2. Color: Natural.

B. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through a 1-inch (25-mm) sieve; soluble-salt content of 2 to 5 dS/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 percent of dry weight.
2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

2.4 WEED-CONTROL BARRIERS

A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. (101g/sq. m) minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally encountered chemicals, alkalis, and acids.

2.5 PESTICIDES

A. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.6 TREE-STABILIZATION MATERIALS

A. Trunk-Stabilization Materials:

1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal (38-by-38-mm actual) by length indicated, pointed at one end.
2. Wood Deadmen: Timbers measuring 8 inches (200 mm) in diameter and 48 inches (1200 mm) long, treated with specified wood pressure-preservative treatment.
3. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes.
4. Guys and Tie Wires: ASTM A 641/A 641M, Class 1, galvanized-steel wire, two-strand, twisted, 0.106 inch (2.7 mm) in diameter.
5. Tree-Tie Webbing: UV-resistant polypropylene or nylon webbing with brass grommets.
6. Flags: Standard surveyor's plastic flagging tape, white, 6 inches (150 mm) long.
7. Proprietary Staking-and-Guying Devices: Proprietary stake or anchor and adjustable tie systems to secure each new planting by plant stem; sized as indicated and according to manufacturer's written recommendations.

B. Root-Ball Stabilization Materials:

1. Upright Stakes and Horizontal Hold-Down: Rough-sawn, sound, new hardwood or softwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal (38-by-38-mm actual) by length indicated; stakes pointed at one end.
2. Wood Screws: ASME B18.6.1.
3. Proprietary Root-Ball Stabilization Devices: Proprietary at- or below-grade stabilization systems to secure each new planting by root ball and that do not encircle the trunk; sized according to manufacturer's written recommendations unless otherwise indicated.

2.7 LANDSCAPE EDGINGS

A. Plastic Edging: Standard black polyethylene or vinyl edging, horizontally grooved, extruded in standard lengths, with 9-inch (225-mm) plastic stakes.

2.8 MISCELLANEOUS PRODUCTS

A. Root Barrier: Black, molded, modular panels 18 inches (457 mm) deep, 85 mils (2.2 mm) thick, and with vertical root deflecting ribs protruding 3/4 inch (19 mm) out from panel surface; manufactured with minimum 50 percent recycled polyethylene plastic with UV inhibitors.

B. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's written instructions.

C. Burlap: Non-synthetic, biodegradable.

D. Planter Filter Fabric: Nonwoven geotextile manufactured for separation applications and made of polypropylene, polyolefin, or polyester fibers or combination of them.

E. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb (0.45 kg) of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb (0.45 kg) of ectomycorrhizal fungi, 33 percent hydrogel, and a maximum of 5.5 percent inert material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, and adjust locations when requested. Make minor adjustments as required.

3.3 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits.

1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
2. Excavate approximately three times as wide as ball diameter for balled and burlapped, and container-grown stock.
3. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
4. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
5. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
6. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
7. Maintain supervision of excavations during working hours.
8. Keep excavations covered or otherwise protected when unattended by Installer's personnel.
9. If drain tile is indicated on Drawings or required under planting areas, excavate to top of porous backfill over tile.

B. Backfill Soil: Subsoil and topsoil removed from excavations may be used as backfill soil unless otherwise indicated.

C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Drill 6-inch diameter holes, 24 inches apart, into free-draining strata and backfill with free-draining material.

D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.4 TREE, SHRUB, AND VINE PLANTING

A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 1-inch above adjacent finish grades.

1. Backfill: Planting soil: use excavated soil for backfill.

2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1-inch from root tips; do not place tablets in bottom of the hole.

5. Continue backfilling process. Water again after placing and tamping final layer of soil.

D. Balled and Potted and Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 1-inch above adjacent finish grades.

1. Backfill: Planting soil use excavated soil for backfill.
2. Carefully remove root ball from container without damaging root ball or plant.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1-inch from root tips; do not place tablets in bottom of the hole.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

E. Bare-Root Stock: Set and support each plant in center of planting pit or trench with root flare 1-inch above adjacent finish grade.

1. Backfill: Planting soil use excavated soil for backfill.
2. Spread roots without tangling or turning toward surface. Plumb before backfilling, and maintain plumb while working.
3. Carefully work backfill in layers around roots by hand. Bring roots into close contact with the soil.
4. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
5. Place planting tablets equally distributed around each planting pit when pit is approximately one-half filled. Place tablets beside soil-covered roots about 1-inch from root tips; do not place tablets in bottom of the hole or touching the roots.
6. Continue backfilling process. Water again after placing and tamping final layer of soil.

3.5 TREE, SHRUB, AND VINE PRUNING

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Prune, thin, and shape trees, shrubs, and vines as directed by Architect.

C. Prune, thin, and shape trees, shrubs, and vines according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

D. Do not apply pruning paint to wounds.

3.6 TREE STABILIZATION

A. Trunk Stabilization by Upright Staking and Tying: Install trunk stabilization as follows unless otherwise indicated:

1. Upright Staking and Tying: Stake trees of 2 to 5 inch caliper. Stake trees of less than 2-inch caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18-inches below bottom of backfilled excavation and to extend one-third of trunk height above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.
2. Upright Staking and Tying: Stake trees with two stakes for trees up to 12 feet high and 2-1/2 inches or less in caliper; three stakes for trees less than 14 feet (4.2 m) high and up to 4 inches in caliper. Space stakes equally around trees.
3. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
4. Support trees with two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

B. Trunk Stabilization by Staking and Guying: Install trunk stabilization as follows unless otherwise indicated on Drawings. Stake and guy trees more than 14 feet in height and more than 3 inches in caliper unless otherwise indicated.

1. Site-Fabricated, Staking-and-Guying Method: Install no fewer than three guys spaced equally around tree.

    a. Securely attach guys to stakes 30 inches long, driven to grade. Adjust spacing to avoid penetrating root balls or root masses.
    b. Support trees with bands of flexible ties at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
    c. Attach flags to each guy wire, 30 inches above finish grade.

2. Proprietary Staking and Guying Device: Install staking and guying system sized and positioned as recommended by manufacturer unless otherwise indicated and according to manufacturer's written instructions.

3.7 ROOT-BARRIER INSTALLATION

A. Install root barrier where trees are planted within 48-inches of paving or other hardscape elements, such as walls, curbs, and walkways, unless otherwise indicated on Drawings.

B. Align root barrier vertically and run it linearly along and adjacent to the paving or other hardscape elements to be protected from invasive roots.

C. Install root barrier continuously for a distance of 60 inches in each direction from the tree trunk, for a total distance of 10 feet per tree. If trees are spaced closer, use a single continuous piece of root barrier.

1. Position top of root barrier 1/2 inch above finish grade.
2. Overlap root barrier a minimum of 12 inches at joints.
3. Do not distort or bend root barrier during construction activities.
4. Do not install root barrier surrounding the root ball of tree.

3.8 GROUND COVER AND PLANT PLANTING

A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on Drawings in even rows with triangular spacing.

B. Dig holes large enough to allow spreading of roots.

C. For rooted cutting plants supplied in flats, plant each in a manner that minimally disturbs the root system but to a depth not less than two nodes.

D. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.

E. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

F. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.9 PLANTING AREA MULCHING

A. Install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of 6 inches and secure seams with galvanized pins.

B. Mulch backfilled surfaces of planting areas and other areas indicated.

1. Apply organic mulch ring of 3-inch average thickness

2. Apply 24-inch radius around trunks or stems. Do not place mulch within 3 inches of trunks or stems.

3.10 EDGING INSTALLATION

A. Shovel-Cut Edging: Separate mulched areas from turf areas, curbs, and paving with a 45-degree, 4- to 6-inch deep, shovel-cut edge.

3.11 PLANT MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.

B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.12 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas according to manufacturer's written recommendations. Do not apply to seeded areas.

C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.13 REPAIR AND REPLACEMENT

A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Architect.

1. Submit details of proposed pruning and repairs.
2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Remove and replace trees that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.

3.14 CLEANING AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

D. After installation and before substantial completion remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

E. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

3.15 MAINTENANCE SERVICE

A. Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:

1. Maintenance Period: 12 months from date of Substantial Completion.

B. Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:

1. Maintenance Period: 6 months from date of Substantial Completion.

END OF SECTION 329300

SECTION 33 05 43
UNDERGROUND UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Conduit, and accessories for direct-buried utility lines.
2. Pullboxes

1.3 DEFINITIONS

A. RNC: Rigid nonmetallic conduit.

B. Pullboxes: Also known as hand holes.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
2. Pullboxes.

B. Field quality-control test reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Comply with ANSI C2.

C. Comply with NFPA 70.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver conduit to Project site with ends capped. Store nonmetallic conduits with supports to prevent bending, warping, and deforming.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions:

1. Notify Owner no fewer than seven days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Owner's written permission.

1.8 COORDINATION

A. Coordinate all utility installation and relocation with the corresponding utility company prior to the start of construction.

B. Coordinate layout and installation of conduit with final arrangement of other utilities, sewers, site grading, and surface features as determined in the field. Maintain a minimum 18” vertical separation at all crossings.

C. Coordinate elevations of conduit into Pullboxes with final locations as determined by coordination with other utilities, underground obstructions, and surface features

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.1 CONDUIT

A. Rigid Steel Conduit: Galvanized. Comply with ANSI C80.1.

B. RNC: NEMA TC 2, Type EPC-40-PVC, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

C. RNC cap: Schedule 40 PVC cap of matching size as conduit to be applied to.

2.2 HAND HOLE

A. Description: Comply with SCTE 77.

1. Material and Load Rating: Units shall be rated for heavy duty traffic, H25 loading. Material can be pre cast concrete or polymer concrete.
2. Configuration: Units shall be designed for flush burial and have open bottom, unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC" or "TELECOMMUNICATION" or “TELECOM” (corresponding with each service.)

6. Minimum pull box size shall be 17” x 30” for the lid and 17” wide x 30” long x 17” deep for the body. Body extensions will not be allowed to achieve required dimensions.

PART 3 - EXECUTION

3.1 UNDERGROUND CONDUIT APPLICATION

A. Underground Conduit for Electric, Telephone, Communications, or Data Utility Service Cables: RNC, NEMA Type EPC-40-PVC, unless otherwise indicated.

3.2 EARTHWORK

A. Excavation and Backfill: Comply with Division 31 Section "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Restore surface features at areas disturbed by excavation and reestablish original grades, unless otherwise indicated. Replace removed sod immediately after backfilling is completed.

C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work. Restore vegetation and include necessary topsoiling, fertilizing, liming, seeding, sodding, sprigging, and mulching.

3.3 CONDUIT INSTALLATION

A. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 36 inches, both horizontally and vertically, at other locations, unless otherwise indicated.

B. Joints: Use solvent-cemented joints in conduit and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent conduit do not lie in same plane.

C. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 feet (3 m) outside the building wall without reducing conduit line slope away from the building, and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition.

D. Sealing: Provide temporary closure at terminations of conduit that have cables pulled. Cap spare conduit at terminations.

E. Pulling Cord: Install 100-lbf- (445-N-) test nylon cord in conduit, including spares.

F. Install trench backfill, with warning tape, per Section 21 20 00 Earth Moving specification.

3.4 INSTALLATION OF PULLBOXES

A. Install Pullboxes level and plumb and with orientation and depth coordinated with connecting conduit to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel from conduit depth to bottom of unit, graded from 1/2-inch (12.7-mm) sieve to No. 4 (4.75-mm) sieve and compacted to 95% ASTM 698.

   a. Elevation: In paved areas and trafficways, set so cover surface will be flush with finished grade. Set covers of Pullboxes in green space 1 inch (25 mm) above finished grade.

C. Finish Grading in green spaces: provide satisfactory soil to the bottom of topsoil depth around all sides of unit. Compact soil in layers per Earth Moving specification. Hand tamp and stomp in directly adjacent to the unit to provide tight compaction against unit. Then place topsoil within 1 inch of top of unit. Hand tamp and stomp in around all sides of unit to provide tight compaction around unit. Top off with additional topsoil if settlement is observed that results in grades more than 1” below the top of unit. Finish grading shall result in mowing over the entire unit in an and easy, comfortable, and uninterruptable fashion.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections and prepare test reports:

   1. Demonstrate capability and compliance with requirements on completion of installation of underground conduit and utility structures.
   2. Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.

B. Correct deficiencies and retest as specified above to demonstrate compliance.

3.6 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of conduit. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout conduit.

END OF SECTION 33 05 43

SECTION 33 13 13
FACILITY SANITARY SEWERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. PVC pipe and fittings.
2. Cleanouts.
3. Concrete.
4. Manholes.
5. Lift station.

1.3 DEFINITIONS

A. PVC: Polyvinyl chloride.

1.4 SUBMITTALS

A. Shop Drawings: For lift station include plans, elevations, sections, details, pumps, control panel, and frames and covers. For cleanouts include frame and lid.

B. Product Certificates: For each type of pipe and fitting, from manufacturer.

C. Operation and maintenance manual for all new components of lift station.

D. Field quality-control reports.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic manholes, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

1.6 FIELD CONDITIONS

A. Interruption of Existing Sanitary Sewerage Service: Do not interrupt service without permission from the Owner. Provide notification a minimum 3 days prior to interruption.

PART 2 - PRODUCTS

2.1 PVC PIPE AND FITTINGS

A. PVC Sewer Piping:

1. Pipe: ASTM D 3034, SDR 35, PVC sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D 3034, PVC with bell ends.
3. Gaskets: ASTM F 477, elastomeric seals.

2.2 CLEANOUTS

A. PVC Cleanouts:

1. Description: PVC body with cast iron top as detailed in the Plans. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.3 LIFT STATION

A. Lift station replacement components as indicated on Utility Sheet C7.01 of civil plans:

1. Determine if existing wet well will fit proposed pumps. If new wet well is required, provide shop drawing of wet well with all dimensions and details. New wet well shall match the existing wet well size and elevations, minimum.
2. All internal components of existing wet well shall be replaced, minimum. Pumps and all associated components shall be per 33 13 13 Appendices, or approved equal.
3. The control panel located outside the lift station shall be removed and replaced per 33 13 13 Appendices, or approved equal.
4. Update electrical service to the control panel per Electrical plans and specifications.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details to indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated.

D. When installing pipe under streets or other obstructions that cannot be disturbed, use trenchless methods approved by the City of Lee's Summit.

E. Install gravity-flow, nonpressure, drainage piping according to the following:
   1. Install PVC gravity sewer piping according to ASTM D 2321 and ASTM F 1668.

F. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure, drainage piping according to the following:
   1. Join PVC gravity sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.

3.4 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318.

3.5 CLEANOUT INSTALLATION

A. Install cleanouts as indicated within the Civil Plans.

B. Set cleanout frames and covers in earth in with tops 1 inch above surrounding grade.

C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.6 LIFT STATION

A. Install all new components for the lift station per the Manufacturer written requirements.

3.7 CONNECTIONS

A. Make connections to existing piping and underground lift station/wet well.

   1. As indicated within the Plans.

   2. Protect existing piping and wet wells to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

   3. Connection to wet well shall be watertight and corrosion resistant.

3.8 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green detectable warning tapes directly over piping.

3.9 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 925 percent of piping diameter.
    c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.

5. Air Tests: Test sanitary sewerage according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

    a. Test plastic gravity sewer piping according to ASTM F 1417.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.10 CLEANING

A. Clean dirt and superfluous material from interior of piping and wet well.

3.11 ACCEPTANCE

A. Obtain Owner approval and acceptance of all sanitary sewer system work.

B. Operate all new components of lift station with Owner present. Verify all components are fully operational and obtain Owner's approval.

END OF SECTION 33 13 13

SECTION 33 41 00
STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Cleanouts.
3. Junction boxes.
4. Catch basins.
5. Stormwater inlets.

1.3 DEFINITIONS

A. None.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Junction Boxes: Include plans, elevations, sections, details, frames, and covers.
2. Catch basins, stormwater inlets, and junction boxes: Include elevations, sections, details, frames, covers, and grates.
3. Pipe Outlets: Include elevations, sections, and details.

C. Field quality-control reports.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic structures, pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle structures according to manufacturer's written rigging instructions.

D. Handle catch basins and stormwater inlets according to manufacturer's written rigging instructions.

PART 2 - PRODUCTS

2.1 PE PIPE AND FITTINGS

A. High Density Corrugated PE Pipe with integrally formed smooth waterway AASHTO M 252 and M294, Type S.

1. Manufacturer: Advanced Drainage Systems (ADS) N-12ST HDPE pipe, or approved equal.
2. Soiltight gasketed joints.

2.2 PVC PIPE AND FITTINGS

A. PVC Sewer Piping:

1. Pipe: ASTM D 3034, SDR 35, PVC sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D 3034, PVC with bell ends.
3. Gaskets: ASTM F 477, elastomeric seals.

2.3 CONCRETE PIPE AND FITTINGS

A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76 (ASTM C 76M).

1. Bell-and-spigot ends and gasketed joints with ASTM C 443 (ASTM C 443M), rubber gaskets.
2. Class III, minimum, based on depth as detailed in civil plans.
3. Class IV, based on depth as detailed in civil plans.
4. Class V, based on depth as detailed in civil plans.

2.4 CLEANOUTS

A. Plastic Cleanouts:

1. Description: HDPE or PVC body with either PVC top or cast-iron frame and lid depending on location. See Civil Plans for details.

2.5 CATCH BASINS & JUNCTION BOXES

A. Standard Precast Concrete Catch Basins and Junction Boxes:
1. Description: Precast concrete manufactured as detailed within the Civil Plans. Include heavy-duty frames and grates.

2.6 STORMWATER INLETS

A. PVC Inlets: As manufactured by Nyloplast and as shown in the civil plans, or approved equal. Include heavy duty frames and grates.

B. Concrete Inlets: Precast concrete manufactured inlets as detailed within the Civil Plans. Include heavy-duty frames and grates.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans and details indicate location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install gravity-flow, nonpressure drainage piping according to the following:

1. Install piping pitched down in direction of flow.
2. Install piping with to depths indicated in civil plans. Minimum cover for HDPE pipe shall be maintained per manufacturer’s Specifications.
3. Install PVC profile gravity sewer piping as detailed in civil plans.
4. Install reinforced-concrete sewer piping as detailed in civil plans.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure drainage piping according to the following:

1. Join PVC profile gravity sewer piping according to ASTM D 2321 for elastomeric-seal joints or ASTM F 794 for gasketed joints.

3.4 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade as detailed in civil plans.

3.5 CATCH BASIN & JUNCTION BOX INSTALLATION

A. Construct catch basins and junction boxes to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.6 STORMWATER INLET AND OUTLET INSTALLATION

A. Construct inlet flared end sections of reinforced concrete, as indicated. Construct a concrete collar around the connection between the HDPE pipe and concrete flared end.

B. Construct riprap of broken stone, as indicated.

C. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

3.7 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Division 22 Section "Facility Storm Drainage Piping."

3.8 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping.

1. Use detectable warning tape over nonferrous piping.

3.9 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (610 mm) of backfill is in place, and again at completion of Project.

1. Submit separate reports for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.

C. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.10 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with water**.**

3.11 ACCEPTANCE

A. Obtain approval and acceptance of all storm sewer construction by Owner.

END OF SECTION 33 41 00

SECTION 312113
RADON MITIGATION

PART 1 GENERAL

1.01 SUMMARY

A. Provide all work necessary to reduce and maintain radon concentration levels below 4.0 PicoCuries per liter (pCi/L) in various buildings specified herein. Perform pre-mitigation diagnostic testing and analysis, provide mitigation system design and installation, and perform post-mitigation testing and monitoring for radon.

1.02 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
   1. ACI INTERNATIONAL (ACI)
      a. ACI 301(2005; Errata 2008) Specifications for Structural Concrete
   2. AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)
      a. AMCA 210(2007) Laboratory Methods of Testing Fans for Aerodynamic Performance Rating
   3. ASTM INTERNATIONAL (ASTM)
      a. ASTM B 209(2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
      b. ASTM B 209M(2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
      c. ASTM C 1002(2007) Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
      d. ASTM C 1047(2010) Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base
      e. ASTM C 36/C 36M(2003e1) Gypsum Wallboard
      f. ASTM C 475/C 475M(2002; R 2007) Joint Compound and Joint Tape for Finishing Gypsum Board
      g. ASTM C 514(2004; R 2009e1) Standard Specification for Nails for the Application of Gypsum Board
      h. ASTM C 645(2009a) Nonstructural Steel Framing Members
      i. ASTM C 834(2010) Latex Sealants
      j. ASTM C 840(2008) Application and Finishing of Gypsum Board
      k. ASTM C 920(2010) Standard Specification for Elastomeric Joint Sealants
      l. ASTM D 2665(2009) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
   4. GYPSUM ASSOCIATION (GA)
      a. GA 216(2010) Application and Finishing of Gypsum Panel Products
   5. INTERNATIONAL CODE COUNCIL (ICC)
      a. ICC IMC(2009) International Mechanical Code
      b. ICC UMC(1997; Errata 2 & 3 1997) Uniform Mechanical Code
   6. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
      a. NEMA MG 1(2009) Motors and Generators
   7. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
      a. NFPA 70(2011) National Electrical Code
   8. NORTHEASTERN LUMBER MANUFACTURERS ASSOCIATION (NELMA)
      a. NELMA Grading Rules(2006) Standard Grading Rules for Northeastern Lumber
   9. SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)
      a. SMACNA 1378(1995) Thermoplastic Duct (PVC) Construction Manual, 2nd Edition
   10. SOUTHERN PINE INSPECTION BUREAU (SPIB)
      a. SPIB 1003(2002) Standard Grading Rules for Southern Pine Lumber

11. U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
    a. EPA 402-R-92-004(1992) Indoor Radon and Radon Decay Product Measurement Device Protocols
    b. EPA 402-R-92-014(1993) Radon Measurement in Schools
    c. EPA 402-R-93-003(1993) Protocols for Radon and Radon Decay Product Measurements in Homes
    d. EPA 402-R-93-078(1993; R 1994) Radon Mitigation Standards
    e. EPA 625-R-92-016(1993; Am 1994) Radon Prevention in Design and Construction of Schools and Other Large Buildings
    f. EPA 625-R-93-011(1993) Radon Reduction Technique for Existing Detached Houses: Technical Guidance for Active Soil Depressurization Systems
12. U.S. GENERAL SERVICES ADMINISTRATION (GSA)
    a. CID A-A-2246(Rev B) paint, Latex
    b. FS TT-P-650(Rev D) Primer Coating, Latex Base, Interior, White (for Gypsum Wallboard, or Plaster)
13. WEST COAST LUMBER INSPECTION BUREAU (WCLIB)
    a. WCLIB 17(2000) Standard Grading Rules
14. WESTERN WOOD PRODUCTS ASSOCIATION (WWPA)
    a. WWPA G-5(1998) Western Lumber Grading Rules

1.03 DEFINITIONS

A. Design

B. Design Drawings
   1. Documentation showing in graphic and quantitative form the extent, design, arrangement, location, relationships, and dimensions of the construction to be provided by the Contractor.

C. Designer
   1. USEPA RCP listed mitigation contractor associated with the Contractor who is responsible for the design and has the qualifications and experience specified.

D. Contract Documents
   1. Documents furnished to prospective bidders/proposers containing information and specifying criteria and project requirements for diagnostic testing, design, construction and monitoring of multiple radon mitigation systems. The documents include this specification and the drawings listed in and accompanying this specification.

E. Long Term Radon Detectors
   1. Alpha track, electretion chamber, or approved equivalent. Devices capable of sensing and recording the presences of radon during a time period of 91 days to 12 months which when analyzed provide a numeric value, measured in pCi/L, for radon concentrations during the time exposed.

F. Short Term Radon Detectors
   1. Charcoal, electretion chamber, or approved equivalent. Devices capable of sensing and recording the presences of radon during a time period of 48 hours to 90 days which when analyzed provide a numeric value, measured in pCi/L, for radon concentrations during the time exposed.

G. Suction Hole
   1. Location at which vacuum is created for sub-slab communication testing.

H. Suction Point
   1. Vertical standpipe penetrating into the soil gas environment containing radon and serving as the conduit to exhaust radon gas to the atmosphere.

I. Test Hole
   1. Location at which pressure readings are taken during sub-slab communication testing. Readings are used to evaluate potential effectiveness of a sub-slab depressurization system.

1.04 SYSTEM DESCRIPTION AND REQUIREMENTS

A. Performance Requirements
   1. Radon mitigation systems shall reduce and maintain radon concentration levels below 4.0 pCi/L in various buildings specified herein. Test, design and construct radon mitigation systems in accordance with EPA 402-R-93-078, EPA 402-R-93-003, and EPA 402-R-92-004 and as specified herein. Additional guidance for testing, designing and constructing radon mitigation systems is contained in EPA 625-R-92-016 and EPA 625-R-93-011.

B. Criteria for Diagnostic Testing and Suction Points
   1. Test locations, suction point locations, pipe sizes, number of fans and discharge points to the building exterior, routing of the radon mitigation systems piping, provision of associated enclosures, and all other work necessary to achieve the desired results specified are the Contractor's responsibility and shall be based on the requirements and restrictions, if any, specified herein.

1.05 SUBMITTALS

A. Shop Drawings
   1. Radon mitigation
   2. Radon mitigation systems enclosures

B. Product Data
   1. Radon mitigation systems components
   2. Radon mitigation systems enclosure components
   3. Radon diagnostic testing devices

C. Design Data
   1. Radon mitigation systems design narrative

D. Test Reports
   1. Pre-mitigation testing
   2. Post mitigation testing

E. Certificates
   1. Contractor qualifications
   2. Contractor experience
   3. Worker protection plan

F. Manufacturer's Instructions
   1. Radon mitigation systems components
   2. Radon mitigation systems enclosure components

G. Operation and Maintenance Data
   1. Radon Mitigation Systems, Data Package 2

H. Closeout Submittals
   1. Radon Detector Location Log
   2. Testing laboratory certification
   3. Proof of current calibration for testing devices

1.06 DESIGN REQUIREMENTS

A. Prepare designs in accordance with the requirements of EPA 402-R-93-078 except that when the contract specification requirements are more stringent, the contract specification shall take precedence. The Contractor shall:
   1. Prepare design drawings and assemble and provide product data for construction of multiple radon mitigation systems;
   2. Prepare design narrative supporting the design shown;
   3. Coordinate all elements of the design to ensure there are no conflicts;
   4. For each building, present information 100 percent complete in a single submission and in sufficient detail to permit a complete review by the Architect. The Architect's review is to check the design for conformance with the requirements contained in the contract

documents. Design review shall not be construed as a waiver from performing requirements contained in the contract which may have been omitted from the Contractor prepared design documents.

5. Provide three copies of the complete design documents.

B. Design Drawing Requirements
   1. Prepare, organize, and present drawings in the format considered standard industry practice for radon mitigation work and as described herein. Provide drawings complete, accurate and explicit enough to show compliance with the contract requirements and to permit construction. Drawings illustrating systems proposed to meet the requirements of the contract specification shall reflect proper detailing for each system to assure appropriate use, proper fit, compatibility of components and coordination with the design narrative and the contract specification. Coordinate drawings to ensure there are no conflicts between design disciplines and between drawings and the contract specification. Each Contractor prepared drawing shall bear the certification number and signature of the RCP listed individual responsible for the work portrayed on that drawing and proposed to meet the contract requirements.
      a. Radon Mitigation Systems(Format and Content)
         1) On copies of the building floor plans, locate and identify each diagnostic test performed using alpha numeric designations. Prepare a separate drawing for each type of diagnostic test performed in each building. Provide grab sample (GS) data. Provide sub-slab communication (SSC) test data on. Provide short term detector (STD) data on copies of the "Device Placement Log" contained in EPA 402-R-92-014.
         2) On copies of the building floor plans, show suction point(s) and routing of the radon mitigation system(s) piping to the building exterior. Indicate pipe size, length of piping in the network, number and nature of flow obstructions, such as fittings, and fan characteristics for each system. Supplement the floor plan information with additional drawings keyed to each floor plan location showing riser diagrams, utility connections and routing, component installations, elevations, sections and details of the radon mitigation system(s). Also, provide construction and installation details such as supporting systems, attachment methods and surface penetration and sealing methods.
         3) Drawings shall not be smaller than A4 - 8 1/2 by 11 inch.
      b. Radon Mitigation Systems Enclosures(Format and Content)
         1) Prepare drawings not smaller than A4 - 8 1/2 by 11 inch portraying the proposed method for enclosing each radon mitigation system in occupied spaces. All spaces shall be considered to be occupied spaces except for mechanical and electrical rooms, warehouses, storerooms, janitor closets, crawl spaces, and attic spaces. Enclosures are not required for portions of systems installed above suspended acoustical ceilings.
         2) Drawings shall indicate methods and materials to be used in constructing the enclosures and accesses for all operating components. Drawings showing typical enclosures and installations are acceptable (i.e. corner installation, mid-wall installation, etc.).

C. Design Narrative
   1. Format
      a. The design narrative shall include a cover page indicating the project title, location, construction contract number and preparer, a table of contents and tabbed or colored page separations for quick reference. Submit design narrative prepared on A4 - 8 1/2 by 11 inch white paper. The design narrative shall be bound in one volume.
   2. Content
      a. The design narrative shall include a basis of design and calculations. Specific requirements relative to the technical content to be provided are specified in this specification section. The design narrative shall be a presentation of facts to demonstrate that the project requirements are fully understood and that the design is based on sound engineering. The design narrative shall include and address the

following:

1) Executive summary.
2) Scope of work.
3) Building description.
4) Diagnostic testing performed and results of the testing (include Attachments C and D and the Device Placement Logs for the short-term detectors).
5) Diagnostic test devices and equipment used.
6) Locations where readings were recorded (include floor plans).
7) Suspected or confirmed entry points of radon into the buildings (narrative or show on floor plans).
8) Potential problems which may be caused by active (fan-powered) radon mitigation systems, if any.
9) Conclusions and recommendations.
10) Radon mitigation method chosen to reduce radon concentrations levels below 4.0 pCi/L and reasons for choosing the method.
11) Data and calculations to verify negative pressure exists throughout the soil gas environment containing radon sufficient to exhaust the soil gas to the atmosphere under all weather and building operating conditions.
12) Statement of compliance with applicable laws, ordinances, criteria, rules, and regulations of Federal, State, regional and local authorities regarding radon mitigation.
13) Appendices (to include design drawings, forms and logs, laboratory analysis sheets, etc.).

D. Design Review and Approval
   1. The design will be reviewed by the Architect prior to start of construction. The Architect's review is to check the design for conformance with the contract requirements. Design review does not relieve the Contractor of the responsibility of meeting the requirements of the contract and providing radon mitigation systems which, while active, reduce and maintain radon concentration levels below 4.0 pCi/L. The design of the radon mitigation systems and enclosures shall be approved prior to submission of construction submittals for the materials to be used in the construction of the systems and enclosures.

1.07 RADON DETECTOR LOCATION LOG

A. Prepare and provide to the Owner a Radon Detector Location Log for each building detailing the identity and location of each short-term radon detector. Prepare the log using copies of the "Device Placement Log" contained in EPA 402-R-92-014 and provide the appropriate information as line items. In addition to the log, on a copy of the building floor plans, locate and identify each short-term detector.

1.08 WORKER HEALTH AND SAFETY

A. Provide in accordance with EPA 402-R-93-078. Prepare a worker protection plan in accordance with EPA 402-R-93-078.

1.09 QUALITY ASSURANCE

A. Contractor Qualifications and Experience
   1. Within 15 days after award, submit written evidence or data demonstrating that the Contractor and/or one or more subcontractors employed by the Contractor possess the qualifications and experience specified below.

B. Contractor Qualifications
   1. The person responsible for diagnostic testing, design, construction and on-site supervision, as required by the specifications, shall have successfully completed the requirements of and shall be maintaining a current listing in the USEPA RCP Program. Alternatively, in a State with legislation requiring mandatory credentialing for this work, compliance with the State legislation is acceptable. Evidence showing successful completion of the requirements of the USEPA National RCP Program shall include copy of current, valid USEPA RCP photo identification card or equivalent documentation issued by

the State.

2. Contractor Experience
   a. Submit written evidence demonstrating that the Contractor has successfully designed and installed at least two radon mitigation systems of the same or similar to the type required herein. Experience proof shall include but not be limited to:
      1) The contract name and number, completion dates of the project and the total cost of the project;
      2) The names, telephone numbers and fax number of the facility or installation for whom the radon mitigation system design, construction and/or testing were performed;
      3) The name, telephone number and fax number of a supervisory level point of contact at each facility or installation who has knowledge of the Contractor's performance.

C. Testing Laboratory
   1. Submit testing laboratory certification as proof that the testing laboratory performing radon detector analysis has successfully completed the requirements of the USEPA Radon Measurement Proficiency (RMP) Program and is qualified and authorized to perform such analysis. Alternatively, in a State with legislation requiring mandatory credentialing for this work, compliance with the State legislation is acceptable.

D. Diagnostic Testing Equipment
   1. Submit proof of current calibration for testing devices used in performing diagnostic testing.

E. On-Site Supervision
   1. No work at the site will be permitted without the presence of a person possessing the qualifications specified elsewhere in this section, namely USEPA RCP listing or the State equivalent, where applicable.

1.10 DELIVERY, STORAGE AND HANDLING

A. Delivery of Products
   1. Deliver materials to the site in an undamaged condition. Deliver proprietary items in manufacture's original unopened and undamaged containers of packages with manufacture's name and brand and other pertinent data such as specification number, type, and class, date of manufacture. Schedule deliveries of materials to coincide with scheduled installation.

B. Storage and Handling
   1. Carefully store materials off the ground to provide proper ventilation, drainage and protection against weather and dampness. Protect materials from marring, staining, rust, damage and overload and from contaminants such as grease, oil and dirt. Store materials at temperatures recommended by the manufacturer. Handle material to avoid damage such as chipping and breaking. Replace damaged material.

PART 2 PRODUCTS

2.01 RADON MITIGATION SYSTEMS

A. System Performance
   1. Radon mitigation systems shall reduce and maintain radon concentration levels below 4.0 pCi/L after activation of the mitigation systems.
      a. System Piping
         1) Route radon mitigation systems piping so as not to interfere with the daily operations and functions of the building occupants. Keep visibility of the systems to a minimum. Enclose each radon mitigation system in occupied spaces, however, all operating components shall be accessible for maintenance and repair. All spaces shall be considered to be occupied spaces except for mechanical and electrical rooms, warehouses, storerooms, janitor closets, crawl spaces, and attic spaces. Enclosures are not required for portions of systems installed above suspended acoustical ceilings.

b. System Outlet Location
   1) Mitigation system discharge points shall be as specified in EPA 402-R-93-078. Prevent foreign objects from entering the outlet. Maintain water tight seal through all penetrations to the building exterior.
c. System Failure Warning Monitor
   1) Provide a means to detect and announce each radon mitigation system failure. System failure is defined as:
      (a) System blockage: foreign debris.
      (b) Mechanical failure: fan or other mechanical failure.
      (c) System leakage: pipe breakage or crack.
   2) Provide an audio or visual annunciator device to indicate system failure and locate the annunciator device in an occupied space. Conform to the requirements of EPA 402-R-93-078.
d. Air Cleaners
   1) Air cleaners shall NOT be used as a radon reduction method.
e. Ventilation Devices
   1) Devices which reduce radon solely by increasing ventilation to the occupied space shall NOT be used.
f. Back Drafting
   1) Radon mitigation system shall NOT cause back drafting of building chimneys.

B. Radon Mitigation Systems Components
   1. Mechanical and electrical materials, fabrication, construction and installation shall conform to the following industry standards:
      a. Poly(vinyl chloride) (PVC) Piping: ASTM D 2665, Schedule 40.
      b. In-line Tubular Centrifugal Fans: AMCA 210and UL listed.
      c. Electrical Work: NFPA 70, NEMA MG 1 and EPA 402-R-93-078, No. 12 AWG minimum wire size, solid copper installed in EMT or surface metal raceway.
      d. Mechanical Work: ICC IMC, ICC UMC, SMACNA 1378 and EPA 402-R-93-078.
      e. Sealants: ASTM C 920, polyurethane, Type S, Grade P for horizontal application, Grade NS for vertical application, Class 25, Use T.
      f. Crawl space soil-gas retarder membrane shall be minimum 40 mils thick.

2.02 RADON MITIGATION SYSTEMS ENCLOSURES

A. Radon mitigation systems enclosure components, materials, fabrication, construction and installation for concrete, wood studs and furring, metal studs and furring, gypsum wallboard, sealants and painting shall conform to the requirements specified in the respective specification sections addressing this work contained in the project specification.

PART 3 EXECUTION

3.01 RADON TESTING

A. Perform radon testing in accordance with EPA 402-R-93-003 and EPA 402-R-92-004. The Contractor shall arrange that all laboratory test results are sent from the testing laboratory directly to the Owner with one copy to the Contractor.

B. Site investigation data and results obtained from diagnostic testing shall be used to design the radon mitigation systems.

C. Each sub-slab communication test shall include a suction hole and at least four test holes. Use non-shrink grout to repair all holes resulting from diagnostic testing and restore floor and wall finishes to match existing adjacent surfaces.

3.02 DESIGN RADON MITIGATION SYSTEMS AND SYSTEMS ENCLOSURES

A. Design radon mitigation systems as required to achieve radon detection test results below 4.0 pCi/L based on radon diagnostic test results, EPA 402-R-93-078 and the information provided herein. Design the systems enclosures to accommodate the radon mitigation systems configurations and the adjacent or surrounding walls, partitions, ceilings and roof construction.

3.03 RADON MITIGATION SYSTEMS INSTALLATION

A. Installation
   1. Provide radon mitigation systems as indicated in the approved design drawings, as specified in EPA 402-R-93-078 and as required by the specifications and standards referenced herein for the respective materials using workmen skilled in the trades involved. Install piping plumb and parallel to existing walls, partitions and ceilings as appropriate, slope horizontal runs to drain, and secure in place in a rigid and substantial manner.
   2. Seal new and existing floor slab penetrations in accordance with EPA 402-R-93-078 and as specified herein. Prevent entry of soil gas into the building and exhausting of conditioned air via the radon mitigation system. Seal cracks and openings around floor slab penetrations with polyurethane sealant. Provide backer rod or comparable filler material as required. Insure that all penetrations to the building exterior are weathertight.
   3. Lay work out in advance. Exercise care where cutting, channeling, chasing or drilling floors, walls, partitions, ceilings or other surfaces as necessary for proper installation, support or anchorage. Patch and repair damage to buildings, piping and equipment using workmen skilled in the trades involved.
   4. As part of the site investigation, the Contractor shall identify furniture, carpeting or other portable materials and equipment which must be relocated to provide for the installation of the radon mitigation systems, if any. The Owner will work with the Contractor to coordinate relocations.
   5. Coordinate all work with the Owner.

B. Supervision
   1. Installation of the radon mitigation systems shall be supervised by the RCP listed individual responsible for the design of the systems.

C. Electrical Work
   1. NFPA 70 and EPA 402-R-93-078, No. 12 AWG minimum wire size, solid copper installed in EMT or surface metal raceway. A source of electric power should be available within 50 feet of each fan installation.

D. Mechanical Work
   1. ICC IMC, ICC UMC, SMACNA 1378 and EPA 402-R-93-078.

E. System Identification
   1. Label all components of the radon mitigation systems including, but not limited to, piping (every ten feet), enclosures, fans, electrical conduit (every ten feet) and circuit breakers. Labels shall read:
      a. Radon Reduction System. Do Not Turn Off.

3.04 RADON MITIGATION SYSTEM ENCLOSURES INSTALLATION

A. Provide enclosures as indicated in the approved design drawings and as required by the specifications and standards referenced herein for the respective materials using workmen skilled in the trades involved. Install enclosures plumb, level and parallel to existing walls, partitions and ceilings as appropriate, and secure in place in a rigid and substantial manner.

3.05 FIELD QUALITY CONTROL

A. Radon Mitigation System Inspection
   1. Each system shall be inspected and approved in writing by the RCP listed individual responsible for the design of the system. Verify the presence of fire stops. Deficiencies shall be corrected by the Contractor at no additional cost to the Owner.

B. Post Mitigation Testing and Monitoring
   1. Perform post mitigation radon testing in the buildings as specified in EPA 402-R-93-078 and herein.
      a. Short Term
         1) Test each radon mitigation system for effectiveness no sooner than 24 hours nor later than 15 days after activation of the radon mitigation system. Provide short

term radon detectors (charcoal, electret ion chamber or approved equivalent) at the rate of one detector per 2,000 square feet but not less than one detector per enclosed space, except for closets. On copies of the building floor plans, locate and identify each short-term detector and provide short term detector data on copies of the "Device Placement Log" contained in EPA 402-R-92-014.

2) At the end of the testing period, the Contractor shall collect the detectors and send the detectors to the testing laboratory for analysis. Provide radon test results of the effectiveness of the mitigation systems not later than 30 days after collecting the detectors. Radon test results shall be sent from the testing laboratory directly to the Owner with one copy to the Contractor. Complete the line item information on the "Device Placement Log."
3) Radon test results above 4.0 pCi/L shall require system redesign and installation modifications as necessary to achieve radon test results below 4.0 pCi/L. Submit design modifications to the Government for review and approval. After approval of the design modifications, provide installation modifications to the radon mitigation system and retest for effectiveness. Repeat this short-term test procedure until test results below 4.0 pCi/L are achieved.
4) System modifications (as-built systems installations) shall be reflected in the Contractor's design documents (drawings and design narrative).

END OF SECTION 312113

SECTION 313116
TERMITE CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Chemical soil treatment.

1.02 SUBMITTALS

A. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements.

B. Warranty: Submit warranty and ensure that forms have been completed in Owner's name.

1.03 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing this type of work and:
   1. Licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.01 CHEMICAL SOIL TREATMENT

A. Toxicant Chemical: EPA Title 7, United States Code, 136 through 136y approved; synthetically color dyed to permit visual identification of treated soil.

B. Diluent: Recommended by toxicant manufacturer.

C. Mixes: Mix toxicant to manufacturer's instructions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that soil surfaces are unfrozen, sufficiently dry to absorb toxicant, and ready to receive treatment.

B. Verify final grading is complete.

3.02 APPLICATION - CHEMICAL TREATMENT

A. Comply with requirements of U.S. EPA and applicable state and local codes.

B. Spray apply toxicant in accordance with manufacturer's instructions.

C. Apply toxicant at following locations:
   1. Under Slabs-on-Grade.
   2. At Both Sides of Foundation Surface.

D. Under slabs, apply toxicant immediately prior to installation of vapor barrier.

E. At foundation walls, apply toxicant immediately prior to finish grading work outside foundations.

F. Apply extra treatment to structure penetration surfaces such as pipe or ducts, and soil penetrations such as grounding rods or posts.

G. Re-treat disturbed treated soil with same toxicant as original treatment.

H. If inspection or testing identifies the presence of termites, re-treat soil and re-test.

3.03 PROTECTION

A. Do not permit soil grading over treated work.

END OF SECTION