

DESIGN NO. U419

DESIGN NO. U419		NON-BEARING WALL RATINGS - 1, 2, 3 OR 4 HR (SEE ITEMS 4 & 5)							
FLOOR & CEILING RUNNERS (NOT SHOWN) - FOR USE WITH ITEM 2 - CHANNEL SHAPED, FABRICATED FROM MIN 25 MSG CORROSION-PROTECTED STEEL, MIN DEPTH TO ACCOMMODATE STUD SIZE, WITH MIN 1/2" LONG LEGS, ATTACHED TO FLOOR & CEILING WITH FASTENERS SPACED 24" OC MAX.									
1A. FRAMING MEMBERS - FLOOR & CEILING RUNNERS (NOT SHOWN - IN LIEU OF ITEM 1) - FOR USE WITH ITEM 2A, PROPRIETARY CHANNEL SHAPED, MIN 3/8" DEEP, FABRICATED FROM MIN 0.015" (MIN BARE METAL THICKNESS) GALV STEEL, ATTACHED TO FLOOR & CEILING WITH FASTENERS 24" OC MAX, EFFECTIVE THICKNESS IS 0.034"									
CLARKWESTERN BUILDING SYSTEMS INC - ULTRASTEEL®									
DIETRICH INDUSTRIES INC - ULTRASTEEL®									
1B. FRAMING MEMBERS - FLOOR & CEILING RUNNERS (NOT SHOWN - IN LIEU OF ITEM 1) - FOR USE WITH ITEM 2A, PROPRIETARY CHANNEL SHAPED, MIN 2/3" DEEP, FABRICATED FROM MIN 0.015 IN. (MIN BARE METAL THICKNESS) GALV STEEL, ATTACHED TO FLOOR & CEILING WITH FASTENERS 24" OC MAX, EFFECTIVE THICKNESS IS 0.034"									
CLARKWESTERN BUILDING SYSTEMS INC - ULTRASTEEL®									
DIETRICH INDUSTRIES INC - ULTRASTEEL®									
1C. FRAMING MEMBERS - FLR & CLR RUNNER NOT SHOWN - IN LIEU OF ITEM 1 - FOR USE WITH ITEM 2C, PROPRIETARY CHANNEL SHAPED RUNNERS, 3/8" DEEP ATTACHED TO FLOOR & CEILING W FASTENERS 24" OC MAX.									
CALIFORNIA EXPANDED METAL PRODUCTS CO - VIPERTRACK®									
CRACO MFG INC - SMARTTRACK®									
MARINOWARE A DIV OF WARE INDUSTRIES INC - VIPER25® TRACK									
1D. FRAMING MEMBERS - FLOOR & CEILING RUNNER - NOT SHOWN - IN LIEU OF ITEM 1 - FOR USE WITH ITEM 2D, PROPRIETARY CHANNEL SHAPED RUNNERS, 1/2" WIDE BY 3/8" DEEP, FABRICATED FROM MIN 0.02" THICK GALV STEEL, ATTACHED TO FLOOR & CEILING WITH FASTENERS SPACED 24" OC MAX.									
MARINOWARE A DIV OF WARE INDUSTRIES INC - VIPER20S® TRACK, VIPER20® TRACK									
1E. FRAMING MEMBERS - FLOOR & CEILING RUNNERS (NOT SHOWN) - IN LIEU OF ITEM 1 - CHANNEL SHAPED, ATTACHED TO FLOOR & CEILING WITH FASTENERS 24" OC MAX.									
ALLSTEEL & GYPSUM PRODUCTS INC - TYPE SUPREME FRAMING SYSTEM									
CONSOLIDATED FABRICATORS CORP. BUILDING PRODUCTS DIV - TYPE SUPREME FRAMING SYSTEM									
QUAL RUN BUILDING MATERIALS INC - TYPE SUPREME FRAMING SYSTEM									
SCAFFO STEEL STUD MANUFACTURING CO - TYPE SUPREME FRAMING SYSTEM									
1F. FLOOR & CEILING STUDS (NOT SHOWN) - FOR USE WITH ITEM 2B - CHANNEL SHAPED, FABRICATED FROM MIN 20 MSG CORROSION-PROTECTED OR GALV STEEL, MIN DEPTH TO ACCOMMODATE STUD SIZE, WITH MIN 1" LONG LEGS, ATTACHED TO FLOOR & CEILING WITH FASTENERS SPACED MAX 24" OC.									
1G. FRAMING MEMBERS - FLOOR & CEILING RUNNERS (NOT SHOWN, AS AN ALTERNATE TO ITEM 1) - FOR USE WITH ITEM 2F & 9F									
MIN 0.015 IN. (MIN BARE METAL THICKNESS) GALVANIZED STEEL, ATTACHED TO FLOOR & CEILING WITH FASTENERS 24" OC MAX.									
CLARKWESTERN BUILDING SYSTEMS INC - CW PROTRAK®									
DIETRICH INDUSTRIES INC - DIETRICH PROTAK®									
DMFOWBS L L C - PROTAK®									
1H. FRAMING MEMBERS - FLOOR & CEILING RUNNER - NOT SHOWN - IN LIEU OF ITEM 1 - FOR USE WITH ITEM 2G, PROPRIETARY CHANNEL SHAPED RUNNERS, MINIMUM WIDTH TO ACCOMMODATE STUD SIZE, WITH 1/2" LONG LEGS FABRICATED FROM MIN 0.015" (MIN BARE METAL THICKNESS) GALV STEEL, ATTACHED TO FLOOR & CEILING WITH FASTENERS SPACED 24" OC MAX.									
SUPER STUD BUILDING PRODUCTS INC - THE EDGE®									
2. STEEL STUDS - CHANNEL SHAPED, FABRICATED FROM MIN 25 MSG CORROSION-PROTECTED STEEL, MIN DEPTH AS INDICATED UNDER ITEM 5, SPACED A MAX OF 24" OC STUDS TO BE CUT 3/4" LESS THAN ASSEMBLY HEIGHT.									
2A. FRAMING MEMBERS - STEEL STUDS (IN LIEU OF ITEM 2) PROPRIETARY CHANNEL SHAPED STUDS, MIN DEPTH AS INDICATED UNDER ITEM 5, FABRICATED FROM MIN 0.015" (MIN BARE METAL THICKNESS) GALV STEEL, SPACED A MAX OF 24" OC STUDS TO BE CUT 3/4" LESS THAN ASSEMBLY HEIGHT. ALLOWABLE USE OF STUDS IS SHOWN IN THE TABLE BELOW. FOR DIRECT ATTACHMENT OF GYP BD ONLY, EFFECTIVE THICKNESS IS 0.034"									
CLARKWESTERN BUILDING SYSTEMS INC - ULTRASTEEL®									
DIETRICH INDUSTRIES INC - ULTRASTEEL®									
2B. STEEL STUDS - CHANNEL SHAPED, FABRICATED FROM MIN 25 MSG CORROSION-PROTECTED OR GALV STEEL, SPACED A MAX OF 16" OC STUDS FRICTION-FIT INTO FLOOR & CEILING RUNNERS. STUDS TO BE CUT 3/4" TO 3/8" LESS THAN ASSEMBLY HEIGHT.									
2C. FRAMING MEMBERS - STEEL STUDS [AS AN ALTERNATE TO ITEM 2, FOR USE WITH ITEM 3C] PROPRIETARY CHANNEL SHAPED STUDS, 3/8" DEEP SPACED A MAX OF 24" OC STUDS TO BE CUT 3/4" IN LESS THAN THE ASSEMBLY HEIGHT & INSTALLED WITH A TOP FLAT HEAD SCREW TO ATTACH TO THE BOTTOM TRACK OF THE WALL. FOR DIRECT ATTACHMENT OF GYP BD ONLY, CALIFORNIA EXPANDED METAL PRODUCTS CO - VIPERSTUD®									
CRACO MFG INC - SMARTSTUD®									
MARINOWARE A DIV OF WARE INDUSTRIES INC - VIPER25®									
2D. FRAMING MEMBERS - STEEL STUDS (NOT SHOWN) - IN LIEU OF ITEM 2 FOR USE WITH ITEM 1D, PROPRIETARY CHANNEL SHAPED STUDS, MIN DEPTH AS INDICATED UNDER ITEM 5, SPACED A MAX OF 24" OC, FABRICATED FROM MIN 0.02" THICK GALV STEEL STUDS CUT 3/4" TO 3/8" LESS IN LENGTHS THAN ASSEMBLY HEIGHT.									
MARINOWARE A DIV OF WARE INDUSTRIES INC - VIPER20S® - VIPER20®									

DESIGN NO. U419 (CONTINUED)

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NON-BEARING WALL RATINGS — 1, 2, 3 OR 4 HR (SEE ITEMS 4 & 5)

5D. GYPSUM BOARD — (AS AN ALTERNATE TO ITEM 5) — ½" THICK, 48" WIDE, APPLIED VERTICALLY OR HORIZONTALLY. SECURED AS DESCRIBED IN ITEM 6, FOR STUDS 1 & 2 ONLY.

5E. GYPSUM BOARD — TYPE USX — TYPE USX G.

6. GYPSUM BOARD — (NOT SHOWN) — (AS AN ALTERNATE TO ITEM 5 WHEN USED AS THE BASE LAYER ON ONE OR BOTH SIDES OF WALL WHEN ½" OR ¾" THICK PRODUCTS ARE SPECIFIED, FOR DIRECT ATTACHMENT ONLY TO STEEL STUDS ITEM 2B, NOT TO BE USED WITH STUD 1). NOMINAL 5/8" THICK LEAD BACKED PANELS (BETWEEN 6" SQUARE OR TAPERED EDGES, APPLIED VERTICALLY. VERTICAL JOINTS CENTERED OVER STUDS & STAGGERED FROM 1" STUD CAVITY OPPOSITE SIDES OF STUDS. WALLBOARD SECURED TO STUDS WITH ½" LONG TYPE 1-12 (OR NO. 8 BY 1") LONG SINGLE END BITE (FULLER) STEEL SCREWS 8" OC AT PERIMETER & 12" OC IN THE FIELD.

NEW ENGLAND LEAD BURNING CO. INC. DBA

NELCO — NELCO

6A. FASTENERS — (AS AN ALTERNATE TO ITEM 5) — FOR USE WITH ITEMS 1G & 2F LIMITED TO 1 HOUR RATING ONLY. GYPSUM PANELS WITH BEVELED & TAPERED EDGES, APPLIED VERTICALLY, AS SPECIFIED IN THE TABLE BELOW. VERTICAL JOINTS CENTERED OVER STUDS & STAGGERED ONE STUD CAVITY OPPOSITE SIDES OF STUDS. STEEL STUD DEPTH SHALL BE A MINIMUM ¾"

UNITED STATES GYPSUM CO. — TYPE USX

6B. GYPSUM BOARD — (AS AN ALTERNATE TO ITEM 5) — FOR USE WITH ITEMS 1G & 2F ONLY. GYPSUM PANELS WITH BEVELED, SQUARE OR TAPERED EDGES, APPLIED VERTICALLY OR HORIZONTALLY, AS SPECIFIED IN THE TABLE BELOW. VERTICAL JOINTS CENTERED OVER STUDS & STAGGERED ONE STUD CAVITY OPPOSITE SIDES OF STUDS. VERTICAL JOINTS IN ADJACENT LAYERS (MULTILAYER SYSTEMS) STAGGERED ONE STUD CAVITY. HORIZONTAL JOINTS NEED NOT BE ACROSS STUDS. FRAMING, HORIZONTAL EDGES & HORIZONTAL BUTT JOINTS ON OPPOSITE SIDES OF STUDS NEED NOT BE STAGGERED. HORIZONTAL EDGES & HORIZONTAL BUTT JOINTS IN ADJACENT LAYERS (MULTILAYER SYSTEMS) STAGGERED A MINIMUM OF 1" THE MINIMUM NUMBER OF LAYERS FOR THE 1 HR. RATING SHALL BE AS FOLLOWS: GYPSUM BOARD PROTECTION ON EACH SIDE OF WALL

Rating	HR	Min Stud Depth, in. Items 2F	No. Layers & Thickness of Panel	Min Thickness Insul (Item 4)
1	2	1-5/8	2 layers, 1/2 in. thick	Optional
	3	1-5/8	2 layers, 5/8 in. thick	Optional
2	2	1-5/8	3 layers, 1/2 in. thick	Optional
	3	1-5/8	3 layers, 5/8 in. thick	Optional
4	1-5/8	4 layers, 5/8 in. thick	Optional	
	4	1-5/8	4 layers, 1/2 in. thick	Optional

CANADIAN GYPSUM COMPANY — ½" THICK TYPE C, IP-2X OR IP-C-AR, ¾" THICK TYPE AR, C, IP-AR, IP-X1, IP-X2, IP-C-AR, SCX, SH, OR ¾" THICK TYPES IP-X1, IP-X2, IP-X3 OR ¾" THICK TYPE C-AR

UNITED STATES GYPSUM CO. — ½" THICK TYPE C, IP-2X, IP-C-AR OR ¾" THICK TYPE SCX, SH, IP-X1, AR, C, FRX-G, IP-AR, IP-2X, IP-C-AR, ¾" THICK TYPES IP-X1, IP-X2, IP-X3 OR ¾" THICK TYPE C-AR

USX MEXICO S.A DE CV — TYPE USX — TYPE USX, IP-C-AR, IP-C-AR OR ¾" THICK TYPE AR, C, IP-AR, P-X1, IP-X2, IP-C-AR, SCX, SH, OR ¾" THICK TYPES IP-X1, IP-X2, IP-X3 OR ¾" THICK TYPE C-AR

FASTENERS — (NOT SHOWN) — FOR USE WITH ITEMS 2 & 2F — TYPE S OR S-2 STEEL SCREWS USED TO ATTACH PANELS TO STUDS (ITEM 2A) OR FURRING CHANNELS (ITEM 1). FURRING CHANNEL SYSTEMS: 1" LONG FOR ½" THICK PANELS OR ½" LONG FOR ¾" THICK PANELS, SPACED 8" OC WHEN PANELS ARE APPLIED HORIZONTALLY, OR 8" OC ALONG VERTICAL & BOTTOM EDGES & 12" OC IN THE FIELD WHEN PANELS ARE APPLIED VERTICALLY. TWO LAYER SYSTEMS: FIRST 1" LONG FOR ½" THICK PANELS OR ½" LONG FOR ¾" THICK PANELS, SPACED 16" OC SECOND LAYER: ½" LONG FOR ½" THICK PANELS OR ½" LONG FOR ¾" THICK PANELS, SPACED 16" OC WITH SCREWS OFFSET 1" FROM FIRST LAYER. TWO LAYER SYSTEMS APPLIED HORIZONTALLY: FIRST LAYER: 1" LONG FOR ½" THICK PANELS OR ½" LONG FOR ¾" THICK PANELS, SPACED 16" OC SECOND LAYER: ½" LONG FOR ½" THICK PANELS OR ½" LONG FOR ¾" THICK PANELS, SPACED 16" OC WITH SCREWS OFFSET 1" FROM FIRST LAYER. TWO LAYER SYSTEMS APPLIED HORIZONTALLY: FIRST LAYER: 1" LONG FOR ½" THICK PANELS OR ½" LONG FOR ¾" THICK PANELS, SPACED 16" OC STARTING 6" FROM EACH EDGE OF BOARD WITH AN ADDITIONAL SCREW PLACED ½" FROM EACH EDGE OF THE BOARD. SECOND LAYER: ½" LONG FOR ½" THICK PANELS OR ½" LONG FOR ¾" THICK PANELS, SPACED 16" OC STARTING 6" FROM EACH EDGE OF THE BOARD WITH AN ADDITIONAL SCREW PLACED ½" FROM EACH EDGE OF THE BOARD. SCREWS OFFSET 1" FROM FIRST LAYER. THREE LAYER SYSTEMS: FIRST LAYER: 1" LONG FOR ½" THICK PANELS, SPACED 24" OC SECOND LAYER: ½" LONG FOR ½" THICK PANELS, SPACED 24" OC THIRD LAYER: ½" LONG FOR ½" THICK PANELS, SPACED 24" OC WITH SCREWS OFFSET 1" FROM FIRST LAYER. FOUR LAYER SYSTEMS: FIRST LAYER: 1" LONG FOR ½" THICK PANELS, SPACED 24" OC SECOND LAYER: ½" LONG FOR ½" THICK PANELS, SPACED 24" OC THIRD LAYER: ½" LONG FOR ½" THICK PANELS, SPACED 24" OC FOURTH LAYER: ½" LONG FOR ½" THICK PANELS OR 3" LONG FOR ¾" THICK PANELS, SPACED 24" OC WITH SCREWS OFFSET MIN 6" FROM LAYER BELOW. FOR ALL LAYERS, AN ADDITIONAL SCREW SHALL BE PLACED ½" FROM EACH EDGE OF THE BOARD. FOUR LAYER SYSTEMS: FIRST 1" LONG FOR ½" THICK PANELS SPACED 24" OC SECOND LAYER: ½" LONG FOR ½" THICK PANELS, SPACED 24" OC THIRD LAYER: ½" LONG FOR ½" THICK PANELS, SPACED 24" OC FOURTH LAYER: ½" LONG FOR ½" THICK PANELS, SPACED 24" OC WITH SCREWS OFFSET MIN 6" FROM LAYER BELOW. FOR ALL LAYERS, AN ADDITIONAL SCREW SHALL BE PLACED ½" FROM EACH EDGE OF THE BOARD. CORROSION-PROTECTED STEEL, SPACED VERTICALLY A MAX OF 24" OC FLANGE PORTION ATTACHED TO EACH INTERSECTING STUD WITH 1" MIN SCREWS, NOT FOR USE WITH STUD 1 & 5E.

7A. FRAMING MEMBERS — (NOT SHOWN) — OPTIONAL ON ONE OR BOTH SIDES, NOT SHOWN, FOR SINGLE OR DOUBLE LAYER SYSTEMS) — AS AN ALTERNATE TO ITEM 5

7B. FRAMING MEMBERS — (OPTIONAL, NOT SHOWN) — AS AN ALTERNATE TO ITEM 7, FOR SINGLE OR DOUBLE LAYER SYSTEMS, FURRING CHANNELS & STEEL FRAMING MEMBERS ON ONE SIDE OF STUDS AS DESCRIBED BELOW.

A. FURRING CHANNELS — FORMED OF NO. 26 MS GALV STEEL, ¾" WIDE BY ¾" DEEP. SPACED MAX. 24" ON PERPENDICULAR TO STUDS. CHANNELS SECURED TO STUDS AS DESCRIBED IN ITEM 6. GYPSUM BOARD ATTACHED TO FURRING CHANNELS AS DESCRIBED IN ITEM 6. NOT FOR USE WITH ITEM 5A.

B. STEEL FRAMING MEMBERS — USED TO ATTACH FURRING CHANNELS (ITEM 7AA) TO STUDS (ITEM 2). CLIPS SPACED MAX. 48" OC RISC-1 CLIPS SECURED TO STUDS WITH NO. 8 X ½" MINIMUM SELF-DRILLING, S-2 STEEL SCREW THROUGH THE CENTER HOLE. FURRING CHANNELS ARE FRICION FITTED INTO CLIPS.

PATCO INTERNATIONAL INC. — TYPES RISC-1, RISC-V.

7C. FRAMING MEMBERS (OPTIONAL, NOT SHOWN) AS AN ALTERNATE TO ITEM 7, FOR SINGLE OR DOUBLE LAYER SYSTEMS, FURRING CHANNELS & STEEL FRAMING MEMBERS ON ONE SIDE OF STUDS AS DESCRIBED BELOW.

A. FURRING CHANNELS — FORMED OF NO. 26 MS GALV STEEL, SPACED 24" ON PERPENDICULAR TO STUDS. CHANNELS SECURED TO STUDS AS DESCRIBED IN ITEM 6. FURRING CHANNELS & STEEL FRAMING MEMBERS AS DESCRIBED IN ITEM 5. TWO LAYERS OF GYPSUM BOARD ATTACHED TO FURRING CHANNELS — DESCRIBED IN ITEM 6. NOT FOR USE WITH ITEM 5A.

B. STEEL FRAMING MEMBERS — USED TO ATTACH FURRING CHANNELS (ITEM 7BA) TO ONE SIDE OF STUDS (ITEM 2). CLIPS SPACED 48" OC, CLIP & SCREW TO STUDS WITH TWO NO. 8 X ½" COARSE DRYWALL SCREWS, ONE THROUGH THE HOLE AT EACH END OF THE CLIP. FURRING CHANNELS ARE FRICION FITTED INTO CLIPS.

KINETICS SOUND CONTROL INC. — TYPE ISOMAX

7D. FRAMING MEMBERS — (OPTIONAL, NOT SHOWN) — USED AS AN ALTERNATE METHOD TO ATTACH RESILIENT CHANNELS (ITEM 7C), CLIPS ATTACHED TO EACH INTERSECTION OF THE RESILIENT CHANNEL & THE STEEL STUDS (ITEM 2). RESILIENT CHANNELS ARE FRICION FITTED INTO CLIPS, & THEN CLIPS ARE SECURED TO THE STEEL STUD WITH MIN 1" LONG TYPE 1-12 STEEL SCREWS THROUGH THE CENTER HOLE OF THE CLIP & THE RESILIENT CHANNEL FLANGE.

KEENE BUILDING PRODUCTS CO INC. — TYPE RSC ASSURANCE

JOINT TIE & COMPOUND — VINYL OR CASEIN, DRY OR PREMIXED JOINT COMPOUND APPLIED IN TWO COATS TO JOINTS & SCREW HEADS OF OUTER LAYER TIE. TIE, NOM 7 WIDE, EMBEDDED IN FIRST LAYER OF COMPOUND OVER ALL JOINTS OF OUTER LAYER PANELS. PAPER TAPE & JOINT COMPOUND MAY BE ON INSIDE OR OUTSIDE OF STUDS.

2. THROUGH-PENETRATORS — ONE METALLIC PIPE, CONDUIT OR TUBING TO BE INSTALLED EITHER CONCENTRICALLY OR ECCENTRICALLY WITHIN THE FIRST SYSTEM OF THE ANNULAR SPACE SHALL BE MIN 0 IN. TO MAX ½ IN. PIPE OR CONDUIT TO BE RIGIDLY SUPPORTED ON BOTH SIDES OF FLOOR OR WALL ASSEMBLY. THE FOLLOWINGS TYPES AND SIZES OF METALLIC PIPES, CONDUITS OR TUBING MAY BE USED.

3. THROUGH-PENETRATORS — ONE METALLIC PIPE, CONDUIT OR TUBING TO BE INSTALLED EITHER CONCENTRICALLY OR ECCENTRICALLY WITHIN THE FIRST SYSTEM OF THE ANNULAR SPACE SHALL BE MIN 0 IN. TO MAX ½ IN. PIPE OR CONDUIT TO BE RIGIDLY SUPPORTED ON BOTH SIDES OF FLOOR OR WALL ASSEMBLY. THE FOLLOWINGS TYPES AND SIZES OF METALLIC PIPES, CONDUITS OR TUBING MAY BE USED.

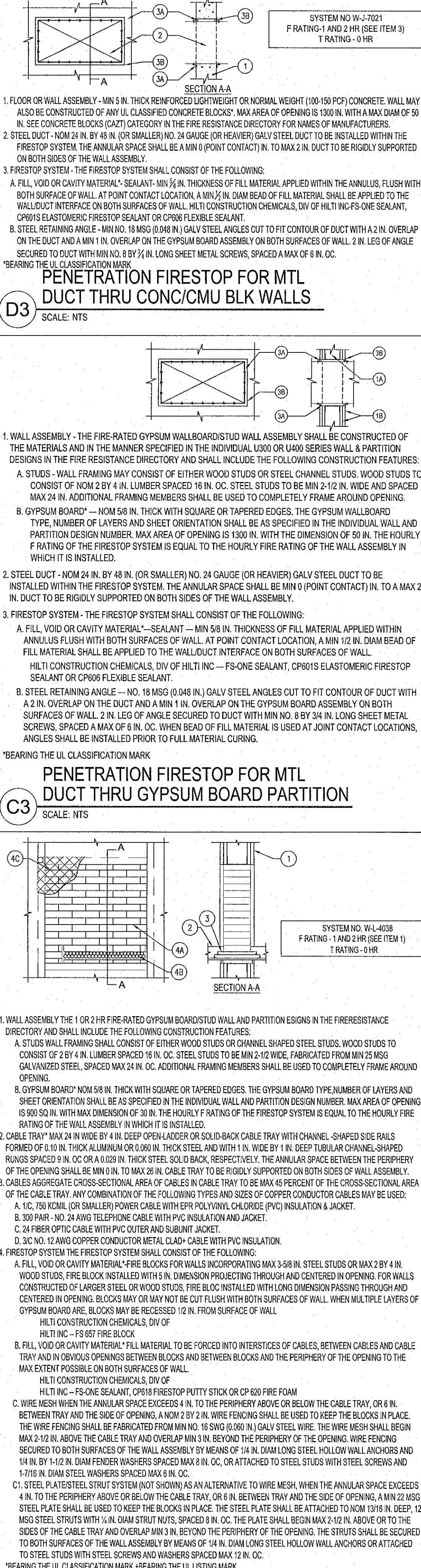
4. THROUGH-PENETRATORS — ONE METALLIC PIPE, CONDUIT OR TUBING TO BE INSTALLED EITHER CONCENTRICALLY OR ECCENTRICALLY WITHIN THE FIRST SYSTEM OF THE ANNULAR SPACE SHALL BE MIN 0 IN. TO MAX ½ IN. PIPE OR CONDUIT TO BE RIGIDLY SUPPORTED ON BOTH SIDES OF FLOOR OR WALL ASSEMBLY. THE FOLLOWINGS TYPES AND SIZES OF METALLIC PIPES, CONDUITS OR TUBING MAY BE USED.

5. THROUGH-PENETRATORS — ONE METALLIC PIPE, CONDUIT OR TUBING TO BE INSTALLED EITHER CONCENTRICALLY OR ECCENTRICALLY WITHIN THE FIRST SYSTEM OF THE ANNULAR SPACE SHALL BE MIN 0 IN. TO MAX ½ IN. PIPE OR CONDUIT TO BE RIGIDLY SUPPORTED ON BOTH SIDES OF FLOOR OR WALL ASSEMBLY. THE FOLLOWINGS TYPES AND SIZES OF METALLIC PIPES, CONDUITS OR TUBING MAY BE USED.

6. THROUGH-PENETRATORS — ONE METALLIC PIPE, CONDUIT OR TUBING TO BE INSTALLED EITHER CONCENTRICALLY OR ECCENTRICALLY WITHIN THE FIRST SYSTEM OF THE ANNULAR SPACE SHALL BE MIN 0 IN. TO MAX ½ IN. PIPE OR CONDUIT TO BE RIGIDLY SUPPORTED ON BOTH SIDES OF FLOOR OR WALL ASSEMBLY. THE FOLLOWINGS TYPES AND SIZES OF METALLIC PIPES, CONDUITS OR TUBING MAY BE USED.

7. THROUGH-PENETRATORS — ONE METALLIC PIPE, CONDUIT OR TUBING TO BE INSTALLED EITHER CONCENTRICALLY OR ECCENTRICALLY WITHIN THE FIRST SYSTEM OF THE ANNULAR SPACE SHALL BE MIN 0 IN. TO MAX ½ IN. PIPE OR CONDUIT TO BE RIGIDLY SUPPORTED ON BOTH SIDES OF FLOOR OR WALL ASSEMBLY. THE FOLLOWINGS TYPES AND SIZES OF METALLIC PIPES, CONDUITS OR TUBING MAY BE USED.

8. THROUGH-PENETRATORS — ONE METALLIC PIPE, CONDUIT OR TUBING TO BE INSTALLED EITHER CONCENTRICALLY OR ECCENTRICALLY WITHIN THE FIRST SYSTEM OF THE ANNULAR SPACE SHALL BE MIN 0 IN. TO MAX ½ IN. PIPE OR CONDUIT TO BE RIGIDLY SUPPORTED ON BOTH SIDES OF FLOOR OR WALL ASSEMBLY. THE FOLLOWINGS TYPES AND SIZES OF METALLIC PIPES, CONDUITS OR TUBING MAY BE



SCHEDULES OF HILTI THROUGH PENETRATION FIRESTOP SYSTEMS

CONCRETE FLOORS			CONCRETE OR BLOCK WALLS		
TYPE OF PENETRATION	FIRE RATING	UL-CLASSIFICATION SYSTEM	TYPE OF PENETRATION	FIRE RATING	UL-CLASSIFICATION SYSTEM
CIRCULAR BLANK OPENINGS	1 HR.	FA 0006, CAJ 0055, CAJ 0070	CIRCULAR BLANK OPENINGS	1 HR.	CAJ 0055, CAJ 0070
	2 HR.	FA 0006, CAJ 0055, CAJ 0070		2 HR.	CAJ 0055, CAJ 0070
	3 HR.	FA 0006, CAJ 0055		3 HR.	CAJ 0055
SINGLE METAL PIPES OR CONDUITS	1 HR.	CAJ 1226, FA 1017	SINGLE METAL PIPES OR CONDUITS	1 HR.	CAJ 1226, WJ 1021
	2 HR.	CAJ 1226, FA 1017		2 HR.	CAJ 1226, WJ 1021
	3 HR.	CAJ 1226, FA 1017		3 HR.	CAJ 1228, WJ 1041, WJ 1042
	4 HR.	CBJ 1037, CBJ 1034		4 HR.	CBJ 1034, CBJ 1037, WJ 1041, WJ 1042
SINGLE NON-METALLIC PIPE OR CONDUIT (I.E. PVC, CPVC, ABS, FRP, EMT)	1 HR.	FA 2053, FA 2025, CAJ 2109, CAJ 2098, CAJ 2141, CAJ 2167, CBJ-2021	SINGLE NON-METALLIC PIPE OR CONDUIT (I.E. PVC, CPVC, ABS, FRP, EMT)	1 HR.	CAJ 2109, CAJ 2098, CAJ 2167
	2 HR.	FA 2053, FA 2025, CAJ 2109, CAJ 2098, CAJ 2141, CAJ 2167, CBJ-2021		2 HR.	CAJ 2109, CAJ 2098, CAJ 2167
	3 HR.	FA 2054, CAJ 2109, CAJ 209		3 HR.	CAJ 2109, CAJ 2098
	4 HR.			4 HR.	WJ 2057
SINGLE OR BUNDLED CABLES	1 HR.	FA 3007, CAJ 3095, CAJ 3096	SINGLE OR BUNDLED CABLES	1 HR.	WJ 3036, CAJ 3095, CAJ 3096
	2 HR.	FA 3007, CAJ 3095, CAJ 3096		2 HR.	WJ 3036, CAJ 3095, CAJ 3096
	3 HR.	FA 3007, CAJ 3095, CAJ 3096		3 HR.	CAJ 3095, CAJ 3096
			4 HR.	WJ 3050	
CABLE TRAYS	1 HR.	CAJ 4034, CAJ 4035	CABLE TRAYS	1 HR.	WJ 4016, CAJ 4034, CAJ 4035
	2 HR.	CAJ 4034, CAJ 4035		2 HR.	WJ 4016, CAJ 4034, CAJ 4035
	3 HR.	CAJ 4034, CAJ 4035		3 HR.	CAJ 4034, CAJ 4035
		4 HR.		WJ 8007	
SINGLE INSULATED PIPES	1 HR.	FA 5015, FA 5016, CAJ 5090 CAJ 5091, CAJ 5098	SINGLE INSULATED PIPES	1 HR.	CAJ 5090, CAJ 5091, CAJ 5061
	2 HR.	FA 5015, FA 5016, CAJ 5090 CAJ 5091, CAJ 5098		2 HR.	CAJ 5090, CAJ 5091, CAJ 5061
	3 HR.	FA 5016, CAJ 5090		3 HR.	CAJ 5090, CAJ 5061
	4 HR.	CBJ 5006		4 HR.	CBJ 5006, WJ 5028
ELECTRICAL BUSWAY	1 HR.	CAJ 6006, CAJ 6017	ELECTRICAL BUSWAY	1 HR.	CAJ 6006, CAJ 6017
	2 HR.	CAJ 6006, CAJ 6017		2 HR.	CAJ 6006, CAJ 6017
	3 HR.	CAJ 6006, CAJ 6017		3 HR.	CAJ 6006, CAJ 6017
NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1 HR.	CAJ 7046, CAJ 7051	NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1 HR.	CAJ 7046, CAJ 7051, WJ 7021 WJ 7022
	2 HR.	CAJ 7046, CAJ 7051		2 HR.	CAJ 7046, CAJ 7051, WJ 7021 WJ 7022
	3 HR.	CAJ 7046, CAJ 7051		3 HR.	CAJ 7046, CAJ 7051
MIXED PENETRANTS	1 HR.	CAJ 8041, CAJ 8056	MIXED PENETRANTS	1 HR.	CAJ 8041, CAJ 8056, WJ 8007
	2 HR.	CAJ 8041, CAJ 8056		2 HR.	CAJ 8041, CAJ 8056, WJ 8007
	3 HR.	CAJ 8041, CAJ 8056		3 HR.	CAJ 8041, CAJ 8056, WJ 8007
	4 HR.	CBJ 8010		4 HR.	CBJ 8010, WJ 8007
WOOD FLOOR			GYPSUM WALLBOARD ASSEMBLIES		
METAL PIPES OR CONDUIT	FIRE RATING	UL-CLASSIFICATION SYSTEM	METAL PIPES OR CONDUIT	FIRE RATING	UL-CLASSIFICATION SYSTEM
	1 HR.	FC 1009, FC 1059		1 HR.	WL 1054, WL 1058, WL 1164
	2 HR.	FC 1009, FC 1059		4 HR.	WL 1110, WL 1111
NON-METALLIC PIPE OR CONDUIT	1 HR.	FC 2025, FC 2030, FC 2160	NON-METALLIC PIPE OR CONDUIT	1 HR.	WL 2078, WL 2075, WL 2128
	2 HR.	FC 2025, FC 2029, FC 2128		2 HR.	WL 2078, WL 2075, WL 2128
SINGLE OR BUNDLED CABLES	1 HR.	FC 3012, FC 3044	SINGLE OR BUNDLED CABLES	1 HR.	WL 3065, WL 3111, WL 3112
	2 HR.	FC 3012		2 HR.	WL 3065, WL 3111, WL 3112
INSULATED PIPES	1 HR.	FC 5004, FC 3036, FC 3037	CABLE TRAY	1 HR.	WL 4011, WL 4019
				2 HR.	WL 4011, WL 4019
	2 HR.	FC 5004, FC 3036, FC 3037	INSULATED PIPES	1 HR.	WL 5028, WL 5029, WL 5047
				2 HR.	WL 5028, WL 5029, WL 5047
NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1 HR.	FC 7013	NON-INSULATED MECHANICAL DUCTWORK WITHOUT DAMPERS	1 HR.	WL 7017, WL 7040, WL 7042
				2 HR.	WL 7040, WL 7042
				3 HR.	WL 1095, WL 8013
MIXED PENETRANTS	1 HR.	FC 8009, FC 8014	MIXED PENETRANTS	1 HR.	WL 1095, WL 8013
				2 HR.	WL 1095, WL 8013
				4 HR.	WL 8014

HILTI THROUGH PENETRATION FIRESTOP SYSTEMS NOTES:

1. Job site conditions of each through-penetration firestop system must meet all details of the UL-classified system selected.
2. If job site conditions do not match any UL-classified system is listed in the schedules, contact Hilti for alternative systems or engineer judgment drawings - (800) 879-8000.
3. Where more than one applicable UL-classified system is listed in the schedules, choose the UL system which is most economical for each through-penetration firestop system.
4. Coordinate work w/ other trades to assure that penetration opening sizes are appropriate for penetration locations, & vice versa for each through-penetration firestop system.
5. For 3-hr. rated gypsum walls, contract Hilti for a UL-classified system or engineer judgment drawing - 800-879-8000.
6. WALL ASSEMBLY: THE 1 OR 2 HR FIRE-RATED GYPSUM WALL/BOARD/STUD WALL ASSEMBLY SHALL BE CONSTRUCTED OF THE MATERIALS AND IN THE MANNER SPECIFIED IN THE INDIVIDUAL U300 OR U400 SERIES WALL AND PARTITION DESIGNS IN THE UL FIRE RESISTANCE DIRECTORY AND SHALL INCLUDE THE FOLLOWING SPACE FILLING FEATURES:
- A. STUDS - WALL FRAMING MAY CONSIST OF EITHER WOOD STUDS OR STEEL CHANNEL STUDS. WOOD STUDS TO CONSIST OF NOM 2 BY 4 IN. LUMBER SPACED 16 IN. OC. STEEL STUDS TO BE MIN 2X4 IN. WIDE AND SPACED MAX 24 IN. OC. WHEN STEEL STUDS ARE USED AND THE DIAM OF OPENING EXCEEDS THE WIDTH OF STUD CAVITY, THE OPENING SHALL BE FRAMED ON ALL SIDES USING LENGTHS OF STEEL STUD INSTALLED BETWEEN THE VERTICAL STUDS AND SCREW-ATTACHED TO THE STEEL STUDS AT EACH END. THE FRAMED OPENING IN THE WALL SHALL BE 4 TO 6 IN. WIDER AND 4 TO 6 IN. HIGHER THAN THE DIAM OF THE PENETRATING ITEM SUCH THAT, WHEN THE PENETRATING ITEM IS INSTALLED IN THE OPENING, A 2 TO 3 IN. CLEARANCE IS PRESENT BETWEEN THE PENETRATING ITEM AND THE FRAMING ON ALL FOUR SIDES.
- B. GYPSUM BOARD - $\frac{5}{8}$ " THICK, 4 FT WIDE WITH SQUARE OR TAPERED EDGES. THE GYPSUM BOARD TYPE, THICKNESS, NUMBER OF LAYERS, FASTENER TYPE AND SHEET ORIENTATION SHALL BE AS SPECIFIED IN THE INDIVIDUAL U300 OR U400 SERIES DESIGN IN THE UL FIRE RESISTANCE DIRECTORY. MAX DIAM OF OPENING IS 32 $\frac{1}{2}$ " IN. FOR THROUGH STUDS SHALL MAX DIAM OF OPENING BE 14 $\frac{1}{2}$ " IN. FOR WOOD STUD WALLS. THE RATING OF THE FIRESTOP SYSTEM IS EQUAL TO THE FIRE RATING OF THE WALL ASSEMBLY.
7. THROUGH-PENETRANTS - ONE METALLIC PIPE, CONDUIT OR TUBING TO BE INSTALLED EITHER CONCENTRICALLY OR ECCENTRICALLY WITHIN THE FIRESTOP SYSTEM. THE ANNUAL SPACE SHALL BE MIN 0 IN. TO MAX 2 $\frac{1}{2}$ " IN. PIPE MAY BE INSTALLED WITH CONTINUOUS JOINT SUPPORT. PIPE, CONDUIT OR TUBING MAY BE INSTALLED AT AN ANGLE NOT GREATER THAN 45 DEGREES FROM PERPENDICULAR. PIPE, CONDUIT OR TUBING TO BE RIDGIDLY SUPPORTED ON BOTH SIDES OF WALL ASSEMBLY. THE FOLLOWING TYPES AND SIZES OF METALLIC PIPES, CONDUITS OR TUBING MAY BE USED:
- A. STEEL PIPE - NOM 30 IN DIAM (OR SMALLER) SCHEDULE 40 (OR HEAVIER) STEEL PIPE.
- B. IRON PIPE - NOM 30 IN DIAM (OR SMALLER) CAST OR DUCTILE IRON PIPE.
- C. CONDUIT - NOM 4 IN DIAM (OR SMALLER) STEEL ELECTRICAL METALLIC TUBING OR 6 IN. DIAM STEEL CONDUIT.
- D. COPPER TUBING - NOM 2 IN DIAM (OR SMALLER) TYPE I (OR HEAVIER) COPPER TUBING.
- E. COPPER PIPE - NOM 6 IN DIAM (OR SMALLER) REGULAR (OR HEAVIER) COPPER PIPE.
8. FILL, VOID OR CAVITY MATERIAL - SEALANT - MIN $\frac{1}{2}$ " IN. THICKNESS OF FILL MATERIAL, APPLIED WITHIN THE ANNULUS, FLUSH WITH BOTH SURFACES OF WALL. AT THE POINT OR CONTINUOUS CONTACT LOCATIONS BETWEEN PIPE AND WALL, A MIN $\frac{1}{2}$ " IN DIAM BEAD OF FILL MATERIAL SHALL BE APPLIED AT THE PIPE WALL INTERFACE ON BOTH SURFACES OF WALL. HILTI CHEMICALS, DIV OF HILTI INC-PS-ONE SEALANT
-
- SECTION A-A

PENETRATION FIRESTOP FOR MTL PIPE/
CONDUIT THRU CONC FLR/MASONRY WALL

A2 SCALE: NTS

PENETRATION FIRESTOP FOR CABLE TRAY THRU GYPSUM BOARD PARTITION

SCALE: NETS

PENETRATION FIRESTOP FOR MTL PIPE/ CONDUIT THROUGH CBP RTN

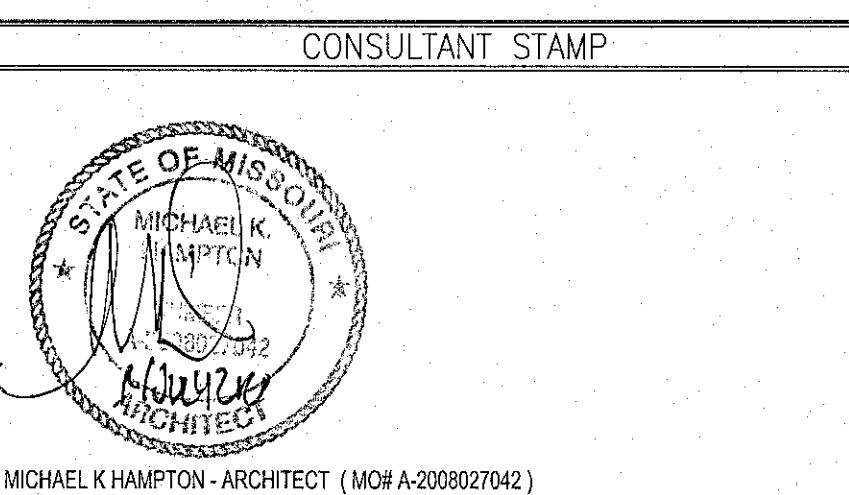
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SCALE: NEG

SCHWERDT DESIGN GROUP INC # 190102



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MISSOURI STATE CERTIFICATE OF AUTHORITY
#F00353876

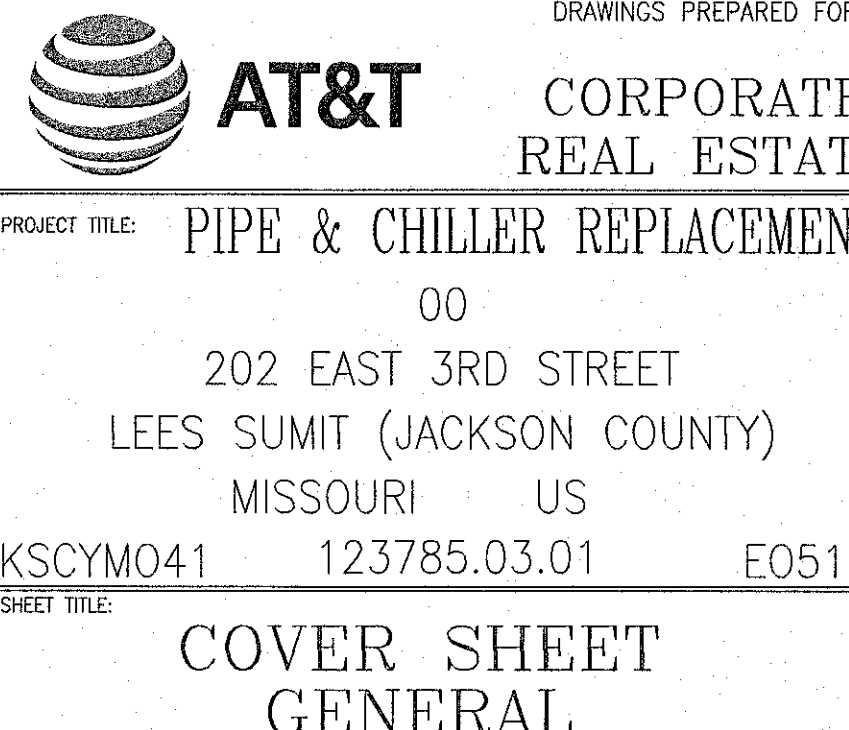


REVISIONS / AUTHORIZATIONS

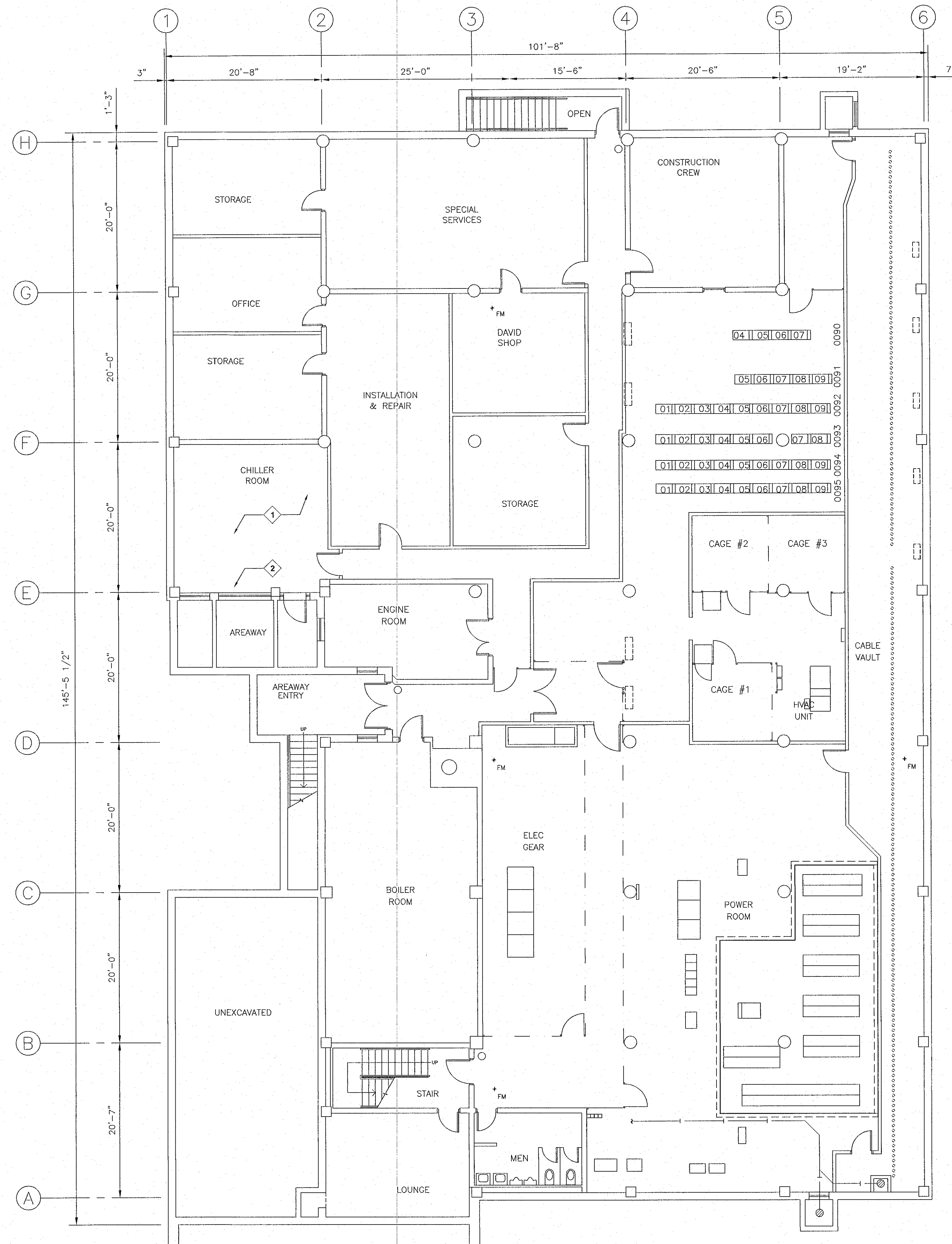
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BUILDINGS, CONSTRUCTION, AND/ OR ZONING CHANGES.



&T PROJECT NUMBER: A01KYNV	DATE: 7-14-20	SCALE: NTS
&T AUTHORIZATION:	DRAWN BY: _____	CHECKED BY: _____
MATT LONG	SHEET: — OF: —	SHEETS
	AT&T DRAWING NO.:	SHEET NO.



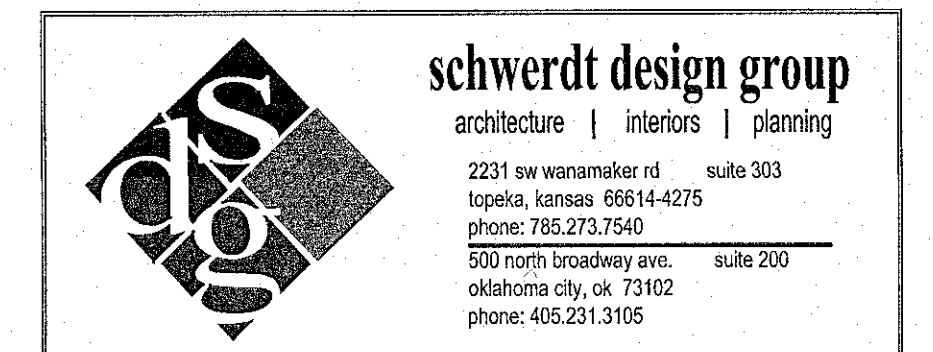
GENERAL NOTES:

- 1) GENERAL CONTRACTOR TO VERIFY EXISTING CONDITIONS PRIOR TO CONSTRUCTION.
- 2) CLEAN FLOOR & REMOVE GREASE, OILS & DEBRIS FROM REMODEL AREA PER EPOXY PAINT MANUFACTURERS RECOMMENDATIONS.
- 3) REVIEW MECHANICAL & ELECTRICAL DRAWINGS FOR EQUIPMENT AND EQUIPMENT REQUIREMENTS.
- 4) CONSTRUCTION AREA TO BE BROOM CLEAN AT THE COMPLETION OF CONSTRUCTION.

REMODEL NOTES:

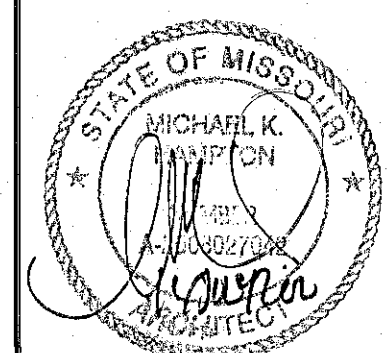
- 1) PAINT CONCRETE FLOOR WITH EPOXY PAINT IN ROOM, COLOR TO BE SELECTED BY OWNER, BASIS OF DESIGN OR EQUAL: SHERWIN WILLIAMS ARMORSEAL 650 SLURC SELF-LEVELING/ RE-COATABLE EPOXY (PROVIDE NON-SLIP TEXTURE).
- 2) PROVIDE CORE DRILL HOLES TO SUPPORT MECHANICAL / ELECTRICAL WORK (REFERENCE MECHANICAL / ELECTRICAL). FLOOR HOLES TO BE 1-1/2" HOLE DIAMETERS APART UNLESS OTHERWISE DIRECTED BY STRUCTURAL ENGINEER. FLOOR HOLES SHALL NOT BE LOCATED AT FLOOR BEAM LOCATIONS. FIRE STOP PENETRATIONS IN FLOOR, CEILING AND RATED PARTITIONS.

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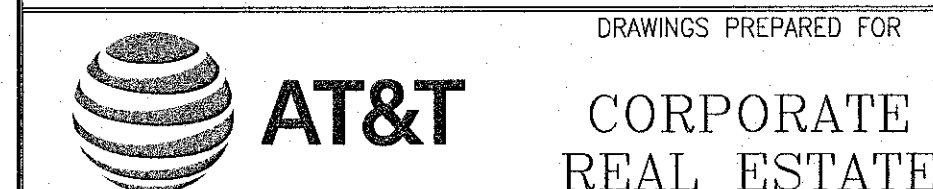
MICHAEL K HAMPTON - ARCHITECT (MCH# A-2008027042)

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NO.	REVISIONS / AUTHORIZATIONS	DATE	BY

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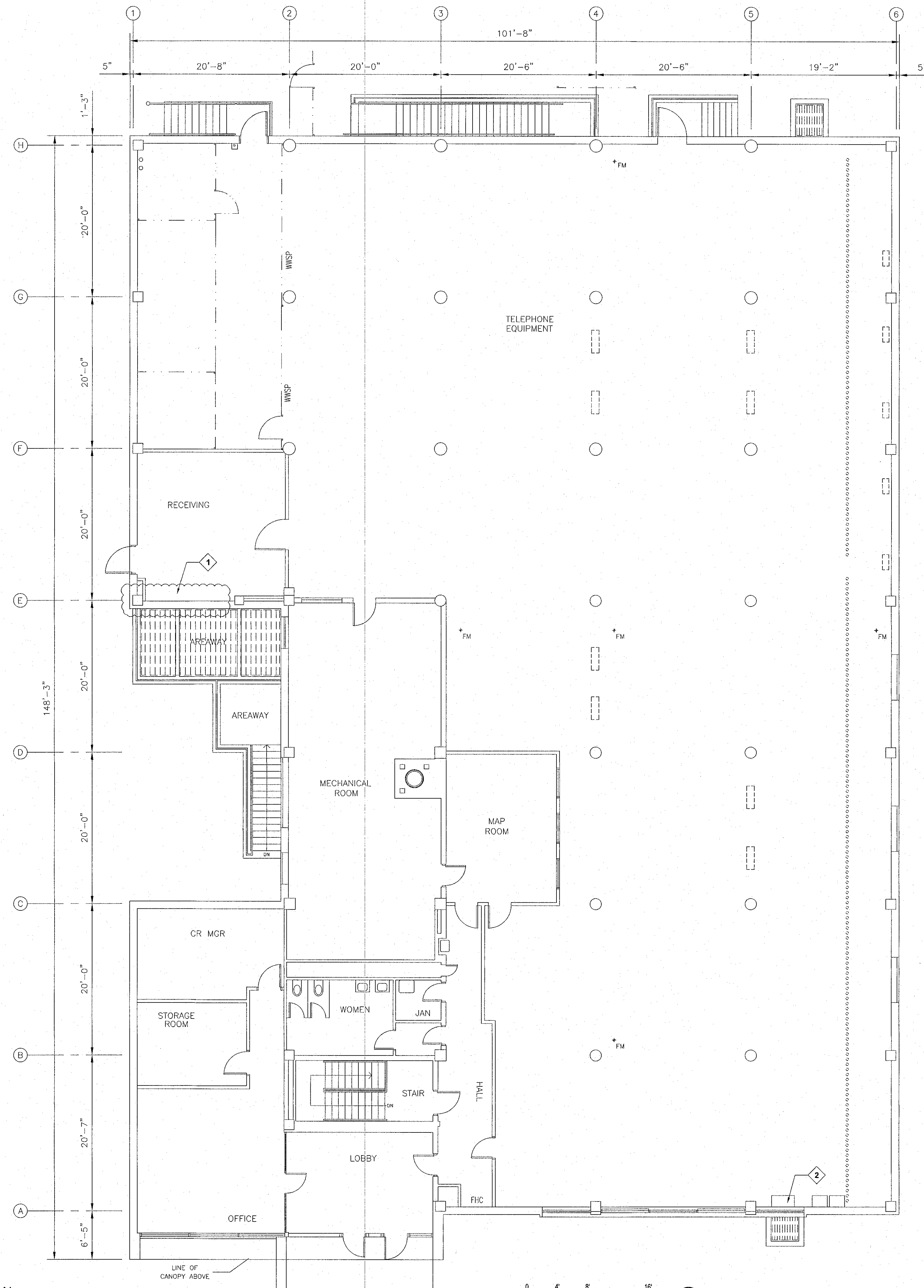


PROJECT TITLE: PIPE & CHILLER REPLACEMENT
00
202 EAST 3RD STREET
LEES SUMIT (JACKSON COUNTY)
MISSOURI US
KSCYMO41 123785.03.01 E05156

BASEMENT REMODEL PLAN ARCHITECTURAL

AT&T PROJECT NUMBER: A01KYNV	DATE: 7-14-20	SCALE: NTS
AT&T AUTHORIZATION: MATT LONG	DRAWN BY: _____ SHEET: -- OF: -- SHEETS	CHECKED BY: _____ AT&T DRAWING NO.: _____

A101



A1 FIRST FLOOR PLAN
SCALE: 1/8" = 1'-0"

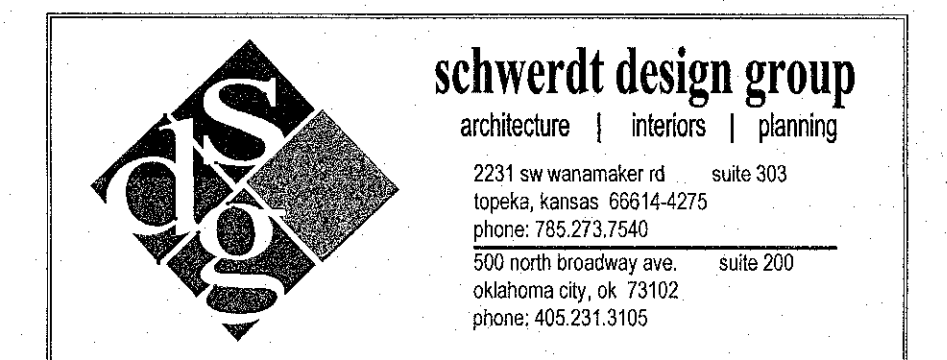
GENERAL NOTES:

- 1) GENERAL CONTRACTOR TO VERIFY EXISTING CONDITIONS PRIOR TO CONSTRUCTION.
- 2) REVIEW MECHANICAL & ELECTRICAL DRAWINGS FOR EQUIPMENT AND EQUIPMENT REQUIREMENTS.
- 3) CONSTRUCTION AREA TO BE BROOM CLEAN AT THE COMPLETION OF CONSTRUCTION.

REMODEL NOTES:

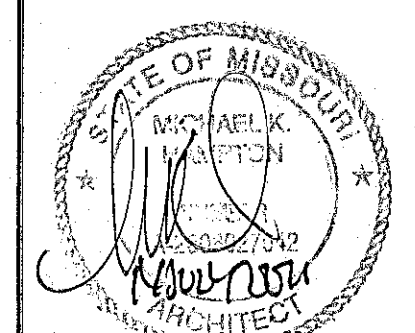
- 1) FIRE STOP PENETRATIONS AT FLOOR, ROOF AND RATED PARTITIONS PER AT&T REQUIREMENTS, REFERENCE MECHANICAL FOR PIPING LOCATIONS.
- 2) RELOCATE EXISTING METAL CABINETS FOR NEW RELIEF PLENUM AS DIRECTED BY OWNER. VERIFY THAT CABINETS ARE GROUNDED AT NEW LOCATION PER AT&T REQUIREMENTS.

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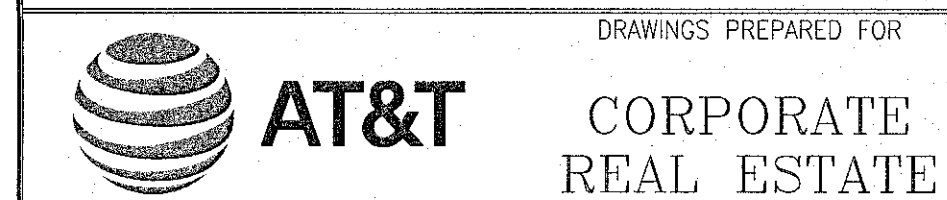
MICHAEL K. HAMPTON - ARCHITECT (MO# A-2008027042)

REVISIONS / AUTHORIZATIONS

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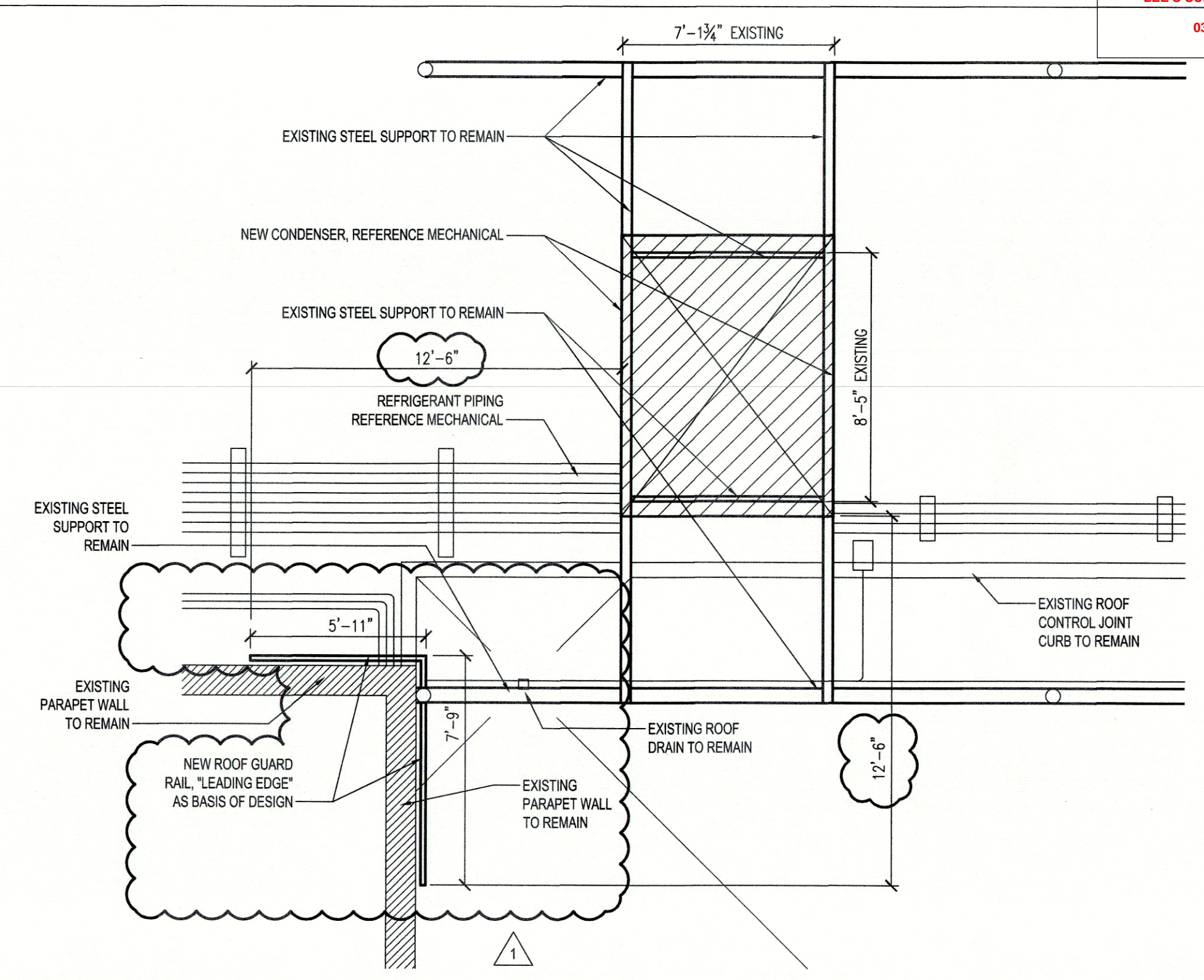
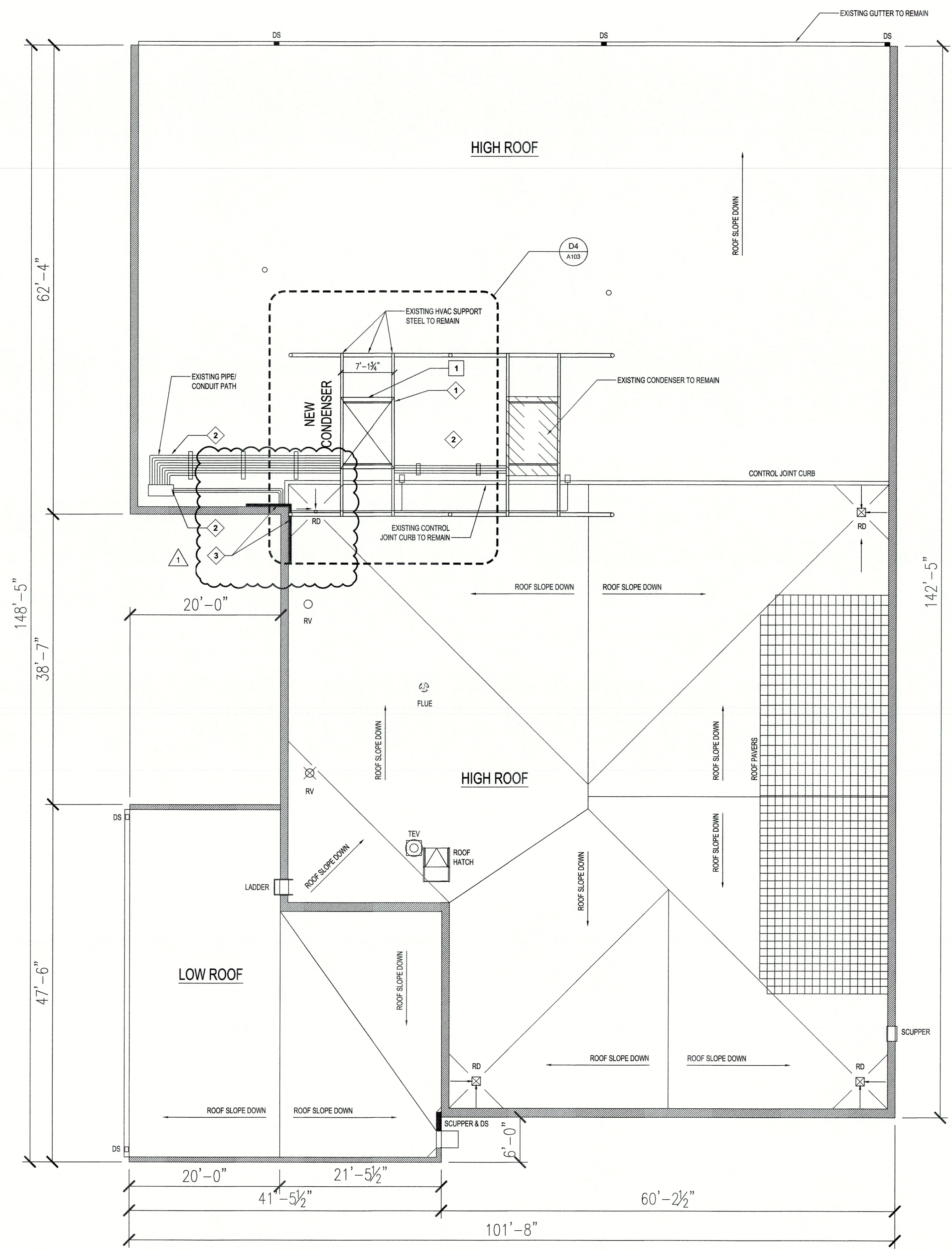


PROJECT TITLE: PIPE & CHILLER REPLACEMENT

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202 EAST 3RD STREET
LEES SUMIT (JACKSON COUNTY)
MISSOURI US
KSCYM041 123785.03.01 E05156

SHEET TITLE:
FIRST FLOOR REMODEL PLAN
ARCHITECTURAL

AT&T PROJECT NUMBER: A01KYNV	DATE: 7-14-20	SCALE: NTS
AT&T AUTHORIZATION: MATT LONG	DRAWN BY: 	CHECKED BY:
	SHEET: -- OF: -- SHEETS	SHEET NO. A102



D4 PARTIAL ENLARGED ROOF PLAN
SCALE: 1/4" = 1'-0"

GENERAL NOTES:

- 1) PROTECT EXISTING ROOF DURING CONSTRUCTION, NOTIFY OWNER OF ANY ROOF WORK PRIOR TO STARTING.

DEMOLITION NOTES:

- 1 REMOVE EXISTING CONDENSER UNIT, REFERENCE MEP FOR UNIT, LOCATION AND COORDINATION. PROTECT EXISTING EQUIPMENT & MATERIALS TO REMAIN.

REMODEL NOTES:

- 1 NEW HVAC UNIT REFERENCE MECHANICAL SIZE AND LOCATION.
- 2 ANY ROOF REPAIR TO EXISTING ROOF SYSTEM TO BE CARRIED OUT BY QUALIFIED ROOFING CONTRACTOR. INSTALLER QUALIFICATIONS: A QUALIFIED FIRM THAT IS APPROVED, AUTHORIZED, OR LICENSED BY MEMBRANE ROOFING SYSTEM MANUFACTURER TO INSTALL MANUFACTURERS PRODUCT AND THAT IS ELIGIBLE TO RECEIVE MANUFACTURER'S WARRANTY.
- 3 PROVIDE ROOF EDGE GUARD RAIL, "LEADING EDGE" WALL MOUNT GUARD RAIL AS BASIS OF DESIGN. (1345 TANEY STREET NORTH KANSAS CITY MISSOURI 688-990-2990) TOP OF GUARD RAIL TO BE 42" OFF ROOF SURFACE AND MOUNTED TO EXISTING PARAPET WALL. SEAL PARAPET AT MOUNTING LOCATION TO BE WATER TIGHT.

CONSULTANT STAMP

STATE OF MISSOURI
MICHAEL K. HAMPTON
ARCHITECT
MICHAEL K HAMPTON - ARCHITECT (MO# A-2008027042)

REVISIONS / AUTHORIZATIONS

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1	ASI #1 - CITY COMMENTS	3/9/21	

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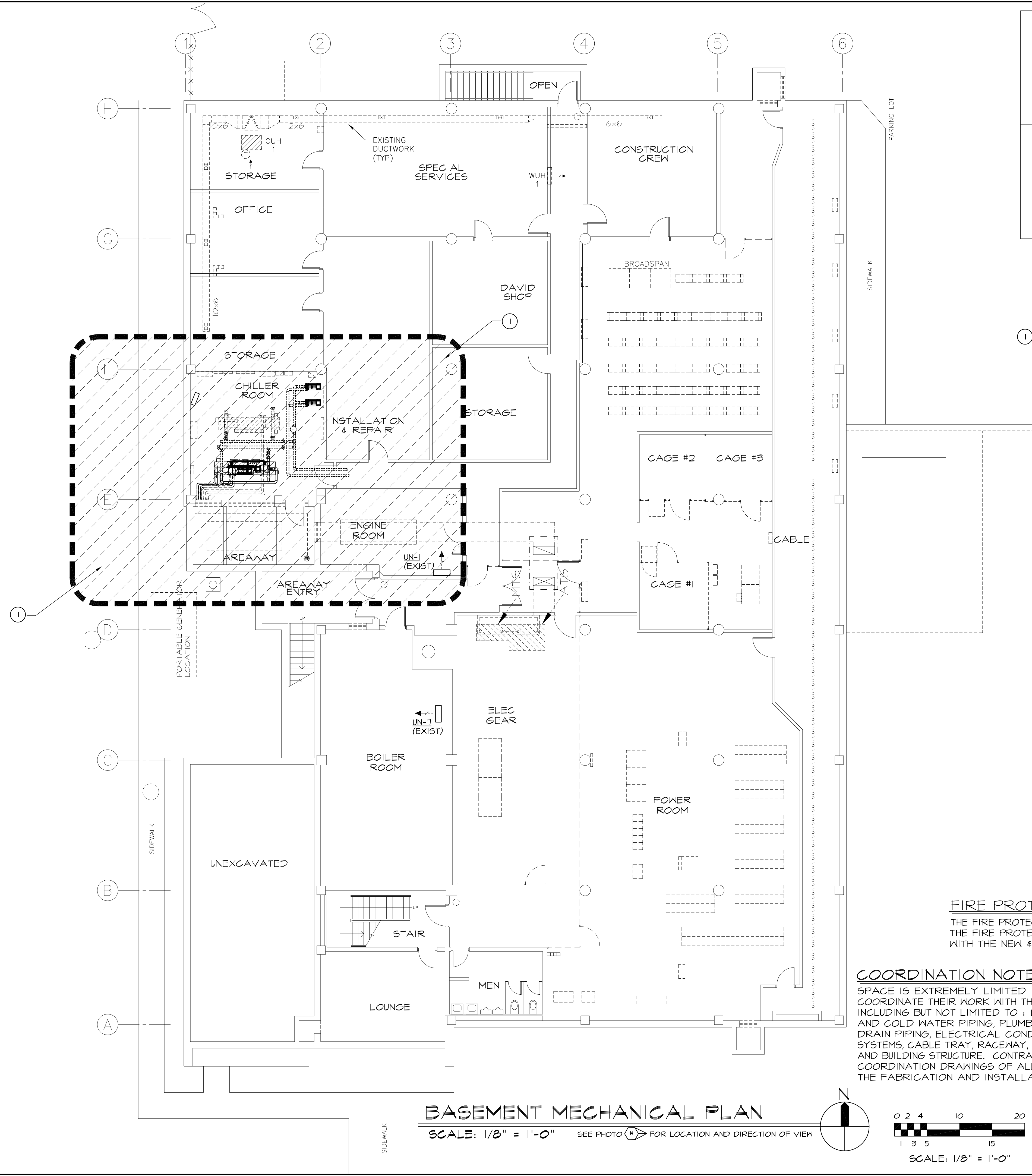
DRAWINGS PREPARED FOR
AT&T CORPORATE REAL ESTATE

PROJECT TITLE: PIPE & CHILLER REPLACEMENT

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202 EAST 3RD STREET
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MISSOURI US
KSCYM041 123785.03.01 E05156

SHEET TITLE: ROOF PLAN ARCHITECTURAL

AT&T PROJECT NUMBER: A01KYNV
DATE: 7-14-20
SCALE: NTS
DRAWN BY: MATT LONG
CHECKED BY: MATT LONG
SHEET: 1 OF 1 SHEETS
AT&T DRAWING NO.: A103



KEYED NOTES:
① SEE LARGER SCALE DRAWINGS ON FOLLOWING SHEETS FOR DEMOLITION AND NEW WORK IN THE BASEMENT MECHANICAL ROOM. REST OF BASEMENT SHOWN FOR REFERENCE.

FIRE PROTECTION NOTES:
THE FIRE PROTECTION CONTRACTOR SHALL REARRANGE THE FIRE PROTECTION SYSTEM PIPING TO COORDINATE WITH THE NEW & REVISED MECHANICAL SYSTEMS.

COORDINATION NOTE:
SPACE IS EXTREMELY LIMITED IN THIS BLDG. CONTRACTOR SHALL COORDINATE THEIR WORK WITH THE INSTALLATION OF BUILDING SYSTEMS INCLUDING BUT NOT LIMITED TO : DUCTWORK AND PIPING, DOMESTIC HOT AND COLD WATER PIPING, PLUMBING, FIRE PROTECTION PIPING, STORM DRAIN PIPING, ELECTRICAL CONDUIT, LIGHTING SYSTEMS, TECHNOLOGY SYSTEMS, CABLE TRAY, RACEWAY, CONVEYOR SYSTEMS, CEILING ELEMENTS AND BUILDING STRUCTURE. CONTRACTOR SHALL PREPARE MULTI-DISCIPLINE COORDINATION DRAWINGS OF ALL ABOVE CEILING SERVICES PRIOR TO THE FABRICATION AND INSTALLATION OF NEW WORK.

BASEMENT MECHANICAL PLAN
SCALE: 1/8" = 1'-0" SEE PHOTO (P) FOR LOCATION AND DIRECTION OF VIEW

SCALE: 1/8" = 1'-0"

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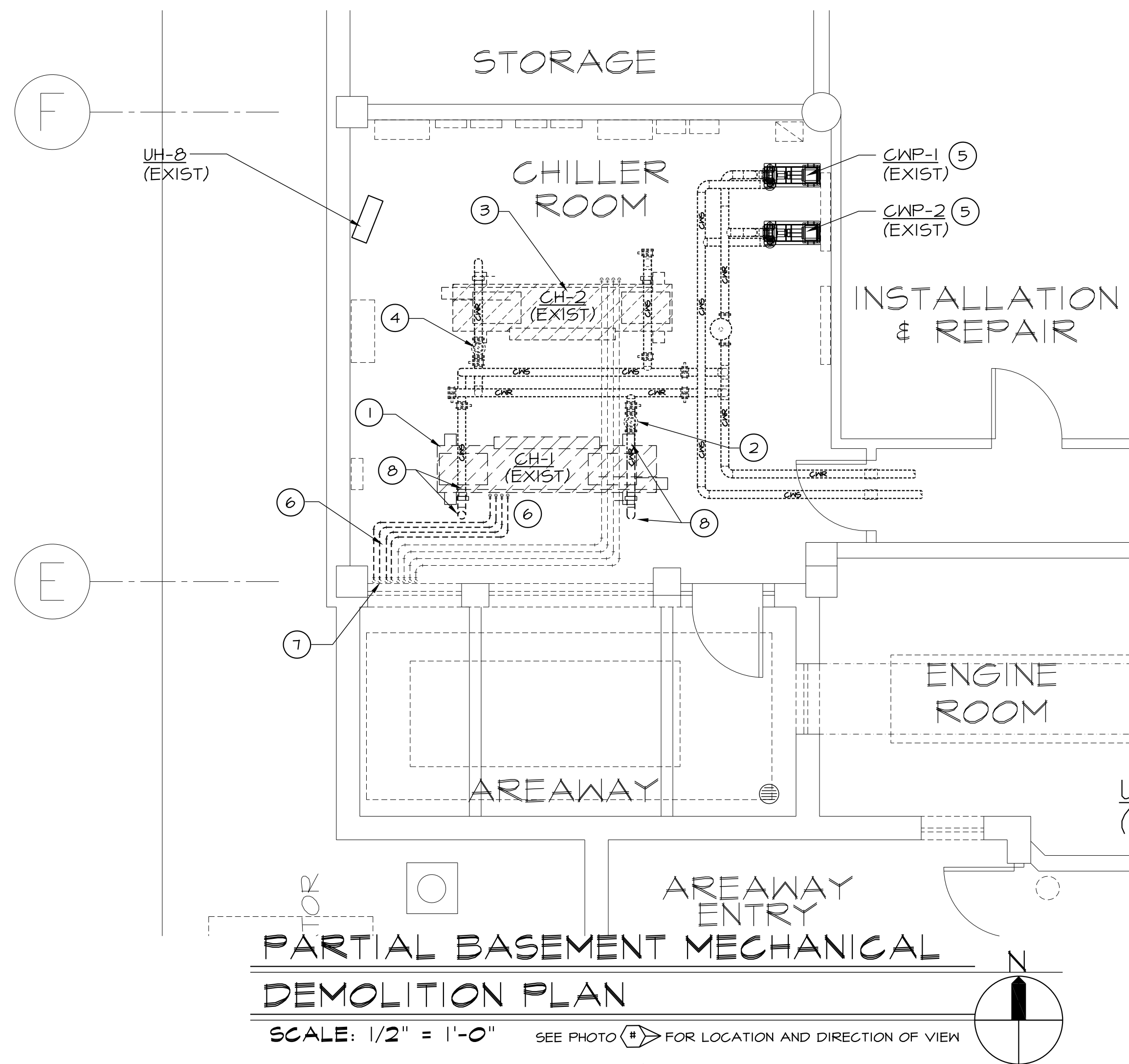
DRAWINGS PREPARED FOR

AT&T CORPORATE
REAL ESTATE

PROJECT TITLE:
PIPE & CHILLER REPLACEMENT
00
202 EAST 3RD STREET
LEES SUMMIT (JACKSON COUNTY)
MISSOURI US
KSCYMO41 123785.03.01 E05156

SHEET TITLE:
**BASEMENT
MECHANICAL PLAN**

AT&T PROJECT NUMBER: AOIKYNV	DATE: 01-20-2020	SCALE: SEE DRAWING
AT&T AUTHORIZATION: MATT LONG	DRAWN BY: GMT	CHECKED BY: GMT
SHEET: 1 OF 1		SHEETS: 1
AT&T DRAWING NO.:		M-1

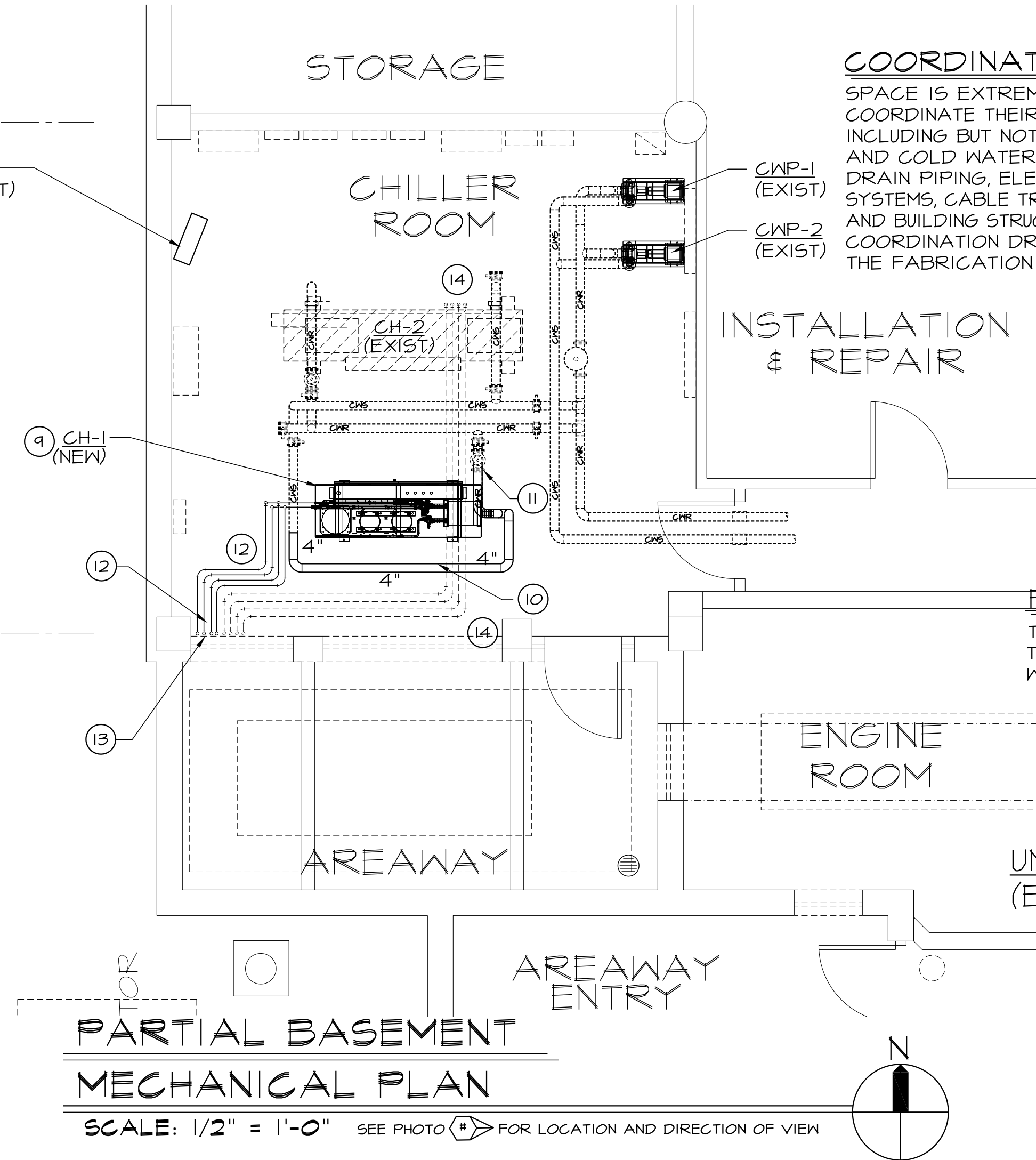


PARTIAL BASEMENT MECHANICAL
DEMOLITION PLAN

SCALE: 1/2" = 1'-0" SEE PHOTO (P) FOR LOCATION AND DIRECTION OF VIEW

KEYED NOTES:

- MECHANICAL CONTRACTOR SHALL COORDINATE WITH GENERAL AND ELECTRICAL CONTRACTORS FOR DISCONNECTING AND REMOVAL OF THE EXISTING CHILLER AND RELATED ITEMS NOT REUSED DURING INSTALLATION OF THE NEW CHILLER. NOTE THAT THE BUILDING MAINTENANCE PERSONNEL SHALL BE ALLOWED TO REMOVE ANY DEVICES, PANELS, FITTINGS, ETC. ON THE EXISTING CHILLER PRIOR TO REMOVAL FROM THE BUILDING. TEMPORARILY RELOCATE THE CHILLER WITHIN THE BASEMENT WHERE DIRECTED TO ALLOW AT&T PERSONNEL TO REMOVE ANY ITEMS AS NOTED ABOVE. AFTER NOTIFICATION THAT THIS HAS BEEN ACCOMPLISHED THE MECHANICAL CONTRACTOR SHALL REMOVE THE REMAINDER OF THE CHILLER. NOTE THAT ALL REFRIGERANT IN THE REMOVED SYSTEM SHALL BE RECLAIMED FROM THE SYSTEM AND PLACED IN APPROVED CONTAINERS AND GIVEN TO AT&T. PLACE CONTAINERS IN BUILDING BASEMENT WHERE DIRECTED BY AT&T. ALL REFRIGERANT BEARING MATERIAL REMOVED SHALL BE FLUSHED AND CLEANED PER SPECIFICATIONS AND REGULATIONS. PROVIDE BILL OF SALE AND LETTER OF COMPLIANCE FOR ALL MATERIAL REMOVED FROM BUILDING.
- DURING THE TIME THAT THE EXISTING CHILLER IS REMOVED AND THE NEW INSTALLED THE EXISTING PRIMARY CHILL WATER PUMP SHALL BE RECONDITIONED WITH NEW BEARINGS AND SEALS. UNIT SHALL BE REINSULATED AFTER WORK HAS BEEN COMPLETED AND OPERATION VERIFIED.
- OPERATION OF THE EXISTING CHILLER CH-2 SHALL BE VERIFIED PRIOR TO STARTING DEMOLITION OF EXISTING UNIT. CONTROLS CONTRACTOR SHALL VERIFY THAT ALL FRESH AIR CYCLES ARE OPERATING PROPERLY PRIOR TO STARTING DEMOLITION. PROVIDE WRITTEN REPORT OF ANY DEFICIENCIES NOTED TO AT&T FOR CONSIDERATION. COORDINATE WITH GENERAL CONTRACTOR AND AT&T PROJECT MANAGER.
- AFTER THE NEW CHILLER IS INSTALLED AND OPERATION VERIFIED AND ACCEPTED THE EXISTING PRIMARY CHILL WATER PUMP FOR CH-2 SHALL BE RECONDITIONED SAME AS NOTED ABOVE. COORDINATE SCHEDULE WITH AT&T PROJECT MANAGER.
- WHILE BUILDING IS OPERATING ON FRESH AIR CYCLE EACH OF THE SECONDARY CHILL WATER PUMPS SHALL BE RECONDITIONED WITH NEW BEARINGS AND SEALS. NOTE THAT ONLY ONE PUMP CAN BE OUT OF SERVICE AT ANY GIVEN TIME. SCHEDULE WORK WITH AT&T. SCHEDULE TO INSURE THAT UNITS ARE DOWN FOR THE ABSOLUTE MINIMUM AMOUNT OF TIME.
- REMOVE THE EXISTING REFRIGERANT HOT GAS AND LIQUID REFRIGERANT PIPING CONTAINING R-22 FROM THE EXISTING CHILLER UP TO THE CONDENSING UNIT ON THE ROOF. NOTE THAT PIPING SHALL BE FLUSHED AND CLEANED PER LOCAL AND FEDERAL REQUIREMENTS. SEE SPECIFICATIONS FOR ADDITIONAL INFORMATION.
- REMOVE EXISTING REFRIGERANT PIPING UP THROUGH THE SECOND FLOOR. FLOOR PENETRATIONS SHALL BE PROVIDED WITH TEMPORARY FIRE STOP DURING INSTALLATION OF NEW PIPING.
- REMOVE EXISTING CHILL WATER PIPING, VALVES, SENSORS, THERMOMETERS, ETC. AT REMOVED CHILLER. REMOVE BACK TO POINT WHERE NEW PIPING SHALL BE INSTALLED FOR CONNECTION TO NEW CHILLER. PROVIDE NEW CHILLER WITH NEW VALVES, SENSORS, THERMOMETERS, ETC. AS INDICATED ON CHILLER PIPING SCHEMATIC.
- INSTALL NEW CHILLER PER SCHEDULES AND DETAILS. SEE SCHEDULES, DETAILS AND DATA SHEETS FOR INFORMATION AND INSTALLATION REQUIREMENTS FOR AT&T FURNISHED CHILLER.
- CONNECT TO EXISTING CHILLER WATER PIPING AND EXTEND NEW PIPING TO NEW CHILLER AND CONNECT PER CHILLER PIPING SCHEMATICS. NOTE THAT SYSTEM MUST BE DRAINED FOR INSTALLATION OF THIS PIPING. ALL WORK MUST BE DONE DURING A PERIOD WHEN THE BUILDING IS OPERATING ON THE FRESH AIR CYCLE. COORDINATE WITH GENERAL CONTRACTOR AND AT&T PROJECT MANAGER. NOTE THAT CHILL WATER SYSTEM SHALL BE DOWN FOR THE ABSOLUTE MINIMUM AMOUNT OF TIME AND CLOSELY COORDINATED WITH AT&T.
- CONNECT TO PUMP DISCHARGE PIPING AND EXTEND TO NEW CHILLER. SEE CHILLER PIPING SCHEMATIC FOR FEATURES.
- EXTEND NEW REFRIGERANT HOT GAS AND LIQUID LINES ON NEW TRAPEZE HANGER SYSTEM IN PLACE OF THE REMOVED LINES. NOTE THAT BOTH THE HOT GAS AND LIQUID LINES INSIDE THE BUILDING SHALL BE INSULATED WITH 1/2" CLOSED CELL INSULATION.
- EXTEND NEW REFRIGERANT PIPING THROUGH SECOND FLOOR SLEEVED AND FIRE STOPPED. RISE UP SUPPORTED ON SECOND FLOOR ON UNI-STRUT SUPPORT SYSTEM PER DETAILS. NOTE THAT PIPING OUTSIDE BUILDING SHALL NOT BE INSULATED. PROVIDE COPPER CLAD OR INSULATED PIPING CLAMPS. NO COPPER PIPING SHALL COME IN CONTACT WITH FERROUS METAL. ALL PIPING SHALL BE "ACR" COPPER WITH ALL JOINTS MADE WITH "SILFO5".
- NOTE THAT ALL EXISTING HOT GAS AND LIQUID PIPING FROM THE EXISTING CHILLER CH-2 LOCATED INSIDE THE BUILDING SHALL BE INSULATED SAME AS NOTED FOR THE NEW CHILLER PIPING.



PARTIAL BASEMENT
MECHANICAL PLAN

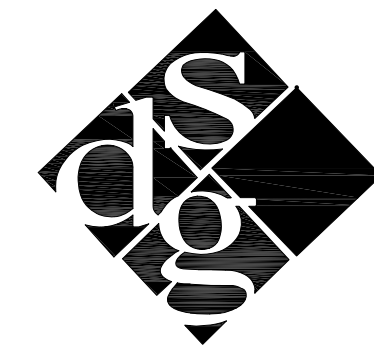
SCALE: 1/2" = 1'-0" SEE PHOTO (P) FOR LOCATION AND DIRECTION OF VIEW

COORDINATION NOTE:

SPACE IS EXTREMELY LIMITED IN THIS BLDG. CONTRACTOR SHALL COORDINATE THEIR WORK WITH THE INSTALLATION OF BUILDING SYSTEMS INCLUDING BUT NOT LIMITED TO : DUCTWORK AND PIPING, DOMESTIC HOT AND COLD WATER PIPING, PLUMBING, FIRE PROTECTION PIPING, STORM DRAIN PIPING, ELECTRICAL CONDUIT, LIGHTING SYSTEMS, TECHNOLOGY SYSTEMS, CABLE TRAY, RACEWAY, CONVEYOR SYSTEMS, CEILING ELEMENTS AND BUILDING STRUCTURE. CONTRACTOR SHALL PREPARE MULTI-DISCIPLINE COORDINATION DRAWINGS OF ALL ABOVE CEILING SERVICES PRIOR TO THE FABRICATION AND INSTALLATION OF NEW WORK.

FIRE PROTECTION NOTES:

THE FIRE PROTECTION CONTRACTOR SHALL REARRANGE THE FIRE PROTECTION SYSTEM PIPING TO COORDINATE WITH THE NEW & REVISED MECHANICAL SYSTEMS.

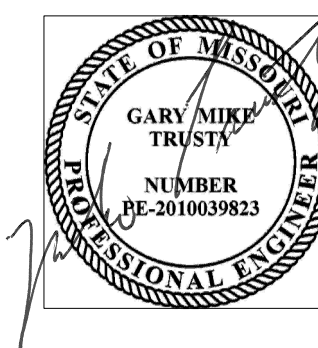


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PROJECT TITLE:

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LEES SUMMIT (JACKSON COUNTY)
MISSOURI US
KSCYM04I 123785.03.01 E05156

SHEET TITLE:

BASEMENT
MECHANICAL PLAN

AT&T PROJECT NUMBER:

AOIKYNV

DATE:

01-20-2020

SCALE: SEE DRAWING

DRAWN BY:

GMT

CHECKED BY: GMT

AT&T AUTHORIZATION:

MATT LONG

SHEET:

OF:

SHEETS

AT&T DRAWING NO.:

M-2



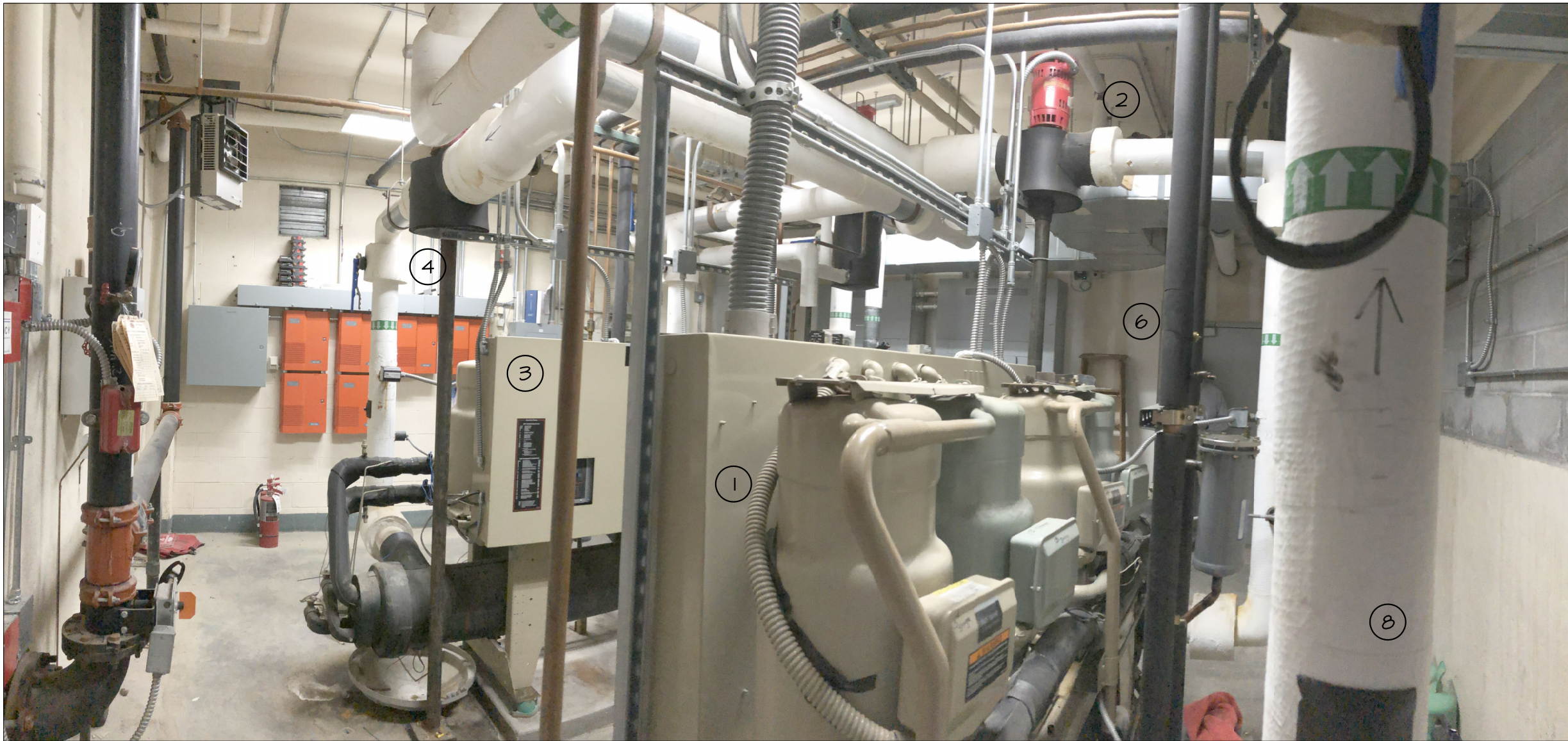
EXIST. CONDITION PHOTO #1

SEE PHOTO (1) FOR LOCATION AND DIRECTION OF VIEW



EXIST. CONDITION PHOTO #2

SEE PHOTO (2) FOR LOCATION AND DIRECTION OF VIEW



EXIST. CONDITION PHOTO #3

SEE PHOTO (3) FOR LOCATION AND DIRECTION OF VIEW

NOTE:
SEE SHEET M-2 FOR
KEYED NOTES.




EXIST. CONDITION PHOTO #4

SEE PHOTO (4) FOR LOCATION AND DIRECTION OF VIEW



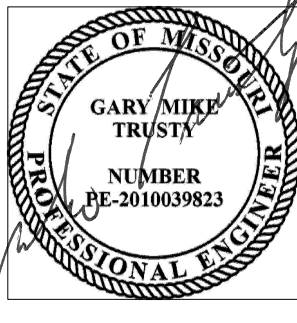
EXIST. CONDITION PHOTO #5

SEE PHOTO (5) FOR LOCATION AND DIRECTION OF VIEW



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SHEET TITLE:
**BASEMENT EXISTING
CONDITION PHOTOS**

AT&T PROJECT NUMBER: AOIKYNV	DATE: 01-20-2020	SCALE: SEE DRAWING
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SHEET: OF: SHEETS	AT&T DRAWING NO.:	SHEET NO. M-3



EXIST. CONDITION PHOTO #6

SEE PHOTO  FOR LOCATION AND DIRECTION OF VIEW



EXIST. CONDITION PHOTO #7

SEE PHOTO  FOR LOCATION AND DIRECTION OF VIEW



EXIST. CONDITION PHOTO #8

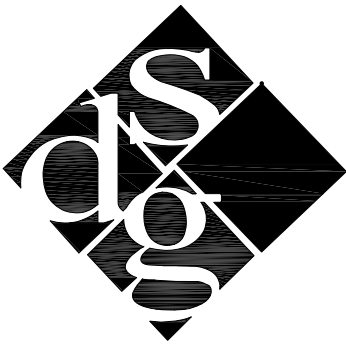
SEE PHOTO  FOR LOCATION AND DIRECTION OF VIEW



EXIST. CONDITION PHOTO #9

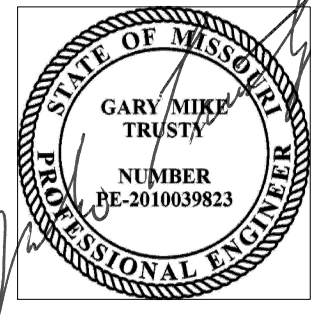
SEE PHOTO  FOR LOCATION AND DIRECTION OF VIEW

NOTE:
SEE SHEET M-2 FOR
KEYED NOTES.



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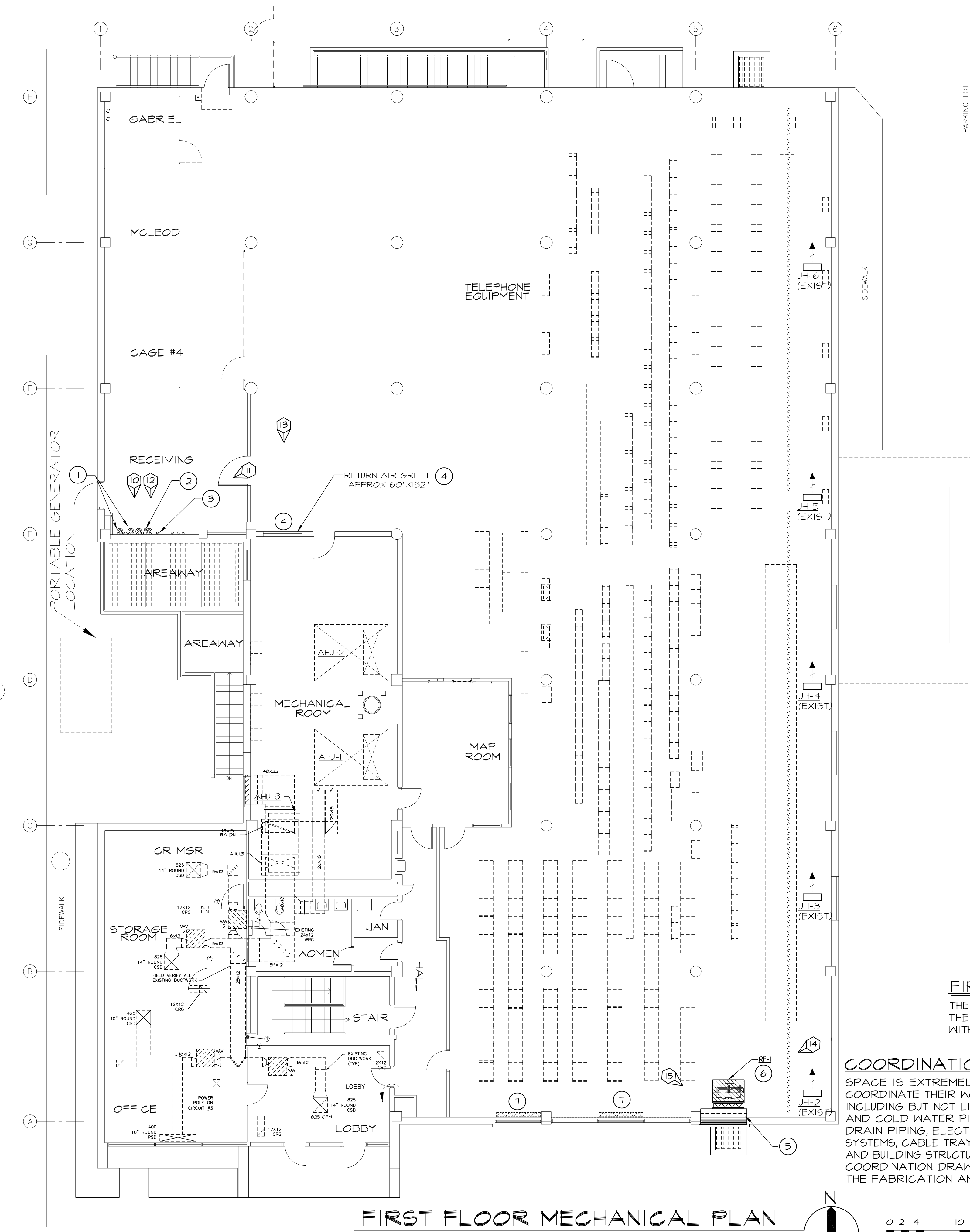
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SHEET TITLE:
BASEMENT EXISTING
CONDITION PHOTOS

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SHEET: OF: SHEETS		SHEET NO. M-4



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SHEET TITLE:
FIRST FLOOR
MECHANICAL PLAN

AT&T PROJECT NUMBER: AOIKYNV	DATE: 01-20-2020	SCALE: SEE DRAWING
AT&T AUTHORIZATION: MATT LONG	DRAWN BY: GMT	CHECKED BY: GMT
SHEET: 1 OF: 15		SHEETS: 15
AT&T DRAWING NO.: M-5		



EXIST. CONDITION PHOTO #10
SEE PHOTO  FOR LOCATION AND DIRECTION OF VIEW



EXIST. CONDITION PHOTO #11
SEE PHOTO  FOR LOCATION AND DIRECTION OF VIEW



EXIST. CONDITION PHOTO #12
SEE PHOTO  FOR LOCATION AND DIRECTION OF VIEW




EXIST. CONDITION PHOTO #13
SEE PHOTO  FOR LOCATION AND DIRECTION OF VIEW



EXIST. CONDITION PHOTO #14
SEE PHOTO  FOR LOCATION AND DIRECTION OF VIEW

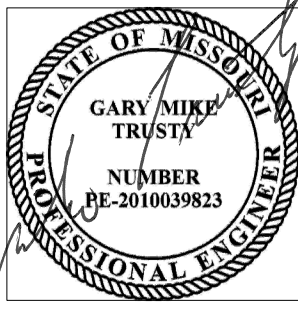


EXIST. CONDITION PHOTO #15
SEE PHOTO  FOR LOCATION AND DIRECTION OF VIEW



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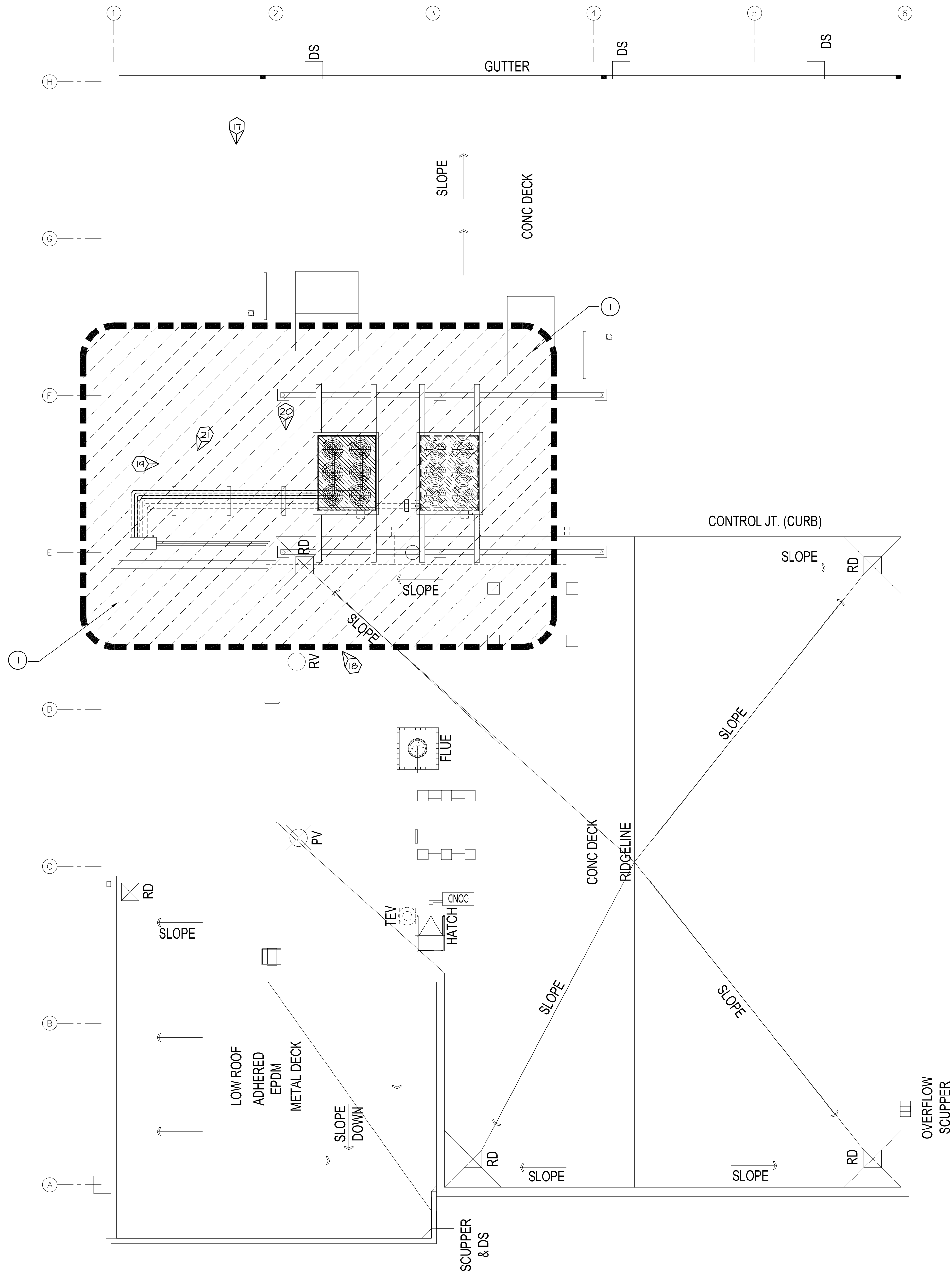
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SHEET TITLE:
**EXISTING CONDITION
FIRST FLOOR PHOTOS**

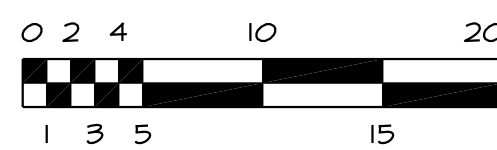
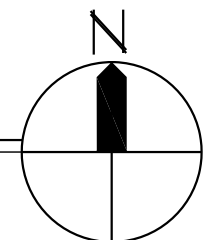
AT&T PROJECT NUMBER:	DATE:	SCALE:
AOIKYNV	01-20-2020	SEE DRAWING
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MATT LONG	GMT	GMT
SHEET:	OF:	SHEETS
AT&T DRAWING NO.:	M-6	



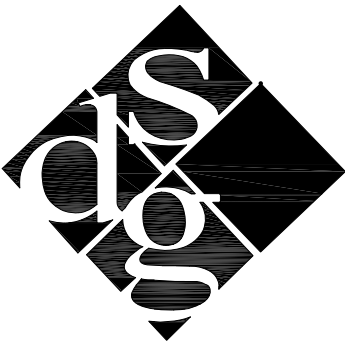
KEYED NOTES:
① SEE LARGER SCALE DRAWINGS ON FOLLOWING SHEETS FOR DEMOLITION AND NEW WORK IN THE BASEMENT MECHANICAL ROOM. REST OF BASEMENT SHOWN FOR REFERENCE.

ROOF MECHANICAL PLAN

SCALE: 1/8" = 1'-0"

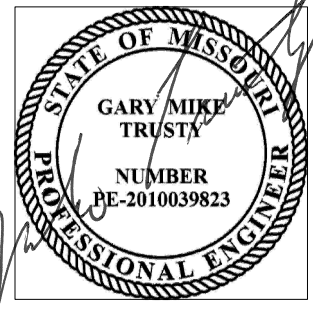


SCALE: 1/8" = 1'-0"



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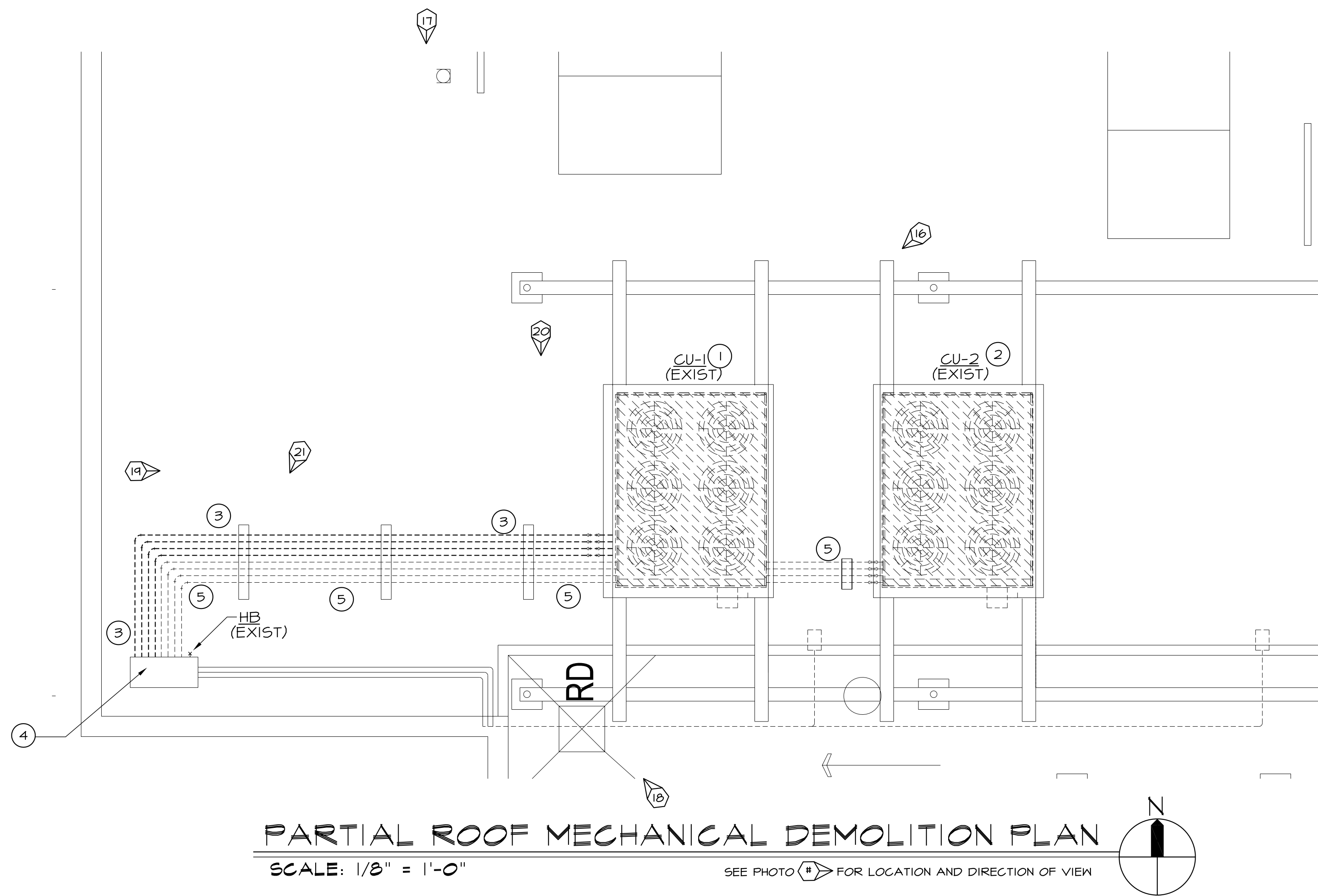
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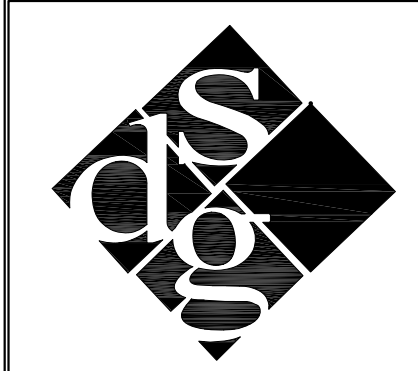
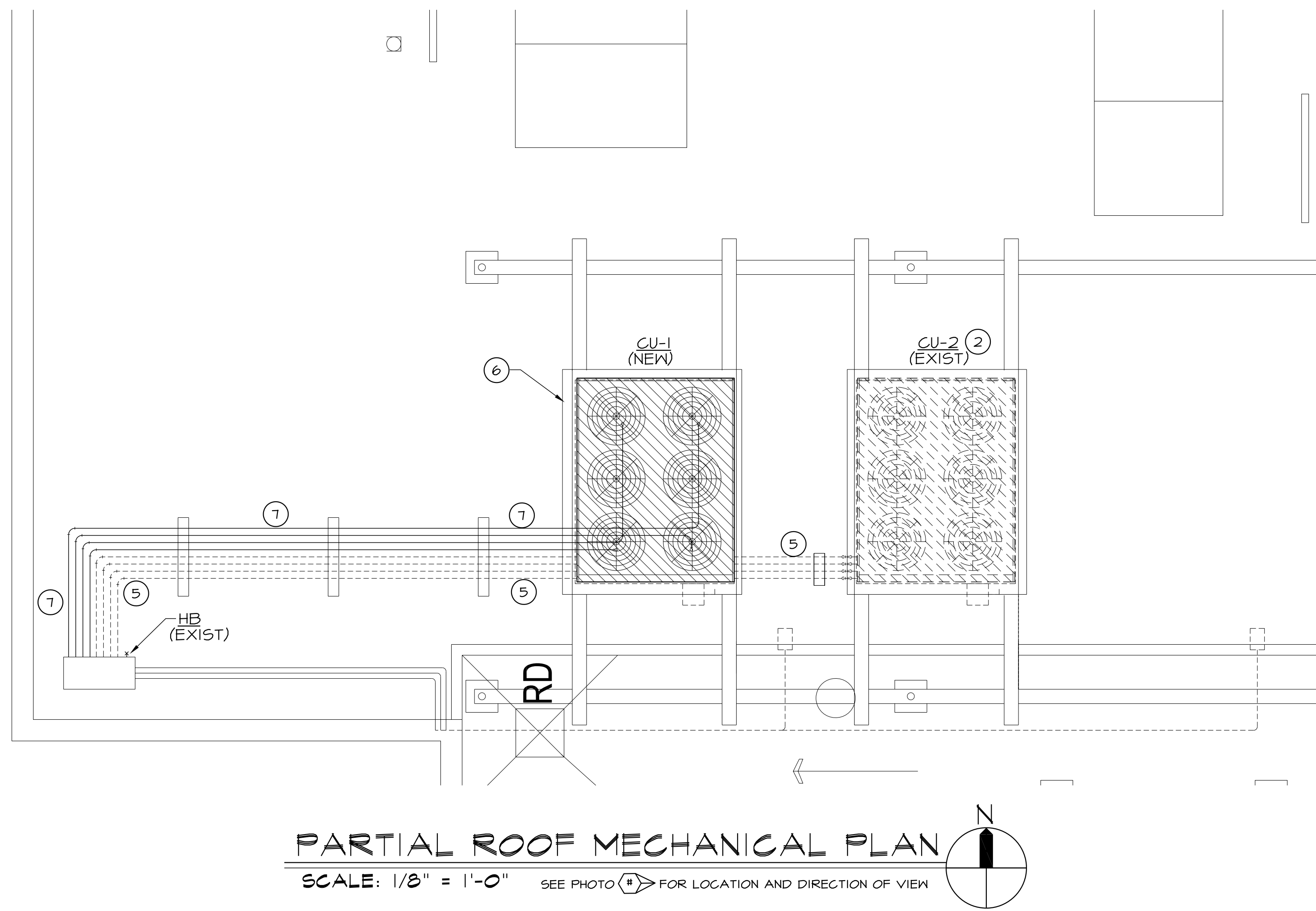
SHEET TITLE:
**ROOF
MECHANICAL PLAN**

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	SHEET: OF: SHEETS	SHEET NO. M-7



KEYED NOTES:

- 1 REMOVE THE EXISTING CONDENSER AND ALL RELATED PIPING, CONTROLS, POWER, ETC. NOTE THAT UNIT SHALL BE FLUSHED AND CLEANED PRIOR TO REMOVAL SAME AS NOTED FOR REMOVED CHILLER.
- 2 EXISTING CONDENSER TO REMAIN IN SERVICE. NOTE THAT BUILDING MAINTENANCE TECHNICIAN HAS OPTION TO REMOVE ANY PARTS FROM REMOVED CONDENSER FOR SERVICE OF THIS UNIT.
- 3 REMOVE ALL REFRIGERANT PIPING ASSOCIATED WITH THE REMOVED CONDENSER UNIT. NOTE THAT PIPING SHALL BE FLUSHED AND CLEANED PRIOR TO REMOVAL SAME AS NOTED FOR CHILLER AND PIPING IN BASEMENT.
- 4 REMOVE EXISTING REFRIGERANT PIPING EXTENDING DOWN THROUGH THE FIRST FLOOR AND TO THE BASEMENT CHILLER ROOM. NOTE THAT ALL PIPING AND REFRIGERANT SHALL BE REMOVED IN STRICT COMPLIANCE WITH THE LOCAL, STATE AND FEDERAL RECLAMATION REGULATIONS.
- 5 EXISTING REFRIGERANT PIPING AND CONDUIT TO CU-2 TO REMAIN. NOTE THAT EXISTING INSULATION ON PIPING SHALL BE REMOVED.
- 6 COORDINATE WITH THE GENERAL CONTRACTOR FOR SUPPORT OF THE NEW CONDENSER ON THE MODIFIED SUPPORT STRUCTURE. SECURE UNIT TO STRUCTURE WITH STAINLESS STEEL HARDWARE.
- 7 EXTEND NEW PIPING AND CONDUIT ON REVISED ROOF SUPPORT SYSTEM. PROVIDE UNI-STRUT SUPPORT SYSTEM PER DETAIL. MODIFY EXISTING SUPPORT SYSTEM TO ACCEPT NEW STRUT SYSTEM. NOTE THAT NEW AND EXISTING REFRIGERANT PIPING ABOVE THE ROOF SHALL NOT BE INSULATED. NOTE THAT ALL HARDWARE SHALL BE STAINLESS STEEL. PRIME AND PAINT ALL EXPOSED FERROUS METAL.



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SHEET TITLE: PARTIAL ROOF MECHANICAL PLANS			
AT&T PROJECT NUMBER: AOIKYNV	DATE: 01-20-2020	SCALE: SEE DRAWING	
AT&T AUTHORIZATION: MATT LONG	DRAWN BY: GMT	CHECKED BY: GMT	
	SHEET: OF: SHEETS	SHEET NO.	M-8



EXIST. CONDITION PHOTO #16

SEE PHOTO  FOR LOCATION AND DIRECTION OF VIEW



EXIST. CONDITION PHOTO #17

SEE PHOTO  FOR LOCATION AND DIRECTION OF VIEW



EXIST. CONDITION PHOTO #18

SEE PHOTO  FOR LOCATION AND DIRECTION OF VIEW



EXIST. CONDITION PHOTO #19

SEE PHOTO  FOR LOCATION AND DIRECTION OF VIEW



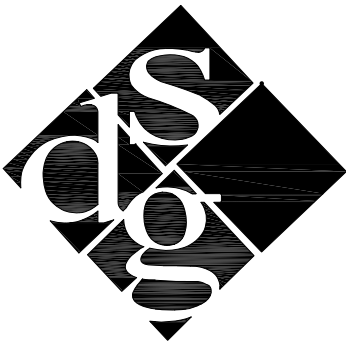
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SEE PHOTO  FOR LOCATION AND DIRECTION OF VIEW



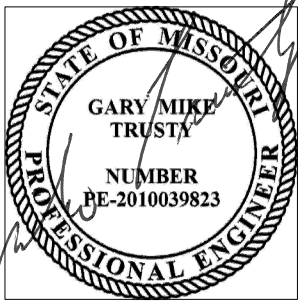
EXIST. CONDITION PHOTO #21

SEE PHOTO  FOR LOCATION AND DIRECTION OF VIEW



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SHEET TITLE:
**EXISTING CONDITION
ROOF PHOTOS**

AT&T PROJECT NUMBER:
AOIKYNV

DATE: 01-20-2020 SCALE: SEE DRAWING

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SHEET: OF: SHEETS
AT&T DRAWING NO.: SHEET NO.
M-9

WATER CHILLER SCHEDULE - FUTURE EQUIPMENT FOR REFERENCE ONLY																					
MARK	NOMINAL TONS	CHILL WATER					CONDENSER DATA (SEE DATA SHEETS)						CHILLER DATA (SEE DATA SHEETS)						MANUFACTURER	MODEL	
		GPM	EWT	LWT	P.D.	MIN. GPM	VOLTS	PHASE	RLA	MCA	MOP	MODEL	KW	VOLTS	PHASE	PRIM. EFF.	R.L.A.	M.C.A.			M.O.P.
CH-1	65	144	54°F	44°F	7.31'	90	208	3	24.6	25.6	30	CAUJC6062	62.54	208	3	1121 KW/TON	205	232	300	TRANE	CCAR065

- CH-1 SHALL BE COMPLETE WITH MICROPROCESSOR CONTROL PANEL, TOUCH SCREEN INTERFACE, TEMPERATURE AND PRESSURE GAGES, OVERLOAD PACKAGE, SOLID STATE LEAVING WATER SENSOR, FACTORY MOUNTED STARTERS, FACTORY START-UP, AMP AND VOLT METER, CONTROL POWER TRANSFORMER, REFRIGERANT GAUGES, EVAPORATOR INSULATION, INTERLOCK COMMUNICATIONS AS DIRECTED BY CONTROLS CONTRACTOR, NEOPRENE ISOLATORS AND CONTROL INTERFACE WITH BUILDING MANAGEMENT SYSTEM, FLOW SWITCHES, AND CHILL WATER RESET. SEE DATA SHEETS FOR ADDITIONAL FEATURES.
- SEE EQUIPMENT DATA SHEETS FOR ADDITIONAL INFORMATION AND SPECIFICATIONS.

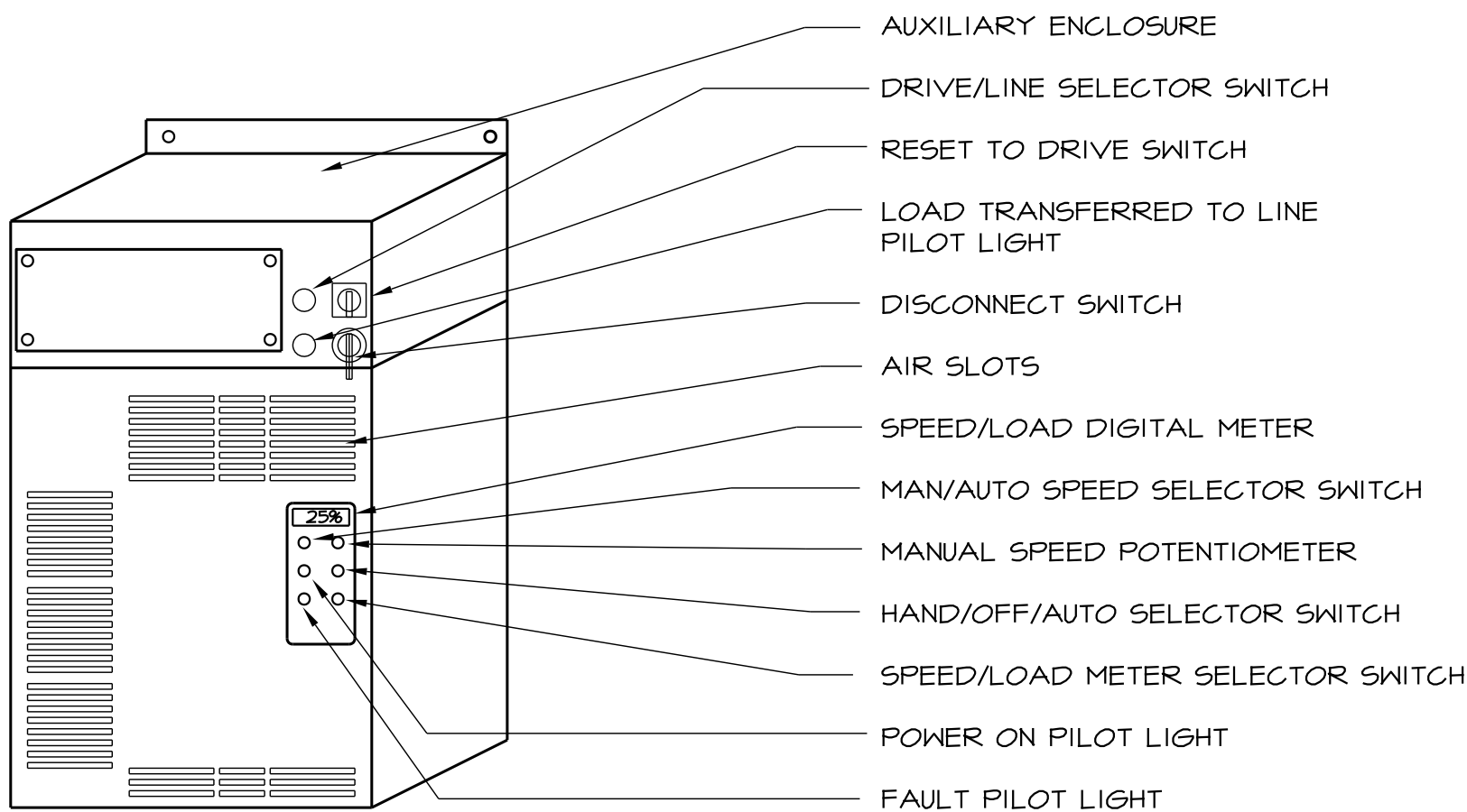
AIR COOLED CONDENSING UNIT SCHEDULE									
MARK	NOMINAL TONS	TOTAL CAPACITY	ELECTRICAL DATA					MANUFACTURER	MODEL
			VOLTS	Ø	FLA	UNIT MCA	UNIT MOP		
CU-1	60	120,000	208	3	24.6	25.6	30	TRANE	CAUJC6062

- CU-1 SHALL BE COMPLETE WITH MICROPROCESSOR CONTROLS, FACTORY START-UP, CONTROL POWER TRANSFORMER, INTERLOCK COMMUNICATIONS AND CONTROL INTERFACE WITH BUILDING MANAGEMENT SYSTEM, LOW AMBIENT TO 0 DEGREE F, NEOPRENE ISOLATORS AND CONDENSER COIL GUARDS. SEE DATA SHEETS FOR ADDITIONAL FEATURES.
- PROVIDE BOTH THE NEW AND EXISTING CONDENSERS WITH AN INTAKE FILTER SCREEN SYSTEM AS MANUFACTURED BY @AIR SOLUTIONS OR APPROVED EQUAL. THAT SYSTEM SHALL PROTECT ALL SURFACES OF UNITS THAT AIR PASSES THROUGH TO REACH THE CONDENSER COILS.
- SEE EQUIPMENT DATA SHEETS FOR ADDITIONAL INFORMATION AND SPECIFICATIONS.

EXHAUST FAN SCHEDULE														
MARK	SERVICE	TYPE	DRIVE	FAN DATA				MOTOR DATA				SONE LEVEL	MANUFACTURER	MODEL
				CFM	T.S.P.	T.S.	RPM	HP	VOLTS	PH.	RPM			
RF-1	BUILDING PRESSURE CONTROL	PROP.	MULTIPLE BELT	24,100	0.125	—	444	2	208	3	1,750	25	ACME	DCH48L

- PROVIDE COMPLETE WITH FACTORY FAN HOUSING, DOUBLE BELT DRIVE, FAN SAFETY GUARD, SAFETY DISCONNECT AND ALL STANDARD DETAILS.
- SEE FAN DETAIL FOR ADDITIONAL REQUIRED FEATURES.

AIR DEVICE SCHEDULE				
MARK	MODEL	TYPE	MANUFACTURER	DESCRIPTION
(A)	"IBD2"	FIRE DAMPER	RUSKIN	STYLE "A"
(B)	CD-50	CONTROL DAMPER	RUSKIN	W/ LINKAGE AND OPERATOR

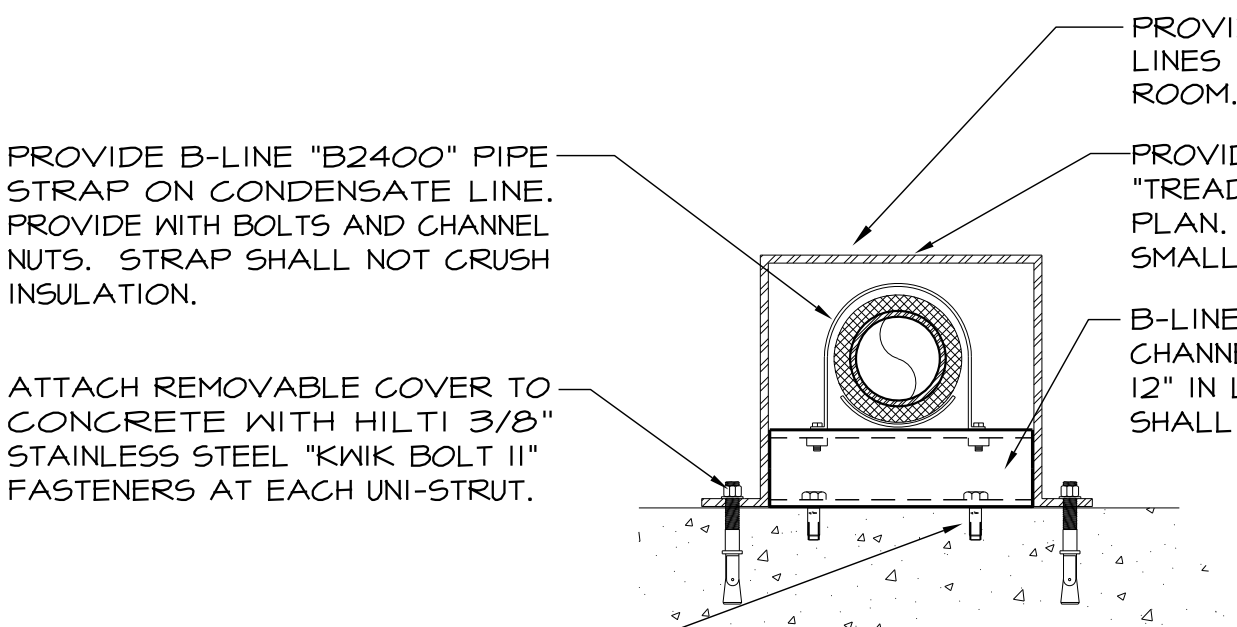


- PROVIDE ADJUSTABLE FREQUENCY CONTROL SIZED TO CONTROL EACH NEW FAN(4 PER UNIT) MOTORS AT AHU'S. UNIT SHALL BE PROVIDED WITH ALL STANDARD DETAILS PLUS OPTIONAL DISCONNECT SWITCH, AUTOMATIC CONSTANT SPEED BY-PASS, INDIVIDUAL MOTOR PROTECTION, PRESSURE TO ELECTRIC INTERFACE, FLOOR STAND, TEST METER AND PID CONTROLLER. UNIT SHALL BE PROVIDED COMPLETE WITH ALL REQUIRED DETAILS. UNITS SHALL BE SIZED FOR NEW MOTOR SIZES. PROVIDE ONE UNIT FOR EACH MOTOR. UNIT SHALL CONTROL 110% OF MOTOR RATED HORSEPOWER.
- ELECTRICAL CONTRACTOR SHALL EXTEND POWER TO UNIT WITH DISCONNECT AND POWER TO MOTORS.
- CONTROL CONTRACTOR SHALL PROVIDE ALL CONTROL INTERLOCK WIRING. CONTROL CONTRACTOR SHALL PROVIDE 0-10 VOLT CONTROL VOLTAGE TO UNIT FOR CONTROL OF SPEED. ALSO PROVIDE INTERLOCK WITH STARTERS. NOTE THAT STARTERS SHALL BE PROVIDED WITH SPEED CONTROLLER.
- MECHANICAL CONTRACTOR SHALL PROVIDE UNIT TO ELECTRICAL CONTRACTOR FOR INSTALLATION.
- NOTE THAT UNIT SHALL HAVE 110% AMPERAGE CAPACITY OF FAN MOTOR.

UNIT	MOTOR SIZE	MOTOR/DRIVE VOLTS/PHASE
RF-1	2 HP	208 VOLT / 3 PHASE

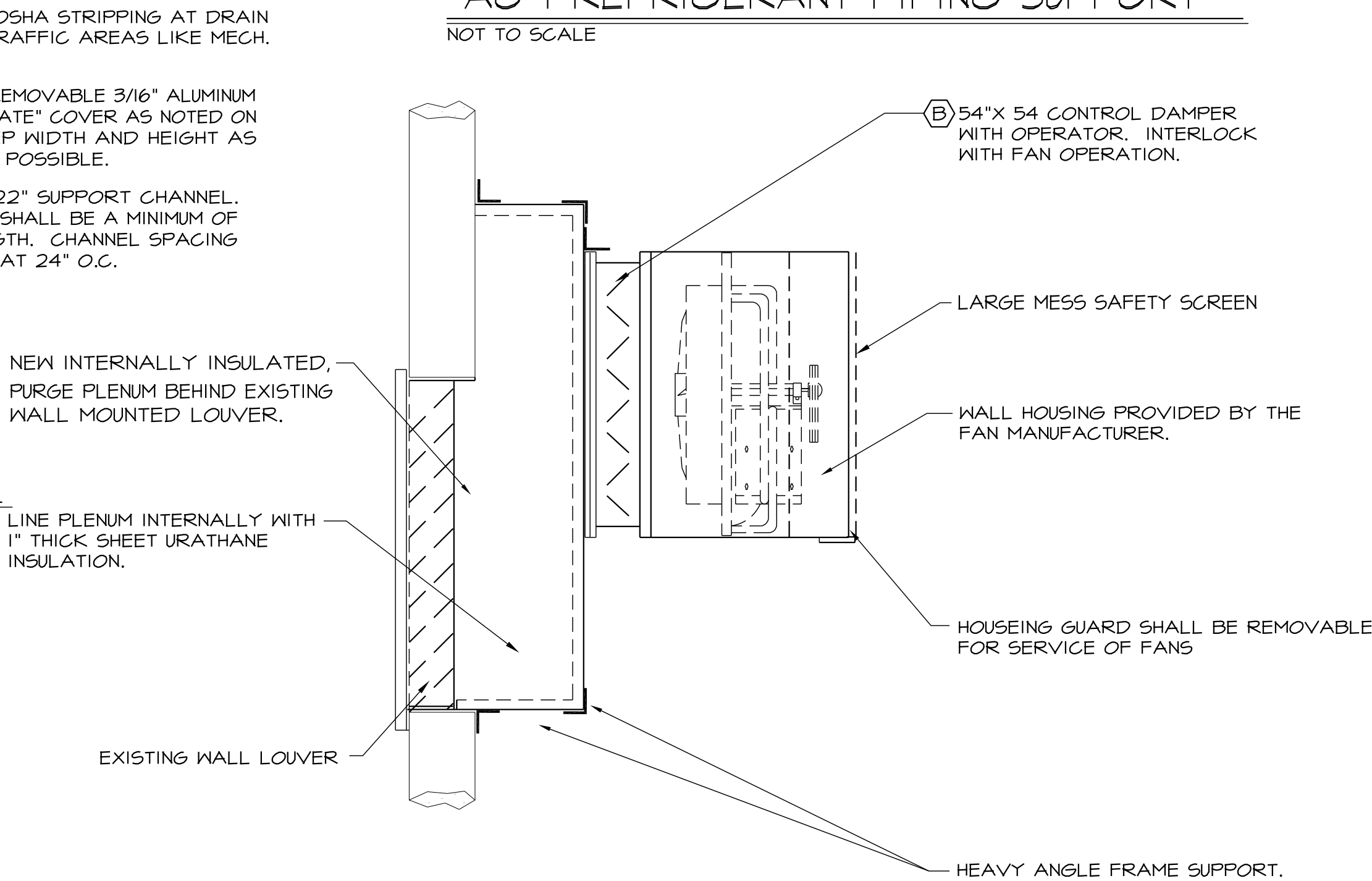
VARIABLE FREQUENCY DRIVE DETAILS

NOT TO SCALE



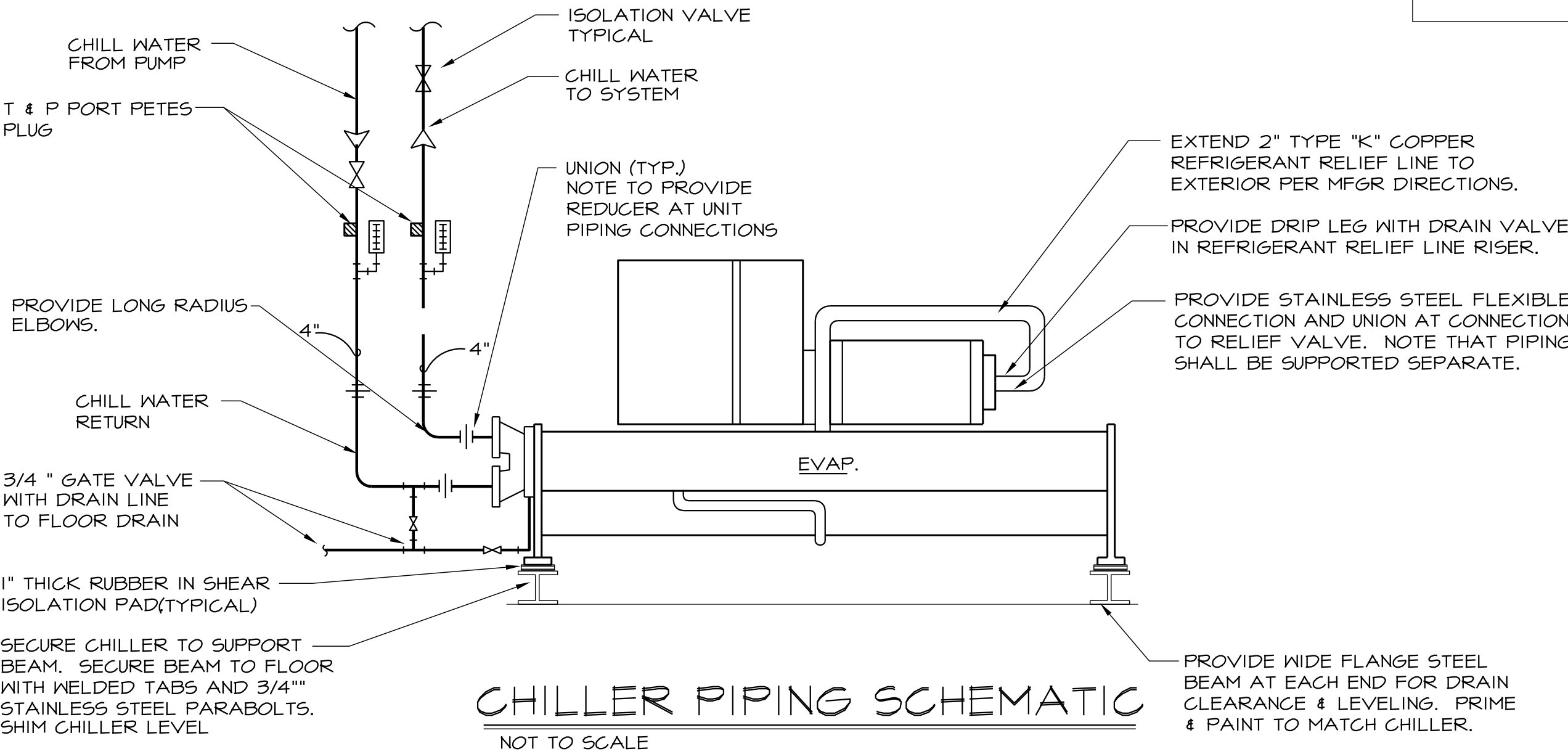
DRAIN PIPING SUPPORT

NOT TO SCALE



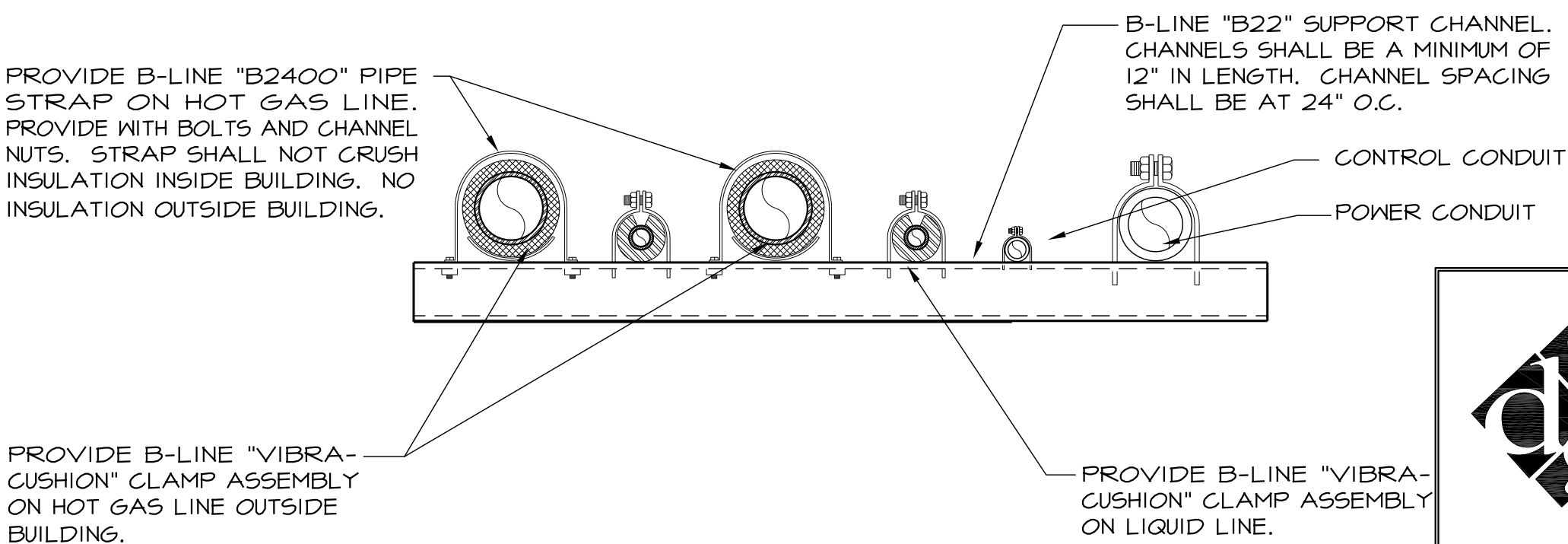
RELIEF EXHAUST FAN/PLENUM DETAIL

NOT TO SCALE



CHILLER PIPING SCHEMATIC

NOT TO SCALE



AC-1 REFRIGERANT PIPING SUPPORT

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miketrusty@msn.com

REVISIONS / AUTHORIZATIONS

NO.	REVISIONS / AUTHORIZATIONS	DATE	BY

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AT&T CORPORATE REAL ESTATE
DRAWINGS PREPARED FOR

PROJECT TITLE:
PIPE & CHILLER REPLACEMENT
00
202 EAST 3RD STREET
LEES SUMMIT (JACKSON COUNTY)
MISSOURI US
KSCYMO41 123185.03.01 E05156

SHEET TITLE:
MECHANICAL SCHEDULES AND DETAILS

AT&T PROJECT NUMBER: A0IKYNY	DATE: 01-20-2020	SCALE: SEE DRAWING
AT&T AUTHORIZATION	DRAWN BY: GMT	CHECKED BY: GMT
MATT LONG	SHEET: OF: SHEETS	SHEET NO.
AT&T DRAWING NO.:		M-10

CONTROL NOTES:

1. PROVIDE COMPLETE CONTROL AND INTERLOCK DRAWINGS FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION.
2. ALL WIRING SHALL BE INSTALLED IN CONDUIT AND IN STRICT ACCORDANCE WITH THE NEC AND ELECTRICAL SPECIFICATIONS. ALL CONTROL WIRING RELATED TO THE CONTROLS SHALL BE INSTALLED BY THE CONTROL CONTRACTOR OR ELECTRICAL CONTRACTOR.
3. ALL WIRING INSIDE CONTROL CABINET SHALL BE RUN IN WIRE WAY WITH TERMINAL STRIPS, BLOCKS, FUSE BLOCKS, ETC. WIRING SHALL BE MINIMUM GAGE PER SCHEDULE. COLOR CODING SHALL BE CONTINUOUS TO FINAL CONNECTION.
4. PROVIDE INTERLOCK BETWEEN EXISTING FAN STARTERS, CONTROL VALVES, OPERATORS, ETC.
5. CONTROL LOGIC PROGRAMMING SHALL BE PROVIDED BY AT&T, ENGINEER AND CONTRACTOR. COORDINATE WITH ENGINEER.
6. CONTROL CONTRACTOR TO INTERLOCK NEW CONTROL DEVICES WITH EXISTING AND/OVER CONTROL SYSTEM FOR COMMUNICATIONS.
7. ALL DEVICES, SENSORS, OPERATORS, CABINETS, ETC. SHALL BE LABELED TO INDICATE FUNCTION AND DIAGRAM IDENTIFICATION. LABELS SHALL BE BAKELITE TYPE AND SCREWED TO DEVICE WITH SET SCREWS. ROOM SENSORS SHALL HAVE COLOR COORDINATED COVERS AND PRINTED TAPE TYPE CONTROL LABELS.
8. PROVIDE ALL INTERLOCK AND COORDINATION WITH EXISTING CONTROLS, STARTERS, EQUIPMENT, ETC.
9. REMOVE ALL EXISTING CONTROLS, TUBING, CABINETS, SENSORS, THERMOSTATS, ETC. NOT USED IN NEW CONTROL SYSTEM.
10. PROVIDE COMPLETE SUBMITTAL ON ALL DEVICES USED IN SYSTEM.
11. ALL ROOM MOUNTED TEMPERATURE SENSORS SHALL BE MOUNTED AT 64" TO BOTTOM OF SENSOR.
12. ALL WIRING SHALL BE PULLED DIRECT FROM CONTROL DEVICE TO CONTROLLER OR INTERFACE PANEL. (NO SPLICING ALLOWED) MAINTAIN COLOR CODING.
13. COORDINATE EXACT LOCATION OF ALL PANELS, SENSORS, ETC. WITH ENGINEER.
14. COORDINATE EXACT ROUTING OF ALL WIRING WITH ENGINEER.
15. ALL CONTROL WIRING TO DIGITAL EQUIPMENT AND SENSORS SHALL BE STRANDED TFFN WIRE OR RATED PLENUM CABLE AS MANUFACTURED BY PHILADELPHIA INSULATED WIRE COMPANY.
16. PROVIDE TRANSFORMER, ISOLATION RELAYS, POWER REGEF., FUSES, ETC. LOCATED IN WIREWAYS AS INDICATED NEXT TO DEVICE TO BE CONTROLLED.
17. CONTROL WIRING IN EQUIPMENT ROOM SHALL BE RUN IN CONDUIT. CONDUIT SHALL BE RUN AS HIGH AS POSSIBLE AND SHALL NOT BE SUPPORTED BY TELEPHONE COMPANY EQUIPMENT RACKS. CONDUIT SHALL MEET SPECIFICATIONS OF ELECTRICAL ENGINEER.
18. PROVIDE CONTROL TRANSFORMER MOUNTED ON CONTROL WIRING WIREWAY. EXTEND CONDUIT AND POWER WIRING TO CONTROL DEVICES AND INTERLOCK. TRANSFORMER SHALL BE KELE & ASSOCIATES MODEL "691-K2" AND PROVIDED WITH ISOLATION FUEL BLOCK AND SWITCH.
19. CONTROL RELAYS AND PLUG BLOCKS SHALL BE RR SERIES HEAVY DUTY GENERAL PURPOSE RELAYS AND SOCKETS.
20. CONTROL CONTRACTOR SHALL PROVIDE THE CONTROL SENSORS, CONDUIT, MOUNTING, WIRING, ETC. TO PROVIDE THE FUNCTIONS AS NOTED. ALL WIRING SHALL BE EXTENDED TO CONTROL PANEL.
21. INDOOR HUMIDISTAT SHALL BE AND/OVER AS PER SCHEDULE. OUTDOOR UNIT SHALL BE BY SAME MANUFACTURER BUT DESIGNED FOR OUTDOOR APPLICATION. NOTE THAT POWER FOR HUMIDISTAT SHALL BE EXTENDED FROM "VS" LOCATED IN CONTROL INTERFACE PANEL CLOSE TO HUMIDITY SENSOR. NOTE THAT THE CONTROL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL CONTROL AND POWER INTERFACE WIRING FROM PRIMARY CONTROL PANELS TO EACH DEVICE.
22. EXISTING AHU CONTROLS SHALL BE CONVERTED TO DIGITAL CONTROLS AND ACTUATORS.
23. MIXED AIR TEMPERATURE, RETURN AIR TEMPERATURE AND SUPPLY AIR TEMPERATURE SHALL BE TYPE "DS" SENSORS INSTALLED AT THE AIR HANDLING UNIT.
24. NOTE THAT WHEN CONTROL WIRING MUST BE TERMINATED AT A TERMINAL STRIP IN THE PANEL THAT THE TERMINAL SHALL BE MARKED WITH SMALL LABEL INDICATING INTERFACE DEVICE.
25. SEE CONTROL RELATED NOTES ON VARIOUS SHEETS FOR ADDITIONAL CONTROL REQUIREMENTS NOT INDICATED ON THESE CONTROL SHEETS.
26. PNEUMATIC CONTROLS AT EXISTING VAV BOXES SHALL REMAIN. CALIBRATE AND VERIFY OPERATION OF EXISTING VAV BOXES.
27. THE CONTROL CONTRACTOR SHALL PROVIDE AN OXYGEN DISPLACEMENT MONITOR AND REFRIGERANT SENSOR LOCATED IN CHILLER ROOM TO DETECT PRESENCE OF REFRIGERANT. UNIT SHALL PROVIDE ALL ALARMS, CONTROLS, SEQUENCE, ETC. AS REQUIRED BY ANSI/ASHRAE - 15. CONTROL OF EXHAUST FAN AND FRESH AIR DAMPER SHALL BE CONTROLLED BY SENSORS AND ROOM TEMPERATURE.
28. ALL EXISTING CONTROLS DEVICES, WIRING, TUBING, ACTUATORS, ETC. NOT REUSED BY THE REVISED CONTROL SYSTEM SHALL BE REMOVED BY THE CONTROLS CONTRACTOR.
29. EXISTING CONTROL WIRING AND CONDUIT SHALL BE REROUTED TO COORDINATE WITH THE NEW LOCATION FOR PANELS AND THE REMOVED WALLS. COORDINATE EXACT ROUTING WITH MECHANICAL AND ELECTRICAL CONTRACTOR TO INSURE THAT CONDUIT SHALL NOT CONFLICT WITH OTHER DISCIPLINES.

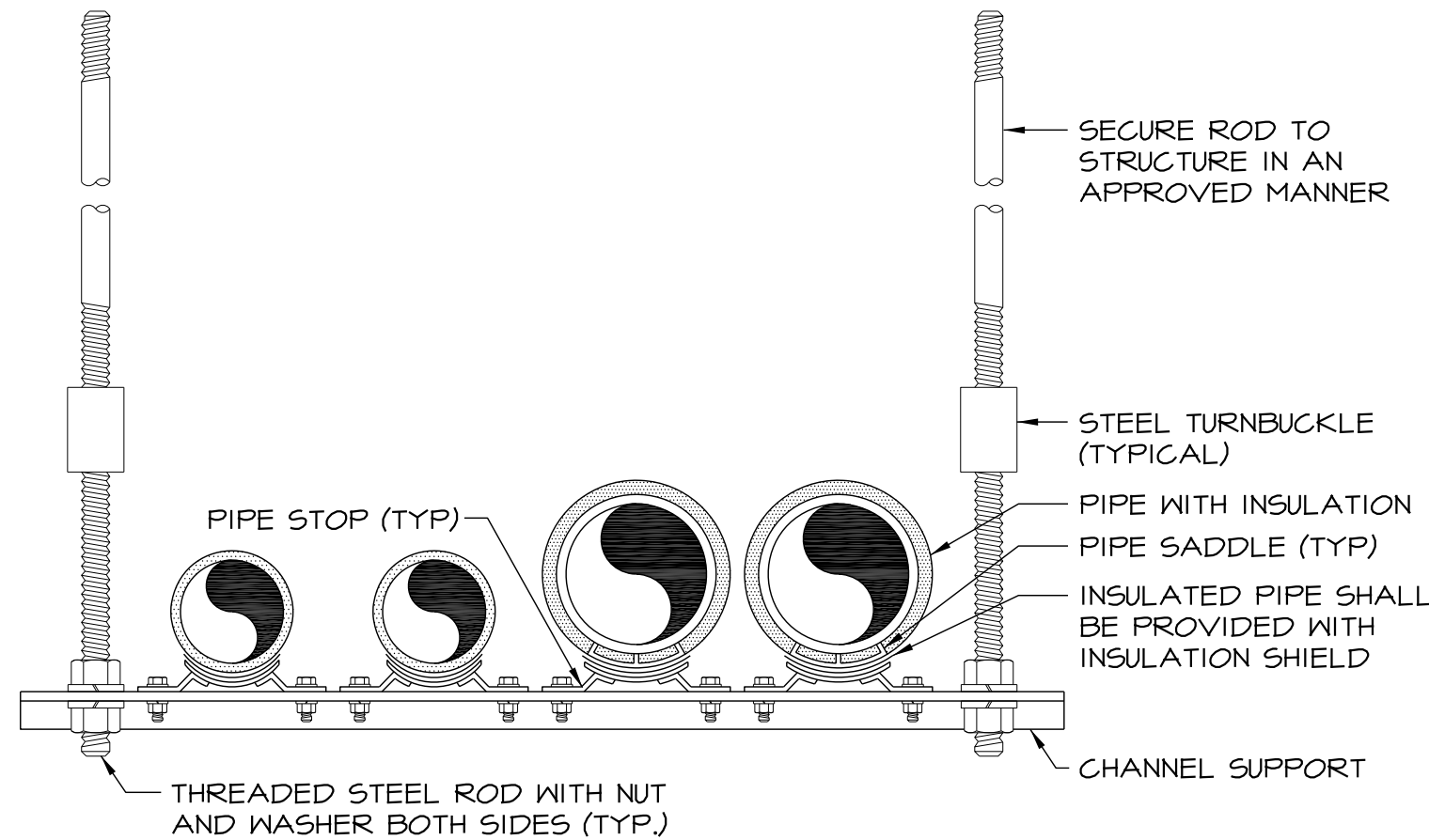
HVAC NOTES:

1. REFER TO GENERAL NOTES ON DRAWING FOR ADDITIONAL REQUIREMENTS.
2. PROVIDE ACCESS DOORS TO ALL FIRE DAMPERS, SMOKE DAMPERS, EQUIPMENT, COILS, ETC. WHERE NOT DIRECTLY ACCESSIBLE THOROUGH AIR DEVICES OR REMOVABLE CEILING GRID. MINIMUM SIZE SHALL BE 18" X 18" UNLESS NOTED OTHERWISE.
3. INSTALL FIRE OR SMOKE DAMPERS IN THE RATED WALLS AS INDICATED. SEAL AROUND ALL PENETRATIONS OF RATED WALLS, CHASES, CEILINGS, FLOORS, ETC. TO MAINTAIN THE FIRE/SMOKE RATING OF THE ASSEMBLY.
4. ALL EQUIPMENT AND MATERIAL SHALL BE SUITABLE FOR ELEVATED TEMPERATURES INDICATED.
5. SEE STRUCTURAL PLANS FOR EXACT DIMENSIONS AND DETAILS OF THE BUILDING.
6. SEAL AROUND ALL DUCT AND PIPE PENETRATIONS OF MECHANICAL TO PROVIDE AN AIR-TIGHT RETURN AIR FLENUM.
7. ALL HVAC WORK TO BE PER SMACNA AND ALL APPLICABLE CODES.
8. ALL DUCTS SHALL BE MOUNTED HIGH AS POSSIBLE AGAINST BOTTOM OF BEAMS EXCEPT AS REQUIRED TO AVOID CONFLICTS WITH INTERSECTING DUCTS. DIAGONALLY OFFSET DUCTS IMMEDIATELY BEFORE AND AFTER PASSING UNDER INTERSECTING DUCTS OR LARGE STRUCTURAL MEMBERS TO MAINTAIN DUCT TIGHT TO STRUCTURE.
9. PROVIDE TURNING VANES AT ALL ELBOWS GREATER THAN 45°. TURNING VANES SHALL BE DOUBLE THICKNESS.
10. EXPOSED DUCTWORK, ETC. SHALL BE FURNISHED SUITABLE FOR PAINTING, AND SHALL BE PAINTED AS REQUIRED BY ARCHITECTURAL SPECIFICATIONS.
11. ANY DUCTWORK WHICH PASSES OVER RETURN AIR OPENING THROUGH WHICH DUCT IS VISIBLE, SHALL BE PAINTED FLAT BLACK A MINIMUM OF 5 FEET EACH SIDE OF OPENING TO REDUCE VISIBILITY.
12. MAXIMUM 2'0" FLEX DUCT ON ALL DIFFUSER RUNOUTS. CONNECTIONS TO FLEX DUCT SHALL BE SMOOTH ON AIRFLOW SIDE.
13. PROVIDE AIR TIGHT FITTING AND DAMPER AT EACH CONNECTION OF ROUND BRANCH DUCTS TO A RECTANGULAR DUCT.
14. PROVIDE FLEXIBLE CONNECTIONS AND TRANSITIONS ON DUCT INLET AND OUTLET CONNECTIONS TO ALL VAV BOXES, ETC., WHERE EQUIPMENT HAS ROTATING PARTS (MOTORS, ETC.).
15. SEE ARCH REFLECTED CEILING PLAN FOR EXACT LOCATION OF ALL CEILING MOUNTED AIR DEVICES.
16. ALL RECTANGULAR SUPPLY DUCTS SHALL BE EXTERNALLY INSULATED. BALANCE OF THE DUCTWORK SHALL BE EXTERNALLY INSULATED WITH 2" THICK FOIL BACKED FIBERGLASS INSULATION UNLESS SHOWN OTHERWISE. DUCT SIZES SHOWN ON PLANS INDICATE ACTUAL DUCT SHEET METAL SIZE.
17. INSTALL SCHEDULED FILTERS AT THE COMPLETION OF CONSTRUCTION. USE ONE SET OF SCHEDULED FILTERS DURING CONSTRUCTION. INSTALL FINAL SET PRIOR TO TEST AND BALANCE. MINIMUM 2" THICK "FARR 30-30"
18. BALANCE AIR SYSTEM TO PROVIDE INDICATED AIR FLOWS. SEE SPECIFICATIONS FOR OTHER TEST AND BALANCE REQUIREMENTS. SUBMIT FINAL BALANCE OF AIR AND WATER SYSTEMS (FLOW AND TEMPERATURE) FOR REVIEW.
19. MECHANICAL CONTRACTOR (MC) SHALL COORDINATE AND VERIFY THE FOLLOWING WITH THE ELECTRICAL CONTRACTOR (EC) PRIOR TO BID:

DISCONNECTS:
WHERE NOT FURNISHED WITH EQUIPMENT: FURNISHED BY EC,
INSTALLED BY EC.
WHERE FURNISHED WITH EQUIPMENT: FURNISHED BY MC,
INSTALLED BY EC.
20. COORDINATE FINAL PLACEMENT OF ALL THERMOSTATS WITH ARCHITECT AND ENGINEER. ANY THERMOSTAT THAT IS REQUIRED TO BE MOUNTED ON AN EXTERIOR WALL SHALL BE MOUNTED ON AN INSULATED PAD.

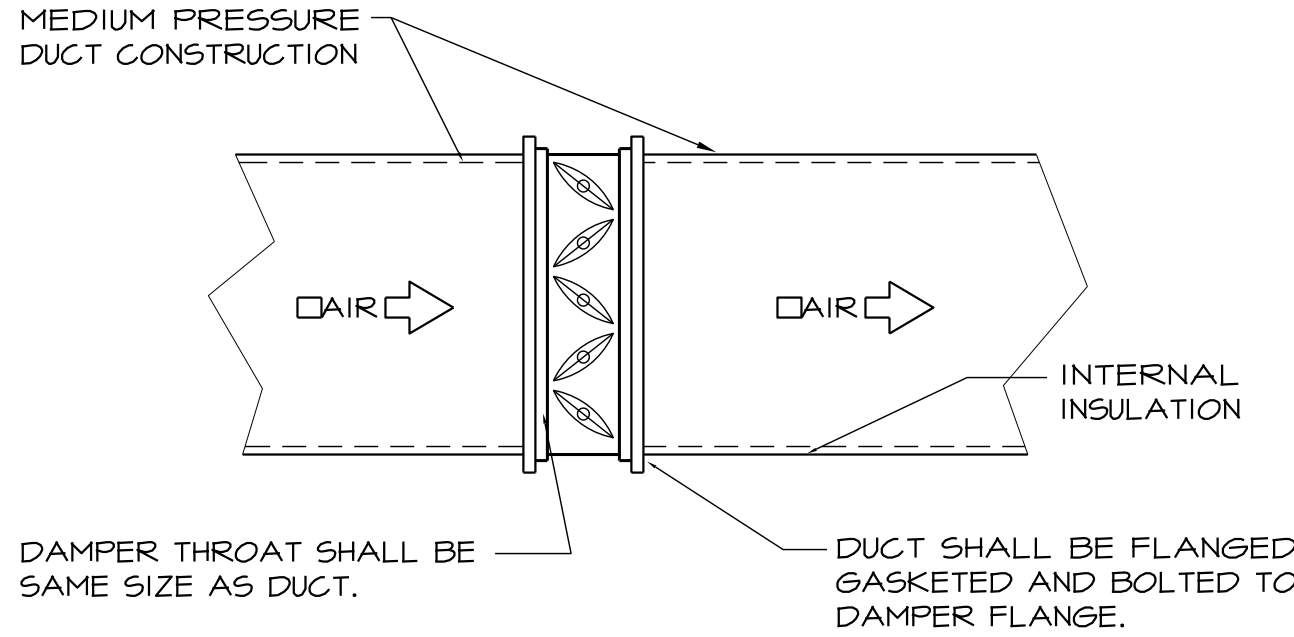
MECHANICAL GENERAL NOTES:

- REFER TO SPECIFICATIONS AND PROJECT MANUAL FOR ADDITIONAL INFORMATION AND REQUIREMENTS.
2. REFER TO ALL PROJECT DRAWINGS FOR DETAILS OF CONSTRUCTION AND INSTALLATION REQUIREMENTS.
 3. REFER TO GENERAL CONDITIONS AND SUPPLEMENTARY GENERAL CONDITIONS FOR THE CONTRACT. THE CONTRACTOR IS RESPONSIBLE FOR FULL COORDINATION OF PROJECT INCLUDING THE EQUIPMENT AND INSTALLATION OF THE MECHANICAL WORK.
 4. CONTRACTOR SHALL BECOME, PRIOR TO BID, THOROUGHLY FAMILIAR WITH THE REQUIREMENTS OF THESE NOTES AS WELL AS OTHER NOTES SHOWN ON THE CONTRACT DOCUMENTS.
 5. ALL DRAWINGS ARE DIAGRAMMATIC AND INDICATE THE GENERAL ARRANGEMENTS OR GEOMETRICAL RELATIONSHIPS OF EQUIPMENT AND SERVICES. THEY ARE NOT INTENDED TO SPECIFY OR SHOW EVERY OFFSET, SEQUENCE, DEVICE, OPTION, FITTING, OR COMPONENT.
 6. INFORMATION AND COMPONENTS SHOWN ON RISER DIAGRAMS OR DETAILS, BUT NOT SHOWN ON PLANS, AND VICE VERSA, SHALL BE PROVIDED AS IF EXPRESSLY REQUIRED BY BOTH.
 7. CONTRACTOR SHALL NOT SCALE DRAWINGS. DRAWINGS SPECIFIC TO THIS DISCIPLINE DO NOT LIMIT THE RESPONSIBILITY OF WORK REQUIRED BY THE CONTRACT DOCUMENTS.
 8. UNLESS NOTED OTHERWISE, THE INDICATION AND/OR DESCRIPTION OF ANY ITEM IN THE DRAWINGS OR SPECIFICATIONS CARRIES WITH IT THE INSTRUCTION TO FURNISH AND INSTALL THE ITEM.
 9. EXACT LOCATIONS OF ALL EQUIPMENT, VAV BOXES, DUCTS, DIFFUSERS, ETC. SHALL BE COORDINATED WITH OTHER TRADES. CEILING MOUNTED SPRINKLER LIGHTING, AND ELECTRICAL REQUIREMENTS TAKE PRECEDENCE OVER CEILING MOUNTED MECHANICAL REQUIREMENTS. SEE ARCHITECTURAL REFLECTED CEILING PLANS FOR CEILING GRID AND LIGHTING LAYOUT FOR COORDINATION OF FINAL DIFFUSER LOCATIONS. ALL SPRINKLER HEADS MUST BE CENTERED IN CEILING GRID PANELS AND MUST PROVIDE FOR A SYMMETRICAL LAYOUT. SEE FIRE PROTECTION NOTES.
 10. SEE ARCHITECTURAL AND STRUCTURAL DRAWINGS FOR BUILDING DETAILS AND DIMENSIONS. COORDINATE PLACEMENT OF ALL THERMOSTATS, ROOF MOUNTED EQUIPMENT, ETC. WITH ARCHITECTURAL AND STRUCTURAL TRADES.
 11. CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING ALL WORK WITH THAT OF OTHER TRADES. REFER TO ARCHITECTURAL, STRUCTURAL, ELECTRICAL, AND OTHER DRAWINGS FOR COMPLETE INFORMATION PRIOR TO BID.
 12. ROUGH-IN OR INSTALLATION OF OWNER FURNISHED EQUIPMENT SHALL NOT BEGIN UNTIL APPROVED EQUIPMENT DRAWINGS ARE OBTAINED FROM OWNER OR ARCHITECT. DO NOT SUBMIT SHOP DRAWINGS FOR ANY EQUIPMENT WHICH MUST BE COORDINATED WITH OWNER FURNISHED ITEMS UNTIL THE APPROVED DRAWINGS ARE OBTAINED FROM OWNER OR ARCHITECT. VERIFY THE APPROVED EQUIPMENT HAS THE SAME ROUGH-IN AND FINAL CONNECTION REQUIREMENTS AND DESIGN CRITERIA AS THE DOCUMENTS. NOTIFY ENGINEER OF ANY CHANGES, INCOMPATIBILITY, OR UNUSUAL CONDITIONS IMMEDIATELY. SEE SPECIFICATIONS OR DRAWINGS FOR LIST OF OWNER FURNISHED EQUIPMENT (WHERE APPLICABLE).
 13. ALL MECHANICAL CONSTRUCTION DETAILS SHALL BE AS SHOWN AND AS REQUIRED TO MAINTAIN "UL" ASSEMBLY RATINGS AS SHOWN ON ARCHITECTURAL SHEETS. SEAL AROUND ALL PENETRATIONS THOROUGH UL RATED ASSEMBLIES, FIRE AND SMOKE WALLS. COORDINATE WITH GENERAL CONTRACTOR.
 14. NO OTHER TRADES, I.E., ELECTRICAL, CEILING, PLUMBING, ETC., SHALL BE SUSPENDED, HUNG, OR SUPPORTED FROM DUCTWORK OR PIPING.
 15. REPLACE ALL ARCHITECTURAL FEATURES REMOVED OR DAMAGED DURING THE COURSE OF THE WORK.



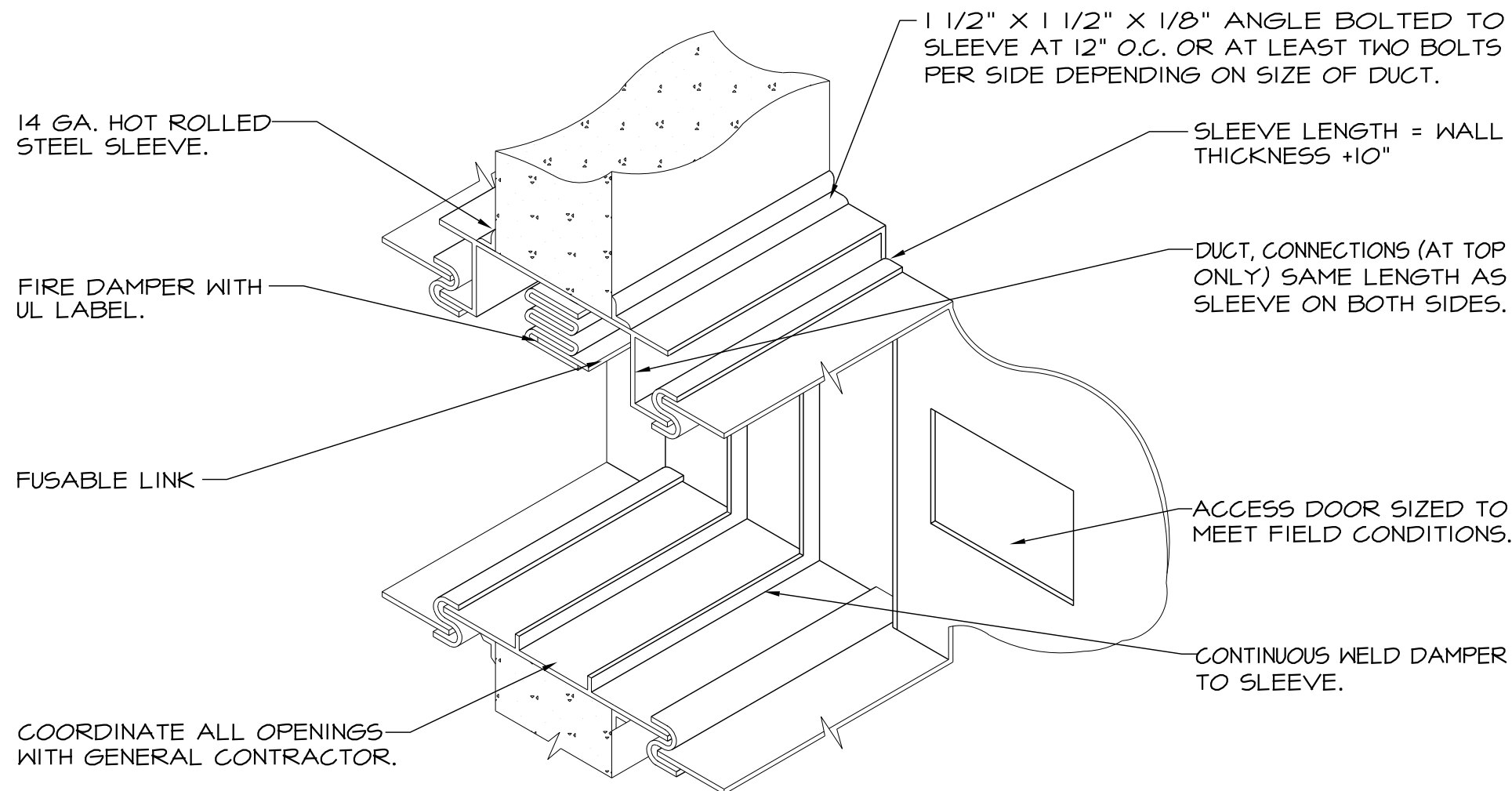
TRAPEZE HANGER DETAIL

NOT TO SCALE



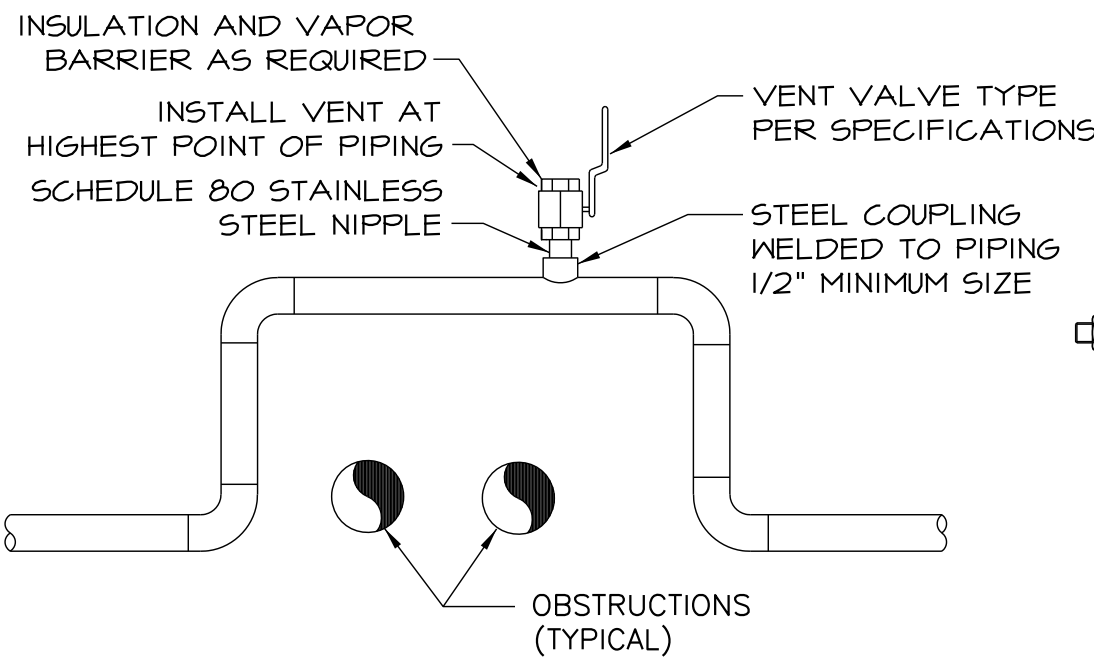
TYPICAL DAMPER INSTALLATION

NOT TO SCALE



FIRE DAMPER DETAIL

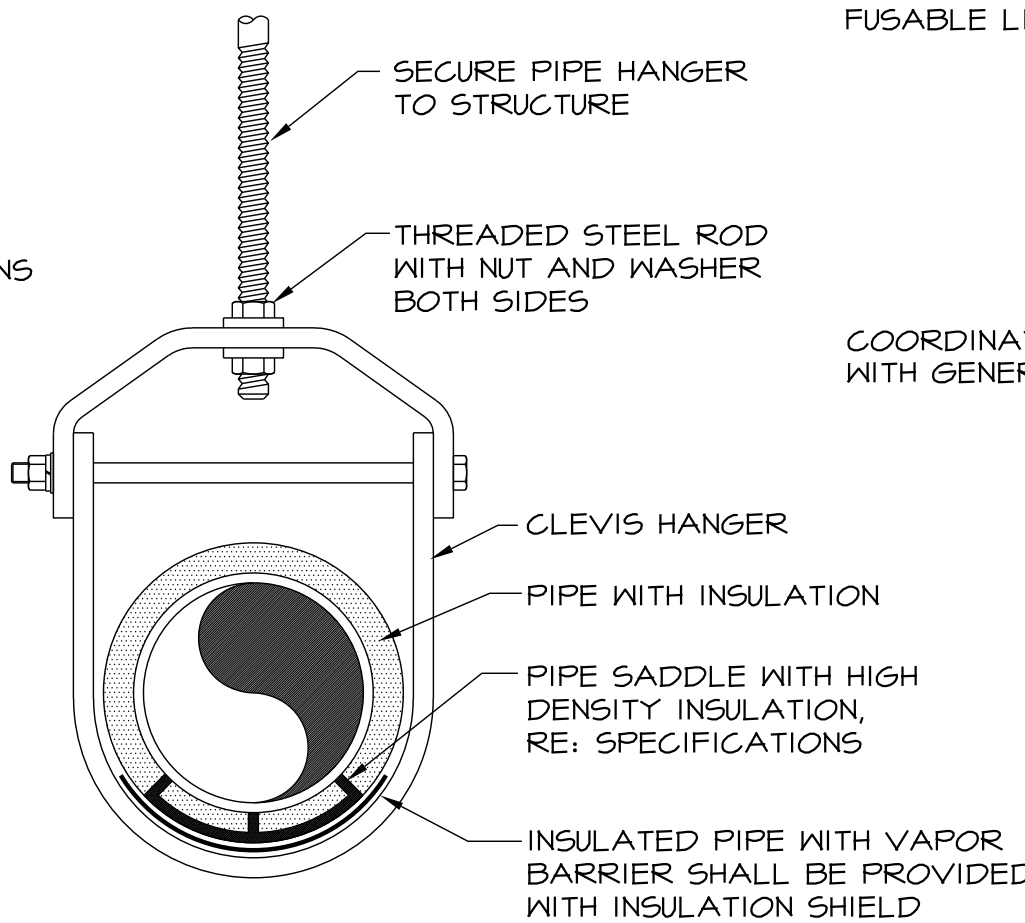
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HIGH POINT MANUAL

AIR VENT

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CLEVIS PIPE SUPPORT

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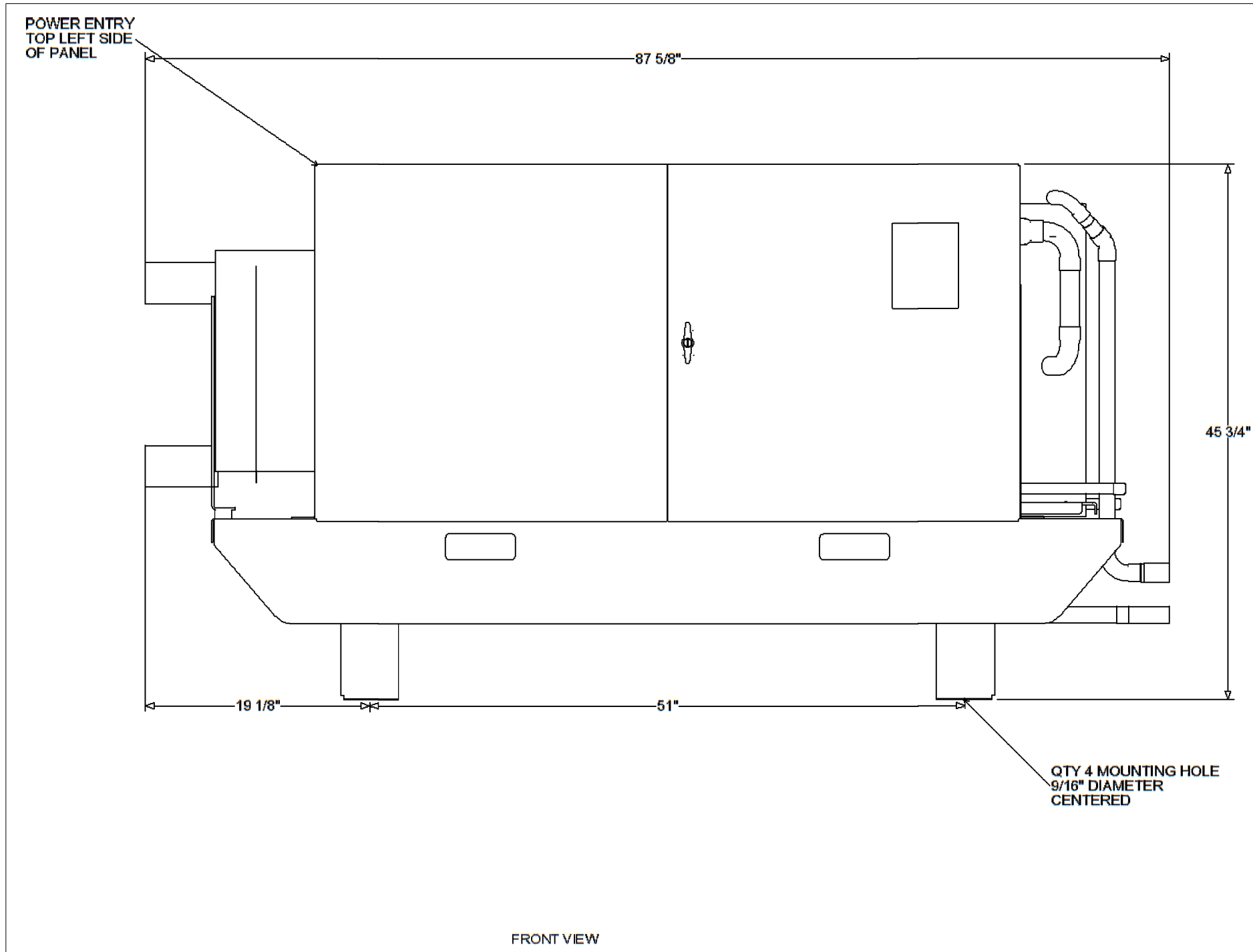
AT&T CORPORATE
REAL ESTATE

PROJECT TITLE:
PIPE & CHILLER REPLACEMENT

202 EAST 3RD STREET
LEES SUMMIT (JACKSON COUNTY)
MISSOURI US
KSCYMO4I 123185.03.01 E05156

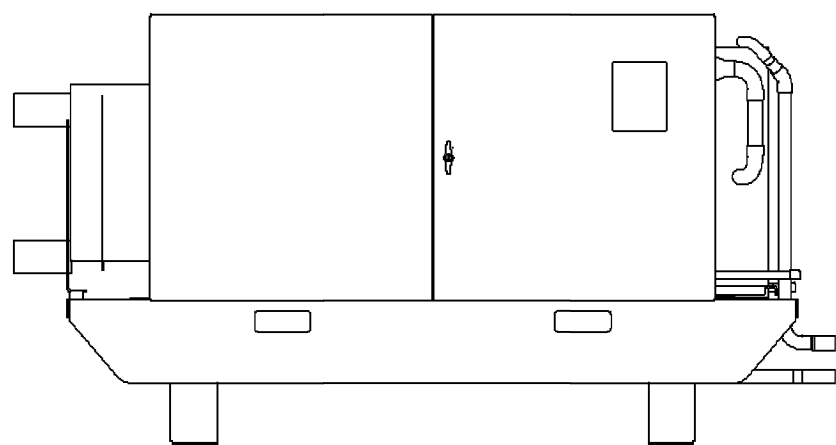
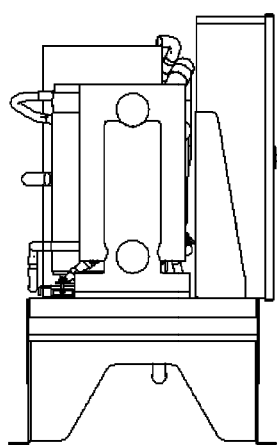
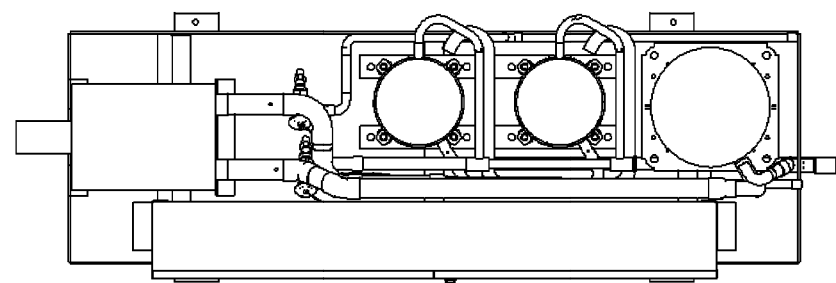
SHEET TITLE:
MECHANICAL SCHEDULES
AND DETAILS

AT&T PROJECT NUMBER: AOKYNV	DATE: 01-20-2020 DRAWN BY: GMT	SCALE: SEE DRAWING CHECKED BY: GMT
AT&T AUTHORIZATION MATT LONG	SHEET: OF: SHEETS AT&T DRAWING NO.:	SHEET NO. M-11



65T
OPERATING WEIGHT 1336.0 lb
SHIPPING WEIGHT 1484.0 lb
CHILLED WATER INLET/OUTLET 3" VIC
LIQUID LINE DIAMETER 1 1/8"
DISCHARGE LINE DIAMETER 1 3/8"

FOR CLARITY, NOT ALL INTERCONNECTING
PIPING IS SHOWN.



TRANE Job Name: AT&T Lee's Summit Missouri Unit Tag: CH-1
Prepared By: Quantity: 1

Unit Overview	
Chiller Model	CCAR - compressor chiller
Unit Nominal Tonnage	65 nominal tons
Refrigeration Capacity	55.56 tons
Cooling Efficiency	1.127 kW/ton
Unit Voltage	208 V/60 Hz/3Ph
Refrigerant Type	R-410A
Agency Listing	ETL/ETL-C listed

Shown with optional
touchscreen.

Evaporator Information	
Evaporator Application	
Standard cooling	
Fluid Temperatures	Flow Rate
Evaporator Leaving 44.00 F	144.0 gpm
Evaporator Entering 53.23 F	Fluid Pressure Drop
Fluid Properties	7.31 ft H2O
Fluid Type Fluid type = water	Fouling Factor
Freeze Point 32.00 F	0.000500 hr-sq ft-deg F/Btu

Condenser Information	
Heat Rejection Capacity	
879271.70 Btu/h	
Saturated Cond Temp	Refrigerant Gas Flow
Temperature 122.0 F	Circuit 1 4804.63 lb/hr
Liquid Refrigerant Temp	Circuit 2 4979.20 lb/hr
Temperature 107.0 F	Gas Discharge Temp
	Circuit 1 187.6 F
	Circuit 2 187.8 F

Unit Electrical			
Unit	RLA	LRA	
Unit Voltage 208 V/60 Hz/3Ph	Compressor A 48.00 A	351.00 A	
Compressor Power 62.36 kW	Compressor B 48.00 A	351.00 A	
Total Power 62.59 kW	Compressor C 109.00 A	717.00 A	
Short Circuit Current Rating 100000.00 A	MCA	MOP	
Short Circuit Rating 100 kA Rating	Single Point Power 232.00 A	300.00 A	

Physical Information			
Dimensions	Weights	Refrigerant Charge	Oil Charge
Length 87.600 in	Operating Weight 1336.0 lb	Circuit 1 16.0 lb	1.75 gal
Width 29.000 in	Shipping Weight 1484.0 lb	Circuit 2 16.0 lb	1.77 gal
Height 45.800 in			

Unit Acoustics	
Sound Attenuator	Compressor sound blankets
Sound Pressure	86 dBA

TRANE Job Name: AT&T Lee's Summit Missouri Unit Tag: CH-1
Prepared By: Quantity: 1

Accessories	
Power Connection Terminal block	User Interface Color Touchscreen
Flow Switch Flow switch factory supplied	Remote Interface BACnet MS/TP
Evaporator Wye-strainer Evap wye strainer with install kit	Power Monitor Power monitor factory supplied
Filter Drier Filter drier with cores factory supplied	Elastomeric Isolator Pads Isolator pad factory supplied

Warranty	
Standard Warranty	

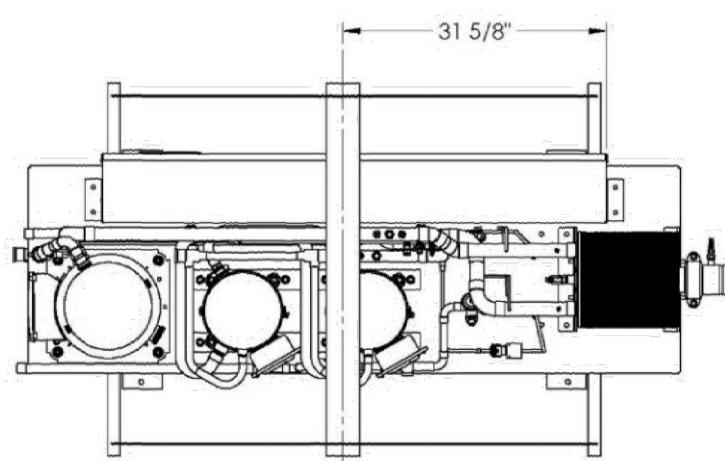
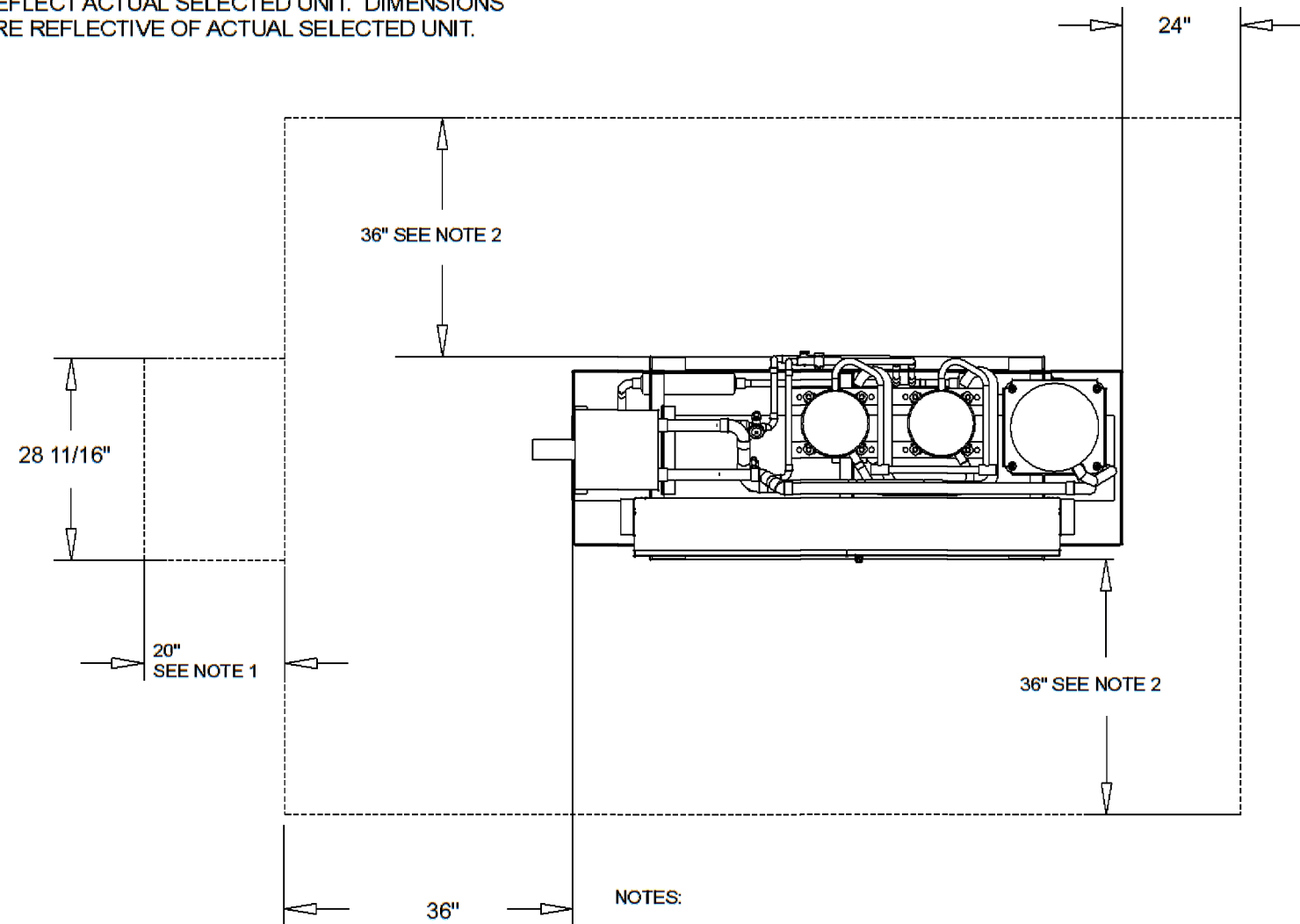
Information for LEED Projects	
Cooling Efficiency 1.127 kW/ton	Outside the scope of AHRI Air-Cooled Water-Chilling Packages Certification Program or not optionally certified, but is rated in accordance with AHRI Standard 550/590 (I-P) and AHRI Standard 551/591 (SI).
Compress Power 62.36 kW	
Refrigerant (R410A) - ckt 1 16.0 lb	
Refrigerant (R410A) - ckt 2 16.0 lb	

TOPSS Version Number: 230
Data Generation Date: 1/23/2020

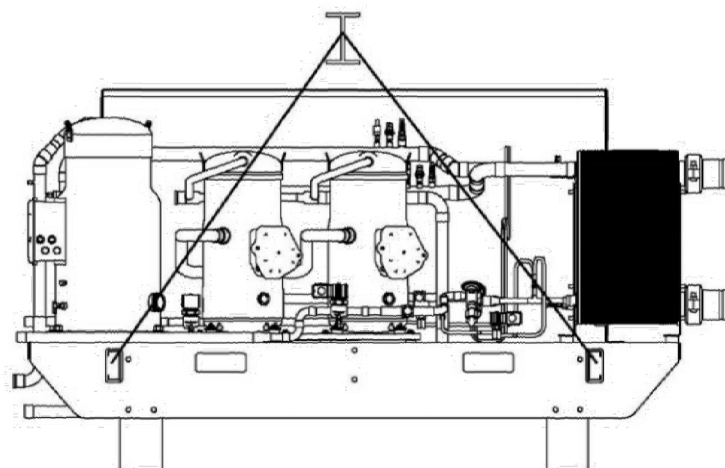
CLEARANCE REQUIRED FOR 40T, 50T, 65T AND 75T CGWR or CCAR

DOOR SWING CLEARANCE 31 1/4"
36" CLEARNACE REQUIRED ABOVE UNIT CONTORL PANEL

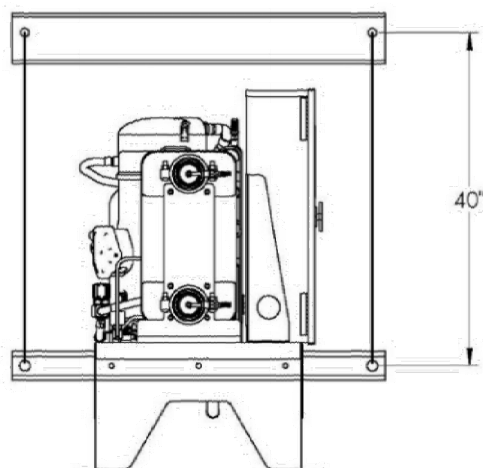
UNIT IS REPRESENTATION OF PRODUCT. MAY NOT
REFLECT ACTUAL SELECTED UNIT. DIMENSIONS
ARE REFLECTIVE OF ACTUAL SELECTED UNIT.



PLAN VIEW



BACK VIEW



LEFT END VIEW

- NOTES:
- DO NOT USE CABLES (CHAINS OR SLINGS) EXCEPT AS SHOWN. OTHER LIFTING ARRANGEMENTS MAY CAUSE EQUIPMENT DAMAGE OR SERIOUS PERSONAL INJURY.
 - EACH OF THE CABLES (CHAINS OR SLINGS) USED TO LIFT UNIT MUST BE CAPABLE OF SUPPORTING THE ENTIRE WEIGHT OF THE UNIT.



schwerdt design group

architecture | interiors | planning

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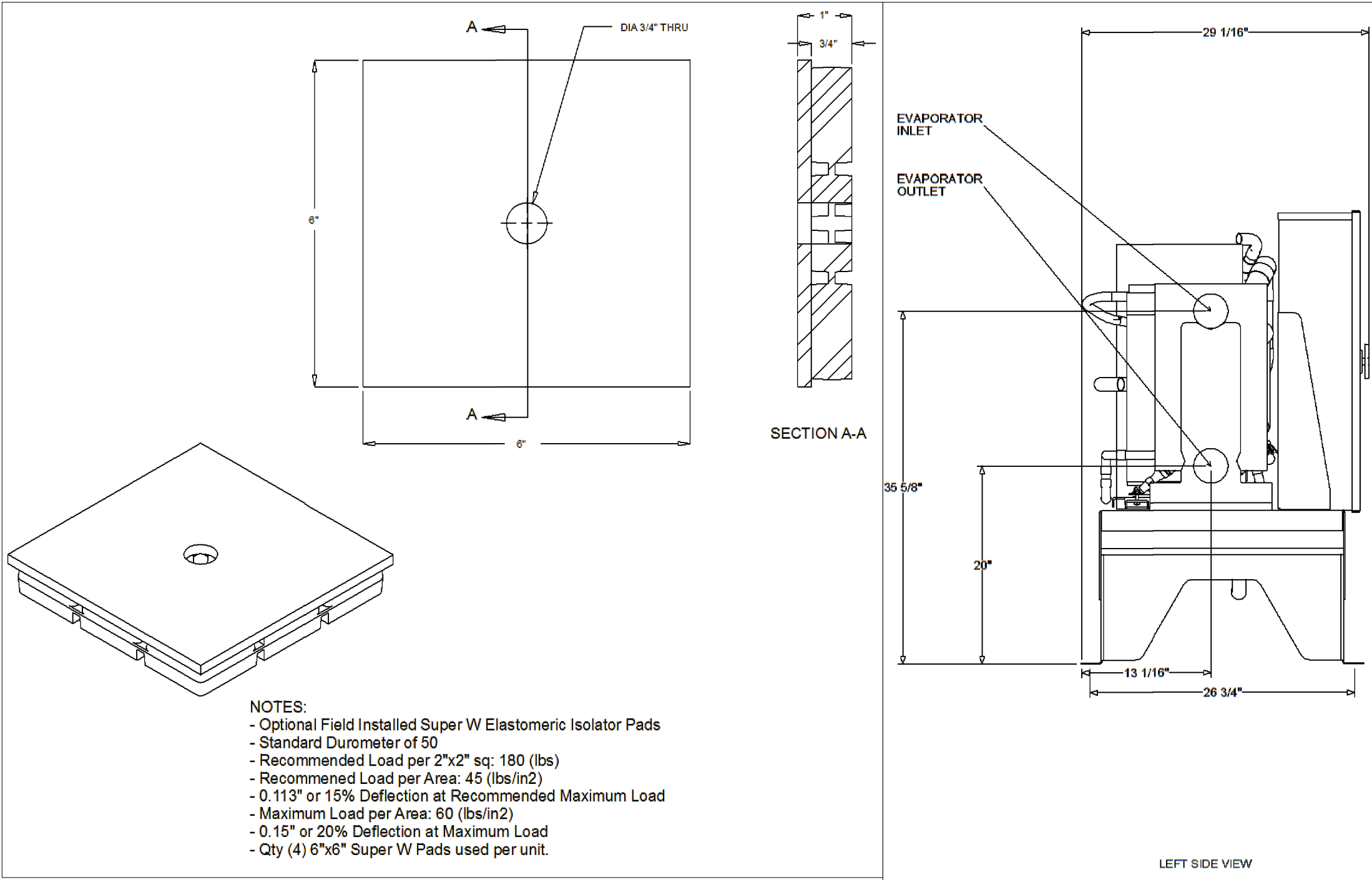


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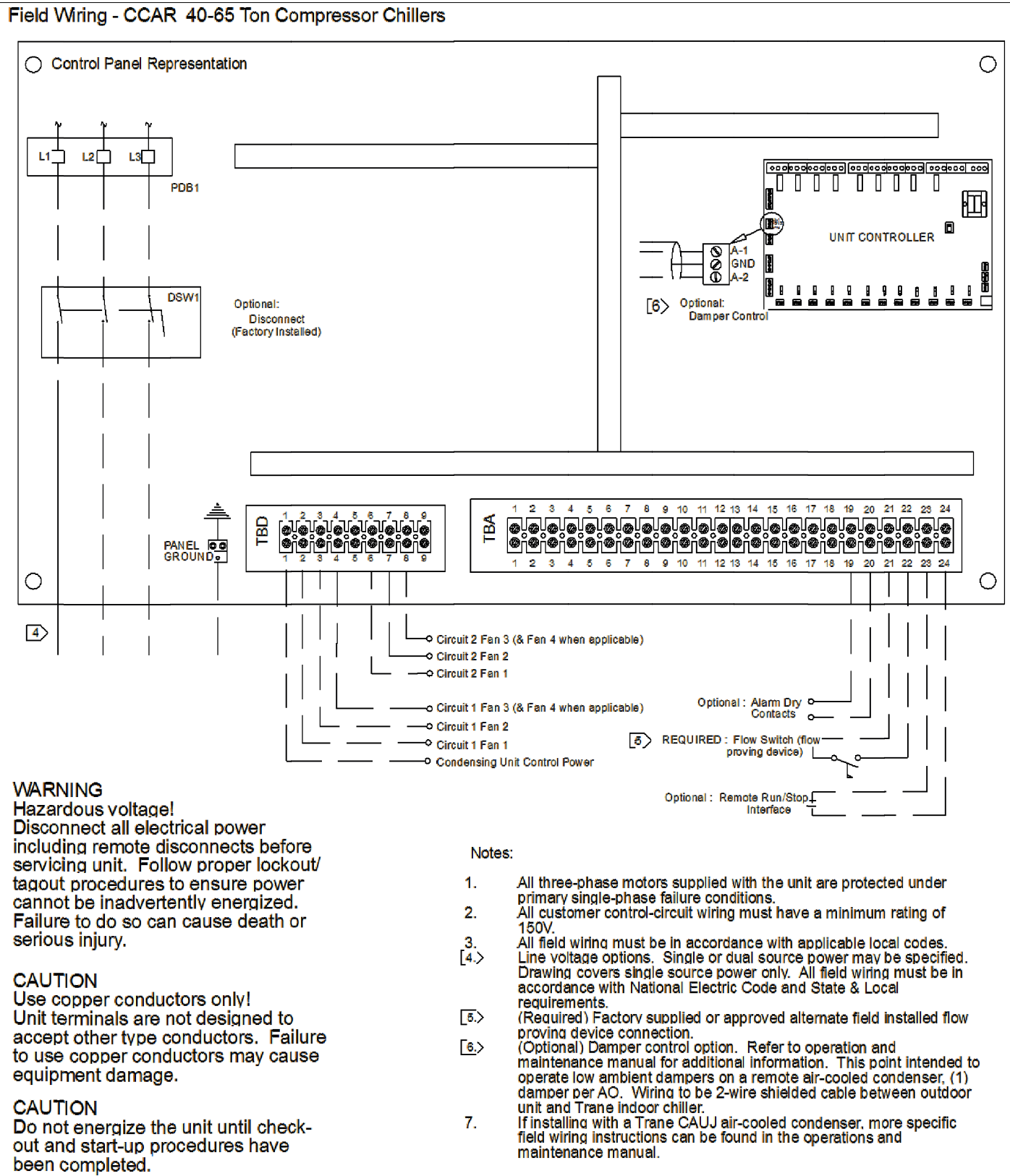
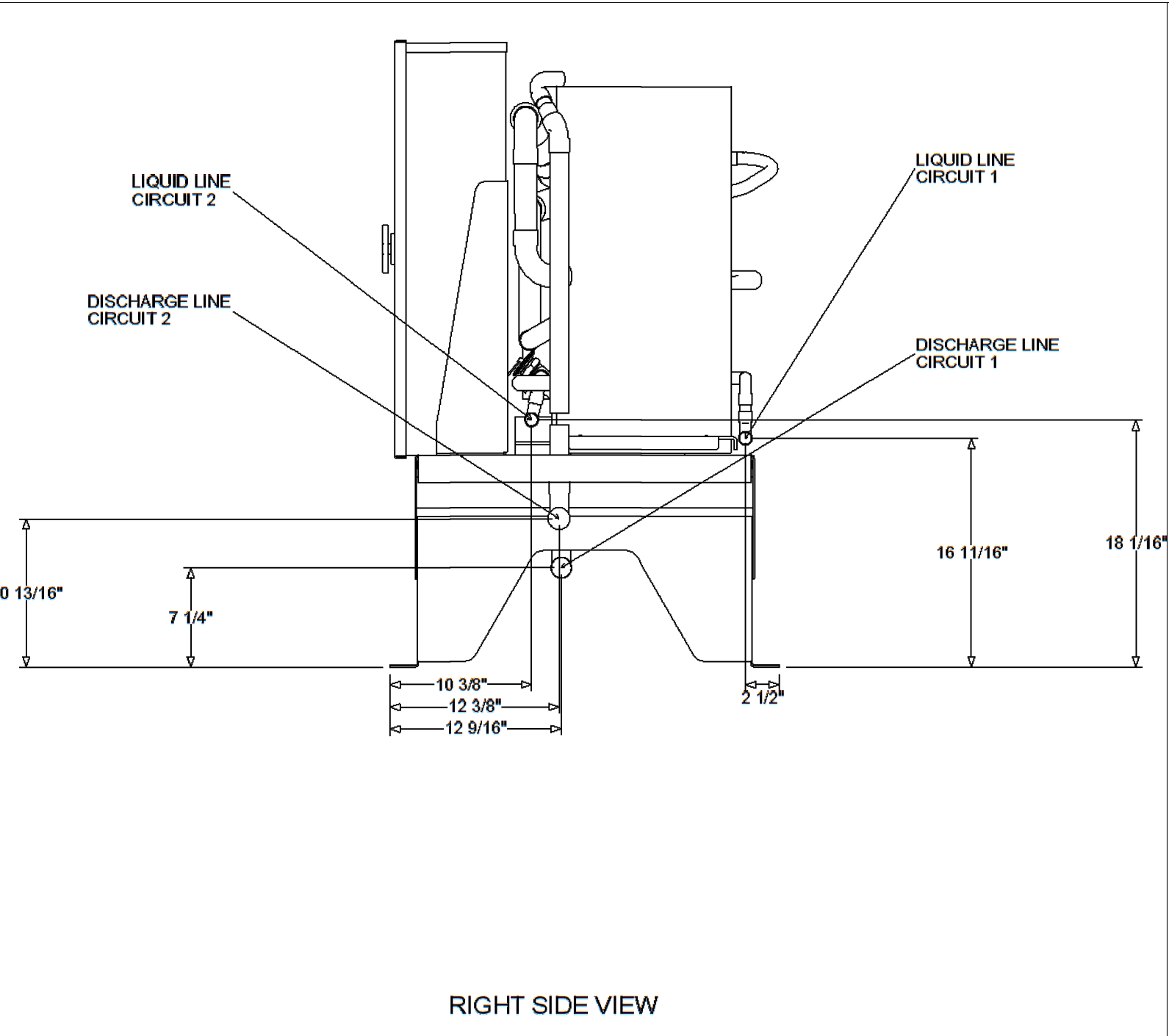
PROJECT TITLE:
PIPE & CHILLER REPLACEMENT
00
202 EAST 3RD STREET
LEES SUMMIT (JACKSON COUNTY)
MISSOURI US
KSCYMO4I 123185.03.01 E05156

SHEET TITLE:
MECHANICAL EQUIPMENT
DATA SHEETS

AT&T PROJECT NUMBER: AOKYNV	DATE: 01-20-2020	SCALE: SEE DRAWING
AT&T AUTHORIZATION: MATT LONG	DRAWN BY: GMT	CHECKED BY: GMT
SHEET: MD-1	OF: 1	SHEETS: 1
AT&T DRAWING NO.:		SHEET NO.:

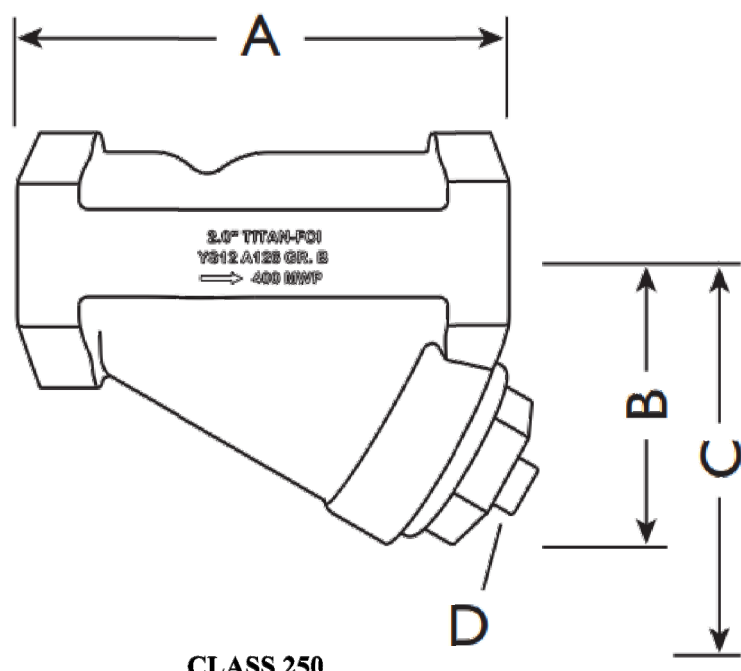


NOTES:
- Optional Field Installed Super W Elastomeric Isolator Pads
- Standard Durometer of 50
- Recommended Load per 2'x2' sq. 180 (lbs)
- Recommended Load per Area: 45 (lbs/in²)
- 0.113" or 15% Deflection at Recommended Maximum Load
- Maximum Load per Area: 60 (lbs/in²)
- 0.15" or 20% Deflection at Maximum Load
- Qty (4) 6"x6" Super W Pads used per unit.



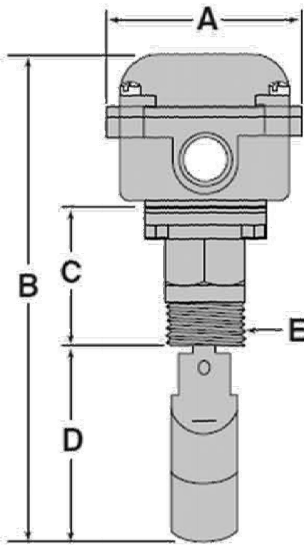
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- "Y" (WYE) STRAINER, THREADED ENDS, CAST IRON**
- NOTES:
- NPT blow-down connection with plug
 - A126 Gr. B, ANSI Class 250 with epoxy paint
 - Straining element is 304SS, 20-mesh screen reinforced with a 304SS, 1/4" perforated metal sleeve
 - Pressure/temperature rating of 400 PSI @ 150°F (WOG)
 - Optional installation kit available upon request



Size	3"
A - Face to Face (in)	10
B - Center Line to Bottom (in)	6
C - Screen Removal (in)	8
D - NPT Plug (in)	1-1/2
Approximate Assembled Weight (lb)	32
Cv - Flow Coefficient	160

- FLOW SWITCH**
- NEMA 4X rated flow switch, 1" NPT, for general purpose applications.
 - Sealed Monel bellows
 - Single pole, double throw snap switch
 - Four stainless steel paddles included – 1", 2", 3" and 6" (25, 50, 80 and 150mm)
 - Sensitivity adjusting screw makes flow adjustment easy
 - Minimum temperature (fluid or ambient) 32°F (0°C)
 - Maximum fluid temperature 225°F (107°C)
 - Maximum operating pressure 160 psi (11.3 kg/cm²)



ELECTRICAL RATINGS

Voltage	Motor Switch Rating (Amperes)		Pilot Duty
	Full Load	Locked Rotor	
120 VAC	7.4	44.4	125 VA at
240 VAC	3.7	22.2	120 or 240 VAC 50 or 60 cycles

Dimensions, in. (mm)

A	B	C	D	E
3 3/4 (83)	8 3/4 (213)	2 3/4 (59)	3 3/4 (87)	1 NPT

TITLE:
FLOW SWITCH SPECIFICATIONS

SIZE DWG. NO. REV
A ELEC-COMP-1122 0
SCALE: WEIGHT: SHEET 1 OF 2

FLOW RATES
Flow rates required to activate flow switch are shown in chart below. The values are calculated for sensing water (potable, non-polluted) in a horizontal pipe. Settings will vary when used to sense flow of other fluids or if located in a vertical pipe.

Pipe Size NPT in. (mm)	Settings	Mode of Operation				Max. Flow Rate gpm (lpm) w/o Paddle Damage
		Flow gpm (lpm)	Velocity fps (mps)	No Flow gpm (lpm)	Velocity fps (mps)	
1 (25)	Factory or Minimum Maximum	4.9 (18.5) 17.8 (66.6)	1.82 (.55) 6.53 (2.60)	3.4 (12.9) 15 (56.8)	1.25 (.38) 5.56 (1.89)	27 (102)
1 1/4 (32)	Factory or Minimum Maximum	7.5 (28.4) 29 (110)	1.60 (.49) 6.23 (1.9)	5.3 (20.1) 24.6 (93.1)	1.14 (.35) 5.28 (1.61)	47 (178)
1 1/2 (40)	Factory or Minimum Maximum	9.4 (35.6) 37.8 (143)	1.48 (.45) 5.95 (1.81)	6.7 (25.4) 32.2 (122)	1.05 (.32) 5.07 (1.54)	63 (239)
2 (50)	Factory or Minimum Maximum	13.7 (51.8) 56.4 (214)	1.31 (.4) 5.39 (1.64)	9.4 (35.6) 47.4 (179)	.9 (.27) 4.83 (1.38)	105 (398)
2 1/2 (65)	Factory or Minimum Maximum	17.9 (67.8) 71.3 (270)	1.20 (.36) 4.78 (1.46)	12.1 (45.8) 59.2 (224)	.81 (.25) 3.97 (1.21)	149 (565)
3 (80)	Factory or Minimum Maximum	24.2 (91.6) 89 (337)	1.05 (.32) 3.87 (1.18)	16.4 (62.1) 72.5 (274)	.71 (.22) 3.15 (.96)	230 (872)
4 (100)	Factory or Minimum Maximum	35.3 (134) 118 (446)	.89 (.27) 2.89 (.91)	27 (102) 105 (397)	.68 (.21) 2.64 (.8)	397 (1505)
5 (125)	Factory or Minimum Maximum	48.6 (184) 178 (674)	.78 (.24) 2.86 (.87)	37.4 (142) 160 (606)	.6 (.18) 2.57 (.78)	654 (2479)
6 (150)	Factory or Minimum Maximum	60.3 (228) 245 (927)	.67 (.20) 2.72 (.83)	46.8 (177) 225 (852)	.52 (.16) 2.5 (.78)	900 (3411)

Values are ± 10%

NOTE: DO NOT USE LIQUID FLOW SWITCHES ON SYSTEMS WITH FLOW VELOCITY GREATER THAN 10 FEET (3M) PER SECOND.

TITLE:
FLOW SWITCH SPECIFICATIONS

SIZE DWG. NO. REV
A ELEC-COMP-1122 0
SCALE: WEIGHT: SHEET 2 OF 2

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AT&T **CORPORATE REAL ESTATE**

PROJECT TITLE:
PIPE & CHILLER REPLACEMENT
202 EAST 3RD STREET
LEES SUMMIT (JACKSON COUNTY)
MISSOURI US
KSCYMO4I 123785.03.01 E05156

MECHANICAL EQUIPMENT DATA SHEETS

AT&T PROJECT NUMBER: AOKYNV	DATE: 01-20-2020 DRAWN BY: GMT	SCALE: SEE DRAWING CHECKED BY: GMT
AT&T AUTHORIZATION: MATT LONG	SHEET: OF: SHEETS AT&T DRAWING NO.:	SHEET NO. MD-2

Validation Period

Product performance, mechanical specifications and submittal data is valid for a period of 60 days from the date of the submittal generation. If 60 days or more has elapsed between submittal generation and equipment release, the product and submittal will should be verified. It is the purchaser's responsibility to request such verification.

GENERAL Scope

A. Perform all work required to provide and install chillers indicated by the contract documents with supplementary items necessary for proper installation. This includes all controls, sensors, motors and any specialty equipment.

References

A. Products shall be designed, tested and rated in accordance with, and installed in compliance with, the current versions of applicable sections of the following standards and codes:
1. Unit performance shall be rated per AHRI (Air-Conditioning, Heating and Refrigeration Institute) Standard 550/590 and 551/591, latest edition (U.S.A.) at standard rating conditions.
2. All units shall be ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) 90.1-2016 compliant.
3. Unit construction shall comply with ANSI (American National Standards Institute)/ASHRAE 15 Safety Standard (latest revision) and NEC (National Electrical Code).
4. ASME Boiler & Pressure Vessel Code, Section VIII, Division 1
5. Unit shall be ETL and ETL, Canada certified.

Submittals

A. Manufacturers warranty details
B. Product data: Include refrigerant, rated capacities and operating characteristics. Specifically, include:
1. Chilling tons, and Full Load EER and IPLV measured and calculated in accordance with the latest version of ASHRAE 550 / 590 in an AHRI approved test facility
C. Shop drawings: Complete set of manufacturer's prints of water chiller assemblies and elevations. Include the following:
1. Assembled unit dimensions
2. Compressor data
3. Required clearances for maintenance and operation
4. Size and location of piping and wiring connections
5. Wiring diagrams: Power, signal, and control wiring
6. Control panel product data and Building Automation System interface information.

Testing

A. Unit shall be factory pressure-tested, and dehydrated and evacuated to 400 microns prior to charging with refrigerant.
B. Unit shall be shipped factory-assembled with all piping and wiring, precharged with a holding charge of nitrogen and shall be stored and handled according to manufacturers recommendations.
C. A factory run test on each chiller module must be performed prior to shipment. All refrigerant and electrical circuits must be verified.
D. The factory run test must be performed at the customers specified full-load submittal conditions. Run test results must be provide upon request. Test data must be archived at the factory and stored by product model and serial number.

Handling and Storage Requirements

A. Unless otherwise specified, chillers shall be delivered completely assembled.
B. Comply with manufacturers installation instructions for chiller loading, local transportation, unloading, storage, hoisting, moving unit into place and final setting.
C. Protect chiller and controls from physical damage. Leave factory shipping covers in place until time of installation.
D. Outdoor storage or operation is strictly prohibited and is subject to voiding warranty.
E. Chiller and controls should be stored indoors, protected from construction dirt and moisture. An inspection should be conducted under shipping tarps, bags, or crates to be sure water shall have not collected during transit. Storage conditions should meet the following criteria:
1. Temperature is between 40.0 F and 120.0 F.
2. Relative humidity is between 10 percent and 80 percent (non-condensing).

Warranty

A. Provide a complete unit parts warranty (excluding refrigerant) for one (1) year from startup or 18 months from shipment, whichever occurs first.
B. Maintenance of equipment while the product is under warranty is mandatory and is the responsibility of the equipment owner.

Agency Listing

The compressor chiller is ETL Listed to United States safety standards.

Equipment

A. Frame shall be heavy-gauge steel and shall be painted in accordance with the manufacturers standard procedures and practices suitable for the operating environment and as a minimum have a top coat of two-part epoxy.
B. Each chiller module shall have a single heavy gauge cabinet enclosing power distribution section and controls section. This panel will contain electrical power distribution components, control components and the chiller module unit controller.
C. Units require the field connection of chilled and condenser water piping, and power and control wiring to control panel terminal block.
D. Chilled water inlet and outlet connections shall be grooved pipe and condenser water inlet and outlet connections shall be female pipe thread (FPT).
E. Chilled water flow proving device such as a flow switch and chilled water wye-strainer with 20 mesh or finer straining element are required and must be field installed

Refrigerant Circuit

Unit shall have two (2) refrigerant circuits. Each refrigerant circuit shall have refrigerant charging port, multiple access ports, liquid line solenoid valve, Active Freeze Protection circuit with solenoid valve, sight glass with moisture indicator and thermal expansion valve.
The Active Freeze Protection system shall be located on a bypass line that extends from a compressor discharge line to a port that is between the expansion valve and the brazed plate heat exchanger. The Active Freeze Protection system shall activate if the suction pressure falls to approximately 101 psig 32.0 F. The Active Freeze Protection system shall deactivate when the suction pressure increases to approximately 105 psig 34.0 F and the freezing potential no longer exists. Freeze protection by leaving water temperature monitoring only is not acceptable.

Compressor - Motor

Fully hermetic direct drive scroll compressors shall be mounted on rubber in shear vibration shall isolators.
Lubrication system - Oil distribution system shall include an oil level sight glass and be arranged to ensure adequate lubrication during starting, stopping and normal operation. Motor shall be suction gas cooled and runs at a constant speed of 3500 rpm at 60Hz.
The chiller shall have two (2) compressors arranged and piped as a tandem set in one refrigerant circuit and a single compressor in the other refrigerant circuit. Compressors nominal 15 tons and less on circuit one have internal overload motor protection to protect against excessive current and temperature caused by overloading, low refrigerant flow or phase loss. Compressors nominal 20 tons and greater on circuit two have a motor protection module inside the terminal box. This device shall provide for efficient and reliable protection against overheating and overloading as well as phase loss/reversal.

Evaporator

Brazed plate evaporator shall be UL listed with refrigerant side working pressure of at least 650 psig on all models. Water side working pressure shall be at least 330 psig. Evaporator shall have two refrigerant circuits. Evaporator shall be insulated with 1/2" thick closed-cell flexible insulation with a K value of 0.26 and shall be furnished with evaporator core, inlet and outlet water temperature sensors. Brazed plate evaporator without core temperature sensor shall not be accepted..

Flow Switch
A flow proving device must be field installed in the chilled water inlet pipe and must be installed in accordance with flow proving device manufacturer recommendations. A shipped-loose flow switch shall be included with 1 inch NPT pipe connection and NEMA 4 housing. When installed in accordance with recommendations of manufacturer, this device meets the requirement for a flow proving device.

Water Strainer Kit
A 20 mesh wye strainer with a tapped NPT blow-off connection that can be fitted with a blow-down valve to facilitate cleaning of the straining element and removable screen shall be shipped with the chiller and must be field installed. Field installed parts will be included to install the wye strainer immediately adjacent to the chiller evaporator grooved pipe inlet connection..

Insulation
All cold surfaces shall be insulated with 1/2" thick closed-cell flexible insulation with a K value of 0.26.

Condenser
For use with remote air-cooled condenser.

Discharge Pressure Control
Discharge pressure control must be provided that results in stable Saturated Discharge Temperature (SDT) between 75°F and 145°F through all steady state, part load and transient operating conditions. The unit controller shall be capable of controlling remote condenser peripheral devices for ambient control purposes with a proportional 2 to 10 VDC signal and on/off contacts.
When the Trane CCAR Compressor Chiller is combined with a Trane CAUJ Air Cooled Condenser, the CCAR Unit Controller must be used to control condenser fan motors and optional low ambient dampers if applicable. For details, see Trane Application Guide - Tube Size and Component Selection for CCAR (20-75 Ton) and CAUJ (20-80 Ton) Split Systems SS-APG014*-EN.

Unit SCCR Rating
Unit shall have a 100 kA Short Circuit Current Rating (SCCR) rating. SCCR rating of less than 100kA shall not be acceptable.

Control Panel
Controller shall be located in the controls section with display mounted on the exterior of the control cabinet door. Controller displays not visible from exterior of unit shall not be acceptable. Power distribution section shall contain incoming power distribution block and ground lugs for customer connection, across-the-line contactors, current transformers, and control power transformer with primary and secondary fuses.
Controls section contains the unit controller with standard and optional expansion boards, door mounted key pad and display or optional touchscreen, optional power monitor, service friendly terminal strips to facilitate circuit diagnosis and field connection. Field connection terminal strip shall have connection points for the following:

1. Remote Off/Auto (digital input)
2. Remote Alarm (digital output)
3. Flow Switch (flow proving device) (digital input) REQUIRED
4. Air Cooled Condenser Fan Enable for six condenser fan motors (digital output)
5. Damper or Motor VFD for one condenser ambient damper set or one motor drive (analog output(s))

Unit controller shall monitor, display and log operating and fault conditions, and provide safety protection for low and high refrigerant operating pressure, low and high refrigerant superheat, low refrigerant differential pressure between low and high side, low chilled water temperature, low chilled water flow, compressor over amperage and abnormal power conditions when fitted with optional power monitor. Mechanical high and low pressure switches and compressor overload protection devices are located in the controls section and are monitored and reported by the controller.

The unit controller shall store 1,008 packets of information taken at set time intervals.The time interval shall be factory set for collecting data every 15 seconds and shall be adjustable. Up to 99 fault conditions shall be stored in the controller and 120 seconds of history shall be saved any time a fault occurs that results in a compressor lockout.

The unit controller stages compressors to maintain the leaving chilled water temperature setpoint of the chiller using proportional, integral and derivative (PID) logic. Unit controller shall have RS232, RS485 and Ethernet communications ports for user interactive communication or for interface with Building Management System (BMS). The controller shall be capable of responding to a BMS signal for Run/Stop, Leaving Chilled Water Temperature Reset and Demand Limiting Reset. Leaving Chilled Water Temperature shall be able to be reset using a 0 to 5 VDC input signal.

BACnet MS/TP BMS Gateway
Unit controller shall provide interface to BMS through BACnet® MS/TP gateway. Once configured, the BMS shall have the ability to monitor chiller operation and fault status, adjust leaving water setpoint, turn unit on or off, and allow load limiting control of the unit.

Operator Interface
Unit controller interface shall be a color touchscreen 15.4 inch display. Non-color and non-touchscreen controller interfaces shall not be acceptable. Touchscreen shall be provided with specific screens allowing user to easily view chiller status and operating conditions in real time for compressors and refrigerant and chilled water circuits. User must be able to acknowledge alarms and change set points. Software must allow user to set and view schedules, view run history in graphical format and view 120 seconds for history leading up to compressor lockout fault.

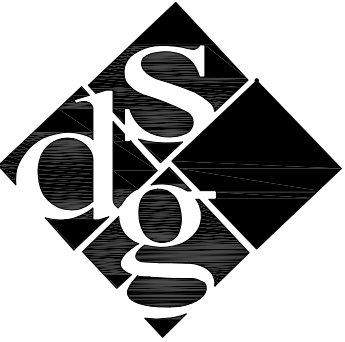
Operator Interface Remote Access
Unit controller shall be capable of remote access via a computer such as a laptop using MCS Connect software. Access via a remote computer shall allow all functionality of the standard local interface with the additional ability to download run and fault history and graphically display history. As an additional benefit, run and fault history can be sent to the factory from the remote computer for trouble shooting assistance.

Forklift and Hoisting Provisions
All units shall have forklift slots and provisions for hoisting.

Power Monitor
Factory installed power monitor shall be specifically designed to protect motors and other 3-phase loads from premature failure and damage due to common voltage faults such as voltage imbalance, over/under voltage, pshall haveee loss, reversal, incorrect sequencing and rapid short cycling.


Sound Attenuator
Unit shall be factory provided with optional acoustically insulated sound blankets installed around the compressors to reduce radiated sound levels.

Isolator
Unit shall be provided with ship loose option including four (4) 3/4 inch thick, six (6) inch square Mason Super VV pads. Pads shall be designed for resilience and vibration isolation.



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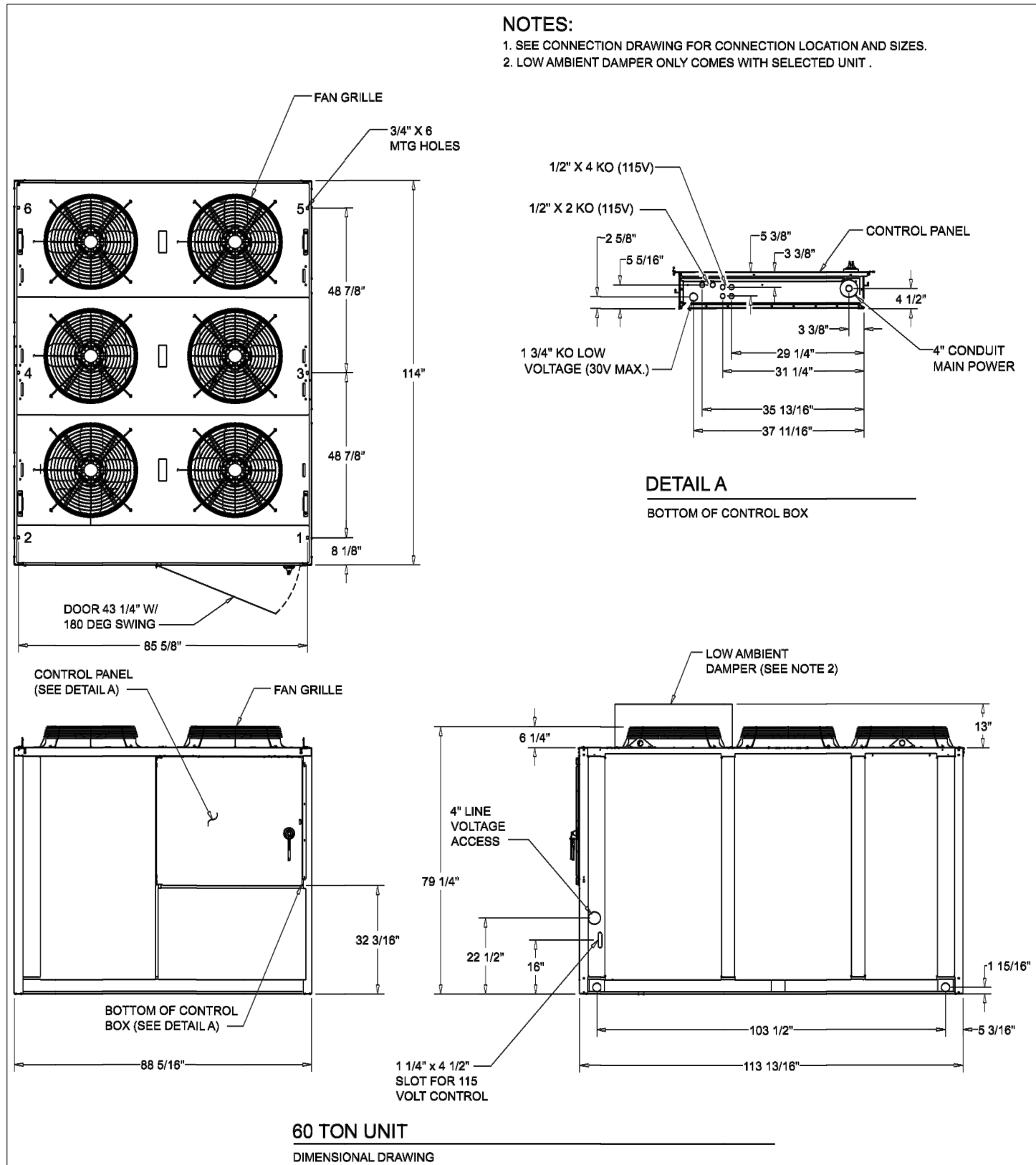
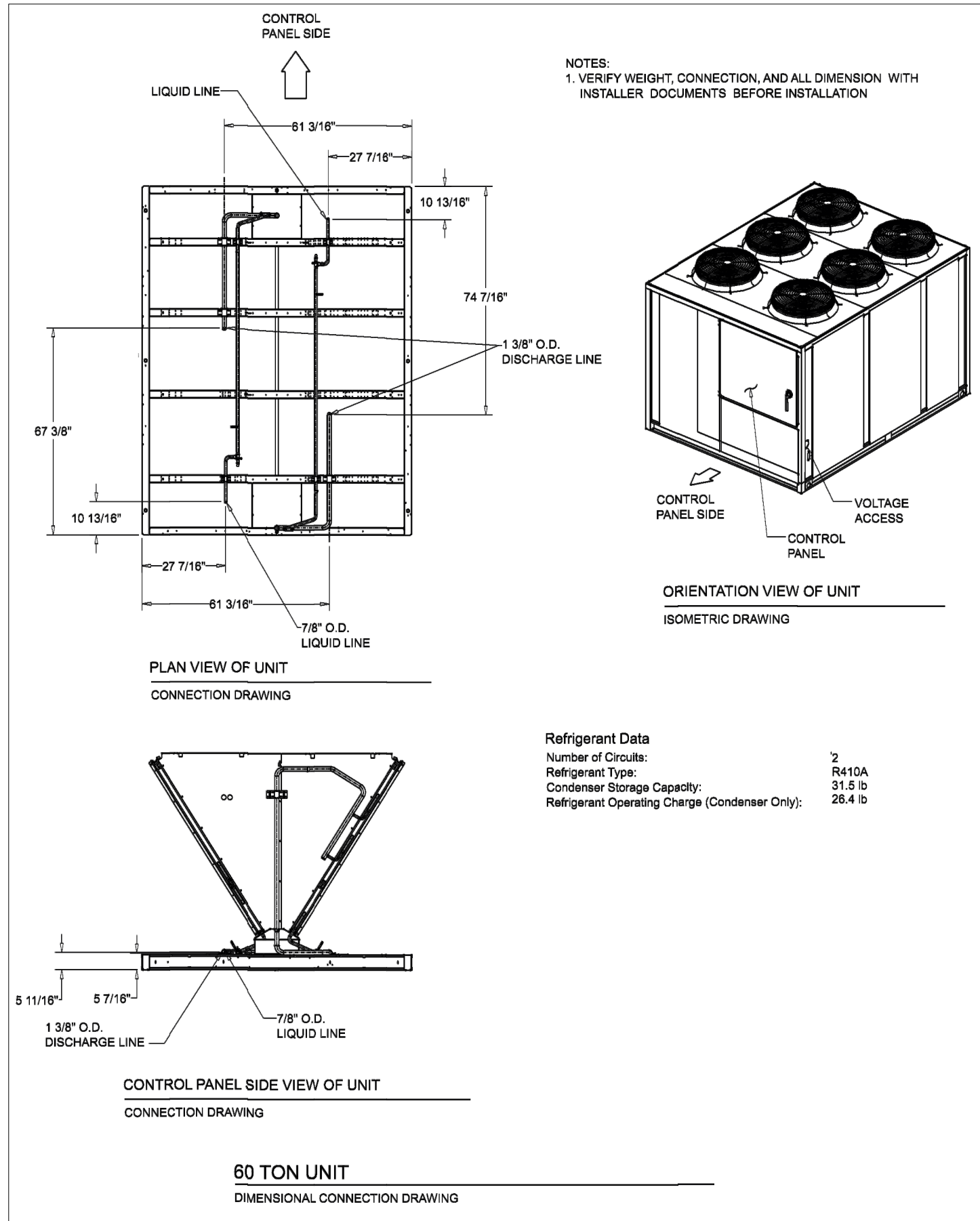


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DRAWINGS PREPARED FOR
**CORPORATE
REAL ESTATE**

PROJECT TITLE:
PIPE & CHILLER REPLACEMENT
00
202 EAST 3RD STREET
LEES SUMMIT (JACKSON COUNTY)
MISSOURI US
KSCYMO4I 123785.03.01 E05156

SHEET TITLE:
**MECHANICAL EQUIPMENT
DATA SHEETS**

AT&T PROJECT NUMBER: AOIKYNV	DATE: 01-20-2020	SCALE: SEE DRAWING
AT&T AUTHORIZATION: MATT LONG	DRAWN BY: GMT	CHECKED BY: GMT
	SHEET: OF:	SHEET NO. MD-3
	AT&T DRAWING NO.:	



Lee's Summit Chiller January 10, 2020

Tag Data - Air-Cooled Condenser Units (Qty: 1)				
Item	Tag(s)	Qty	Description	Model Number
A1	No Tag	1	60 Ton Air-Cooled Condensers	CAUJC60G

Product Data - Air-Cooled Condenser Units

Item: A1 Qty: 1

Standard Unit

R410A Development Sequence

60 ton Unit

200/230 Volt 60 Hertz 3 Phase

Dual circuit

Low Ambient Damper(s) Control

Unit Neoprene Isolators

Mechanical Specifications - Air-Cooled Condenser Units

Item: A1 Qty: 1

General - R410A

All condensing units are factory assembled and wired. Unit frames are constructed of 14 Gauge welded galvanized steel with 14 and 16 gauge galvanized steel panels and Access doors. The unit surface is phosphatized and finished with an air-dry paint to withstand 500 hours of continuous salt spray solution in accordance with ASTM B117.

Condenser Coils

Condenser coils shall have an all Aluminum Microchannel design. The coils are burst tested and leak tested. Factory installed liquid line service valves are standard.

Condenser Fans - R410A

Condenser fans are direct driven with motors having thermal overload protection and permanently lubricated ball bearings.

Controls - R410A

Condenser fan motor contactors, terminal connection point for compressor interlock and a 115 volt control power transformer are mounted within a weather tight enclosure.

Low Ambient Control - R410A

Low ambient allows operation from 40 F [4.5 C] to 0 F [-17.8 C] through the use of fan cycling and head pressure control dampers. The control consists of a heavy gauge damper assembly, Thermistor, Control Board and Actuator. All components are factory-mounted. Low ambient control must be ordered when the air-cooled condenser is matched with a heat recovery chiller.

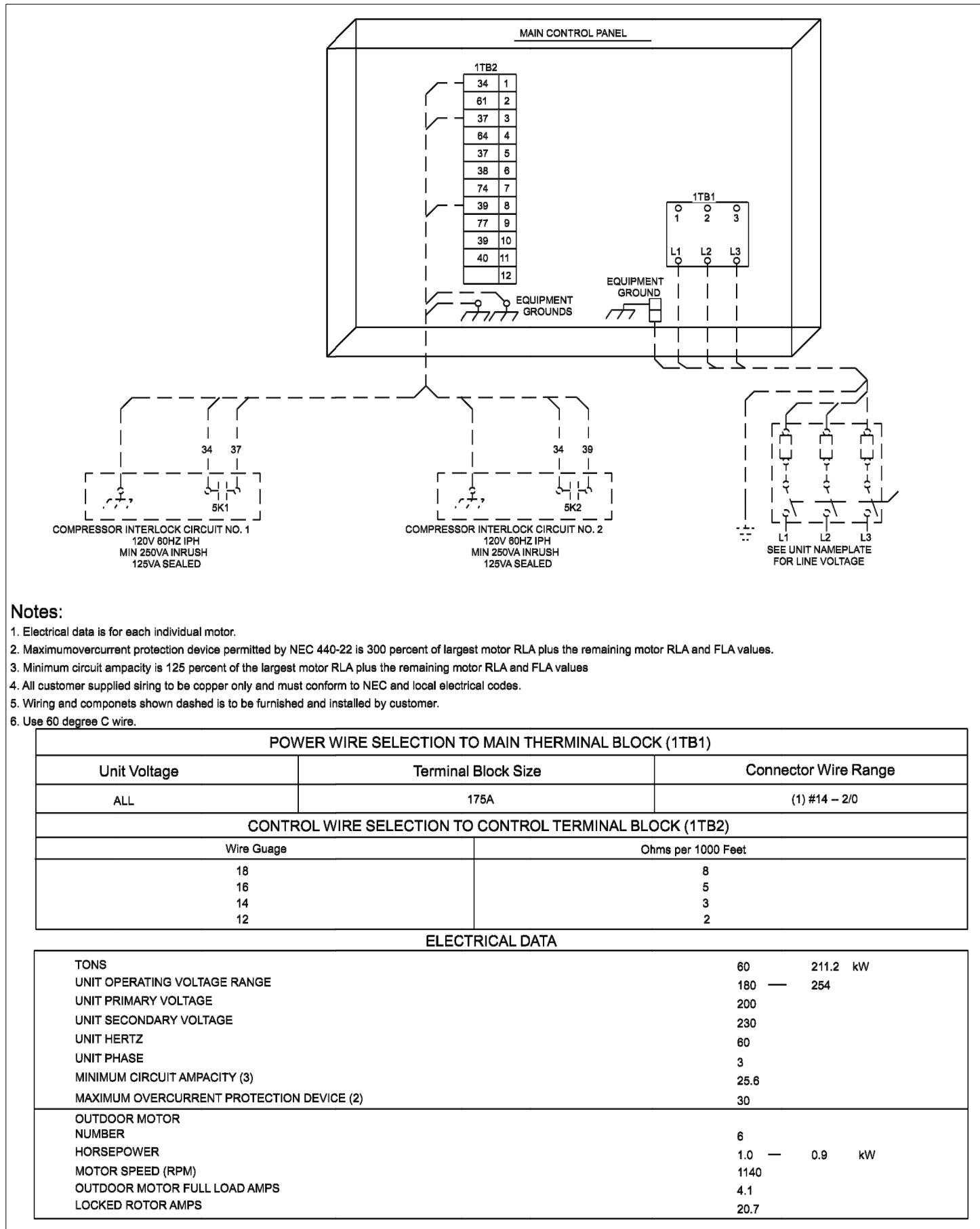
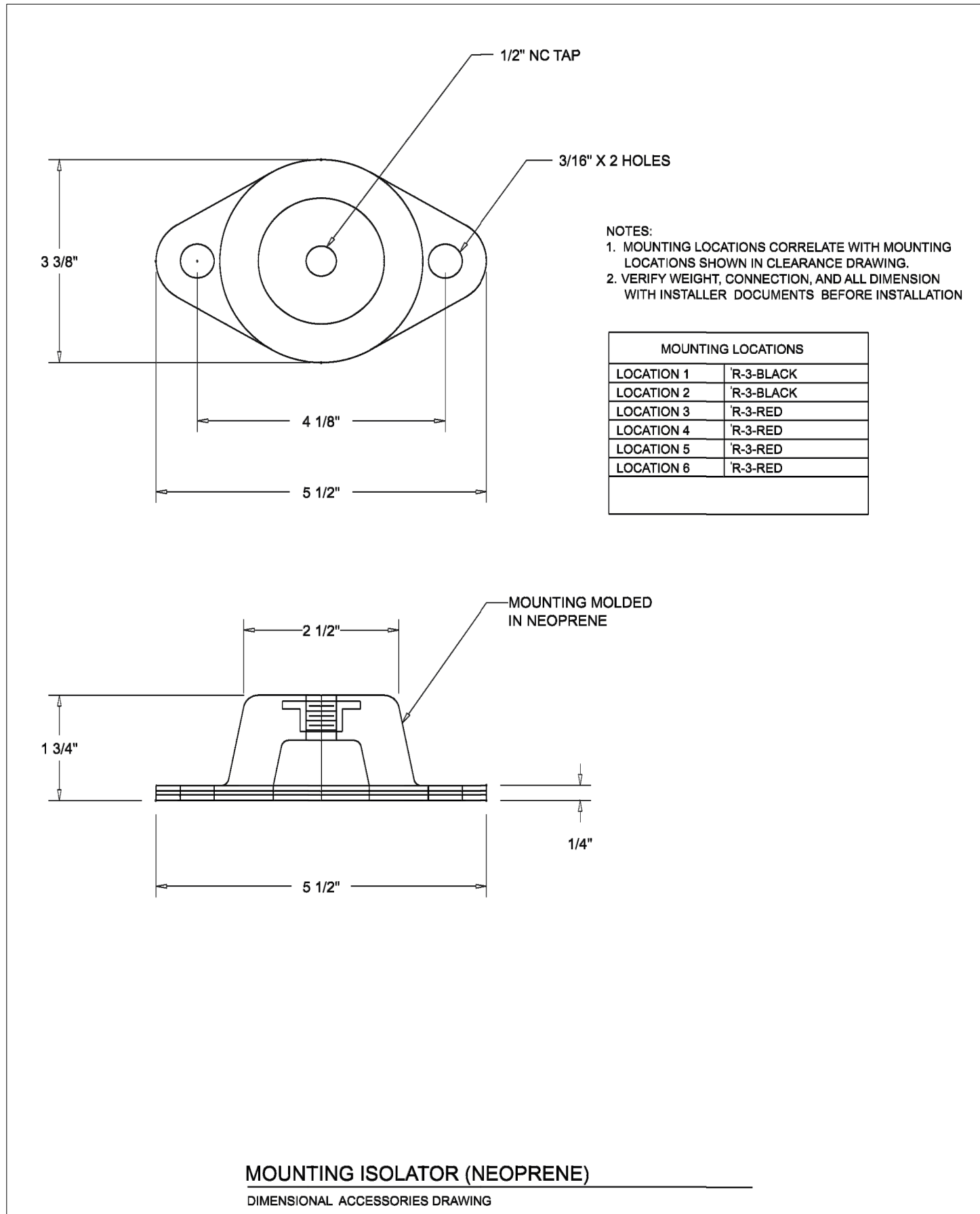
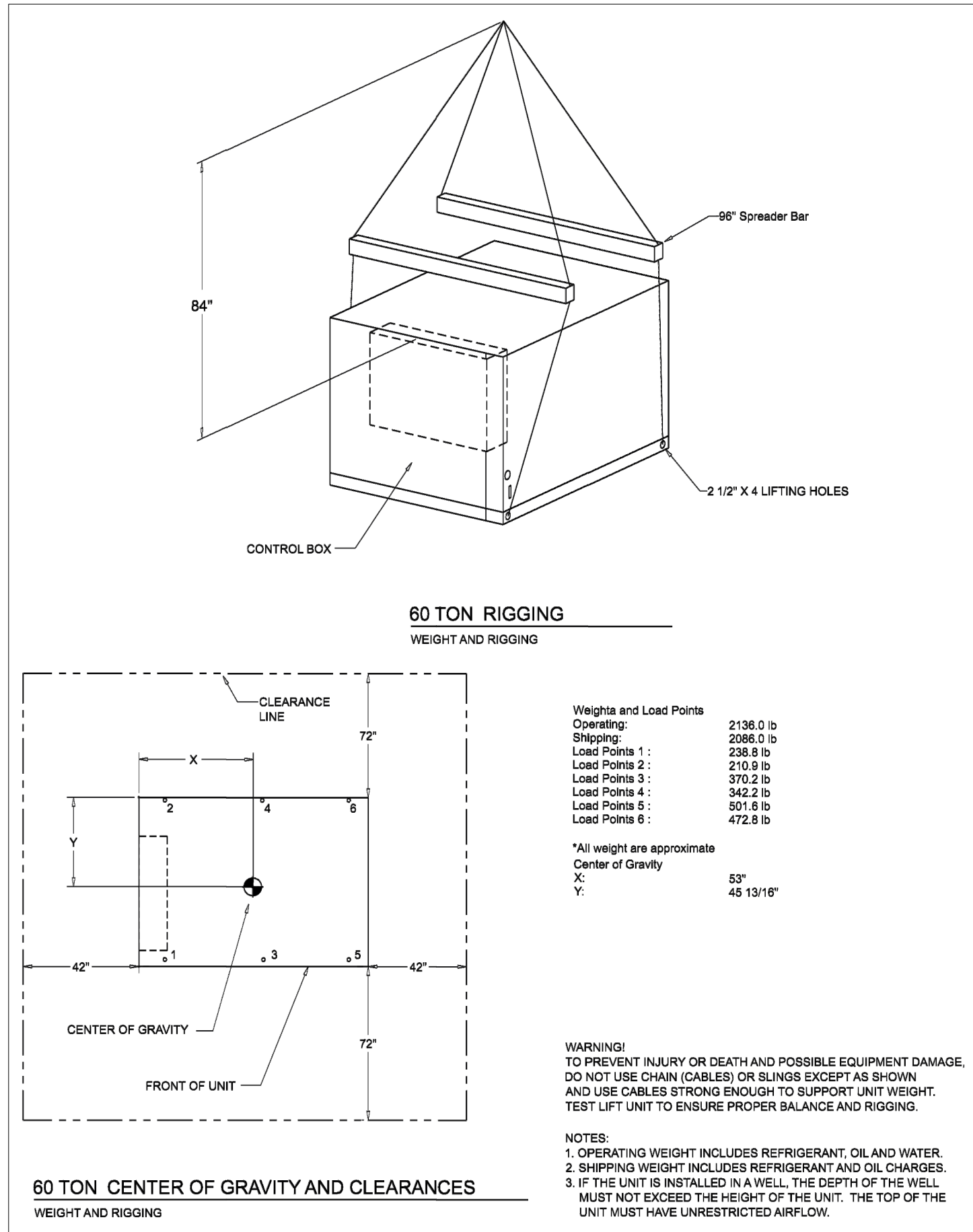
Neoprene-in-shear Isolation Package - R410A

Neoprene isolators reduce transmission of noise and vibration to building structure, equipment and adjacent spaces. Isolators have a steel plate and base completely imbedded in neoprene. The kit includes instructions for field installation.

Field Installed; 30% Bleed Valve TXV

Installation shall require use of 30% bleed, Thermal Expansion Valves. Valves shall be field supplied and field installed. Quantity and size shall be determined by the application.

Note: Liquid line solenoids are required for all applications. Trim solenoids cannot be used.



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DRAWINGS PREPARED FOR

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PROJECT TITLE:

PIPE & CHILLER REPLACEMENT

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202 EAST 3RD STREET
LEES SUMMIT (JACKSON COUNTY)
MISSOURI US

KSCYMO4I 123785.03.01 E05156

SHEET TITLE:

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AT&T PROJECT NUMBER: AOIKYNV	DATE: 01-20-2020 DRAWN BY: GMT	SCALE: SEE DRAWING CHECKED BY: GMT
AT&T AUTHORIZATION: MATT LONG	SHEET: OF: SHEETS	SHEET NO. MD-4

SECTION 15100
SUPPLEMENTARY GENERAL CONDITIONS FOR MECHANICAL WORK

15101 GENERAL CONDITIONS:

a. The provisions of GENERAL CONDITION OF THE CONTRACT are hereby made a part of this section as well as any other pertinent documents issued by the Architect.

15102 DRAININGS:

a. The Mechanical Drawings show the general arrangement of all piping, equipment and appurtenances and shall be followed as closely as actual building construction and the work of other trades will permit. The Mechanical work shall conform to the requirements shown on all the Drawings. General and Structural Drawings shall take precedence over Mechanical Drawings. Because of the small scale of the Mechanical Drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. The contractor shall investigate the structural and finish conditions affecting the work and shall arrange his work accordingly, providing such fittings, valves and accessories as may be required to meet such conditions.

15103 CODES AND STANDARDS:

a. All materials and workmanship shall comply with all applicable codes, specifications, local ordinances, industry standards and utility company regulations.

b. In case of difference between building codes, specifications, state laws, local ordinances, industry standards and utility company regulations and the Contract Documents, the most stringent shall govern. The contractor shall promptly notify the Engineer in writing of any such difference.

c. Non-compliance: Should the contractor perform any work that does not comply with the requirements of the applicable building codes, state laws, local ordinances, industry standards and utility company regulations, he shall bear all costs arising in correcting the deficiencies.

d. Applicable Codes and Standards shall include all state laws, local ordinances, utility company regulations, and the applicable requirements of the following nationally accepted codes and standards:

- (l) Building Codes

(a) International Building Code

(b) International Plumbing Code
- (2) Industry Standards, Codes and Specifications

(a) AASHO _ American Association of State Highway Officials

(b) IEEE _ Institute of Electrical & Electronics Engineers

(c) AMCA _ Air Moving & Conditioning Association

(d) ASHRAE _ American Society of Heating, Refrigeration & Air Conditioning Engineers

(e) ASME _ American Society of Mechanical Engineers

(f) ASTM _ American Society of Testing Materials

(g) AWWA _ American Water Works Association

(h) IPCEA _ Insulated Power Cable Engineers Association

(i) NBS _ National Bureau of Standards

(j)NEMA _ National Electrical Manufacturers Association

(k) NFPA _ National Fire Protection Association


(l)SMACNA _ Sheet Metal & Air Conditioning Contractor's National Association

(m) UL _ Underwriters' Laboratories

(n) ASA _ American Standards Association
- 15104 COORDINATION OF WORK:
- a. The contractor shall compare the Mechanical Drawings and Specifications with the Drawings and obtain Specifications for other trades, and shall report any discrepancies between them to the Engineer and obtain from him written instructions for changes necessary in the Mechanical work. The Mechanical work shall be installed in cooperation with other trades installing inter-related work. Before installation, the contractor shall make proper provision to avoid interference's in a manner approved by the Engineer. All changes required in the work of the contractor caused by his neglect to do so shall be made by him at his own expense.
- b. Anchor bolts, sleeves, inserts and supports that may be required for the mechanical work shall be furnished under the same section of the Specifications as the respective items to be supported, and they shall be installed, except as otherwise specified, by the trade furnishing and installing the material in which they are to be located. Location of anchor bolts, sleeves, inserts and supports shall be paid for by the contractor under the Section of the Specifications for the trade with the responsibility for directing their proper location.
- c. Slots, chases, openings and recesses through floors, walls, ceilings and roofs as specified will be provided by the various trades in their respective materials, but the trade requiring them shall see that they are properly located and shall do any cutting and patching caused by the neglect to do so. Slots, chases, openings and recesses in existing structure shall be cut by the trade requiring them and patched and repaired by that trade.
- d. Locations of pipes, ducts, equipment, fixtures, etc., shall be adjusted to accommodate the work to interference's anticipated and encountered. The contractor shall determine the exact route and location of each pipe and duct prior to fabrication.
- (1) Right of Way: Lines which pitch shall have the right of way over those which do not pitch. For example, steam, condensate and plumbing drains shall normally have right of way. Lines whose elevations cannot be changed shall have the right of way over lines whose elevations can be changed.
- (2) Offsets, transitions and changes in direction in pipes and ducts shall be made as required to maintain proper head room and pitch of sloping lines whether or not indicated on the Drawings. The contractor shall furnish and install all traps, air vents, sanitary vents, etc., as required to effect these offsets, transitions and changes in direction.
- e. Installation and Arrangement: The Contractor shall install all Mechanical work to permit removal (without damage to other parts) of coils, heat exchanger bundles, boiler tubes, fan shafts and wheels, filters, belt guards, sheaves and drives, and all other parts requiring periodic replacement or maintenance. The contractor shall arrange pipes, ducts and equipment to permit ready access to valves, cocks, traps, starters, motors, control components and to clean the openings of swinging and overhead doors and of access panels.
- f. Ductwork: The contractor shall change the cross_sectional dimensions of ductwork when required to meet job conditions but shall maintain at least the same equivalent cross_sectional area. The contractor shall secure the approval of the Engineer prior to fabrication of ductwork requiring such changes.
- g. Access: The contractor shall provide all necessary access panels is equipment, ducts, etc., as required for inspection of interiors and for proper maintenance.
- h. Drawings by Contractor: When directed by the Architect, the contractor shall submit for approval by the Engineer drawings clearly showing the Mechanical work and its relation to the work of other trades before commencing shop fabrication or erection in the field.
- 15105 AUTOMATIC CONTROLS, GENERALLY:
- a. Unless otherwise specified, this contractor shall furnish all necessary controls and provide all labor and materials for installation of all controls. All controls shall be installed strictly according to the electrical section of these specifications except that all control and interlock wiring shall be size #18 copper in conduit.
- 15106 FEES, PERMITS AND INSPECTIONS:
- a. All required fees, permits and inspections shall be obtained and paid for by the contractor under the section of the specifications for which they are required.
- b. Certificate of Final Inspection: Under each applicable section of the Specifications, the contractor shall, upon completion of the work under that section, furnish a certificate of final inspection to the Engineer from the inspection department having jurisdiction.
- 15107 EQUIPMENT AND MATERIALS:
- a. All materials shall be new and shall bear the manufacturer's name, trade name and the UL label in every case when a standard has been established for the particular material. The equipment to be furnished under each section of the Specification shall be essentially the standard product of a manufacturer regularly engaged in the production of the required type of equipment, and shall be the manufacturer's latest approved design.
- b. Delivery and Storage: Equipment and materials shall be delivered to the site and stored in original containers, suitably sheltered from the elements, but readily accessible for inspection by the Engineer until installed. All items subject to moisture damage (such as controls) shall be stored in dry, heated spaces. Equipment and materials of the same general type shall be of the same make throughout the work to provide uniform appearance, operation and maintenance.
- c. Protection: Equipment shall be tightly covered and protected against dirt, water and chemical or mechanical injury and theft. At the completion of the work, fixtures, equipment and materials shall be cleaned and polished thoroughly and turned over to the Owner in a condition satisfactory to the Engineer. Damage or defects developing before acceptance of the work shall be made good at the contractor's expense.
- d. Dimensions: It shall be the responsibility of the contractor to insure that items to be furnished fit the space available. He shall make necessary field measurements to ascertain space requirements, including those for connections, and shall furnish and install such sizes and shapes of equipment that the final installation shall suit the true intent and meaning of the Drawings and Specifications.
- e. Manufacturers' Directions shall be followed completely in the delivery, storage, protection and installation of all equipment and materials. The contractor shall promptly notify the Engineer in writing of any conflict between any requirements of the Contract Documents and the manufacturers' directions and shall obtain the Engineer's written instruction before proceeding with the work. Should the contractor perform any work that does not comply with the manufacturers' directions or such written instructions from the Engineer, he shall bear all costs arising in correcting the deficiencies.
- 15108 EQUIPMENT ACCESSORIES:
- a. The contractor shall furnish and install all equipment, accessories, connections and incidental items necessary to fully complete the work, ready for use, occupancy and operation by the Owner.

b. Connections: All piping connecting to pumps and other equipment shall be installed without strain at the piping connection. The contractor shall be required as directed to remove the bolts in these flanged connections or disconnect piping to demonstrate that piping has been so connected.

c. Connections different from those shown: Where equipment requiring different arrangement or connections from those shown as approved, it shall be the responsibility of the contractor to install the equipment to operate properly and in harmony with the intent of the Drawings and Specifications. When directed by the Engineer, the contractor shall submit drawings showing the proposed installation. If the proposed installation is approved, the contractor shall make all incidental changes in piping, ductwork, supports, insulation, heaters, etc. He shall provide any additional motors, controllers, valves, fittings and other additional equipment required for the proper operation of the system resulting from the selection of equipment, including all required changes in affected trades. The contractor shall be responsible for the proper location of roughing in and connections by other trades. All changes shall be made at no increase in the contract amount or additional cost to the other trades.
- d. Concrete Equipment Bases: Unless otherwise noted on the Drawings or in the Specifications, concrete pads and bases for fans, pumps, tanks and other equipment will be furnished and installed under the Mechanical Sections, the contractor shall establish sizes and location of the various concrete bases required and shall provide all necessary anchor bolts together with templates for holding these bolts in position. Anchor bolts shall be placed in steel pipe sleeves to allow for adjustment, with a suitable plate at bottom end of sleeve to hold the bolt. Each pump shall have a concrete base not less than 4" high which shall project 3" on all sides beyond the equipment. Special vibration isolation foundations that are required are specified with the equipment supported.

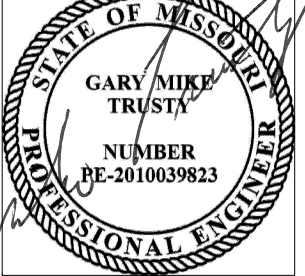
e. Drives and Belt Guards: The contractor shall provide for each V-belt drive or rotating shaft a protective guard which shall be constructed around an angle iron frame, securely bolted to the floor or apparatus. The guard shall completely enclose drives and pulleys and be constructed to comply with all safety requirements. Hinged access doors not less than 6' x 6' shall be provided for access to motor and fan shaft for test purposes. For double inlet fans, the belt guard shall be arranged so as not to restrict the air flow into the fan inlet. Guards shall not interfere with lubrication of equipment.
- f. Supports: The contractor shall support plumb, rigid and true to line all work and equipment furnished under each section. The contractor shall study thoroughly all General, Structural, Mechanical and Electrical Drawings, shop drawings and catalog data to determine how equipment, fixtures, piping, ductwork, etc., are to be supported, mounted or suspended and shall provide extra steel bolts, inserts, pipe stands, brackets and accessories for proper support whether or not shown on the Drawings. When directed, the contractor shall submit drawings showing supports for approval.
- 15109 UTILITIES, LOCATIONS AND ELEVATIONS:
- a. Locations and elevations of the various utilities, included within the scope of this work, have been obtained from utility maps and/or other substantially reliable sources and are offered separate from the Contract Documents as general guide only, without guaranteed as to accuracy. This Contractor shall examine the site and shall verify to his own satisfaction the location and elevation of all utilities and shall adequately inform himself of their relation to the work before entering into a contract.
- 15110 CLEANING AND ADJUSTING:
- a. This Contractor shall not allow his waste materials or rubbish to accumulate in or about the premises, but shall promptly remove same. At the completion of the work, this Contractor shall remove all remaining rubbish, tools, scaffolding, and surplus materials, from and about the premises, and shall leave all work clean and ready for the intended usage. All fixtures, equipment, piping, valves and fittings shall be cleaned of grease, metal cuttings and sludge. Any stoppage discoloration, or other damage to parts of the building, its finish or furnishings due to this Contractor's failure to properly clean or adjust the systems, shall be repaired and/or replaced by him without additional compensation from the Owner. All automatic control devices shall be adjusted for proper operation and water flow to fixtures and equipment shall be balanced.
- 15111 CUTTING AND PATCHING:
- a. Under each section of the Specifications, the contractor shall be responsible for all required digging, cutting, etc., incident to his work under that section, and shall make all required repairs thereafter to the satisfaction of the Engineer, but in no case shall the contractor cut into any major structural element, beam or column without the written approval of the Architect.
- b. Pavements, sidewalks, roads and curbs shall be cut, patched, repaired and/or replaced as required to permit the installation of the work of the various trades and such cutting, patching, repairing and replacing shall be the responsibility of and paid for by the contractor under the section of the Specifications for the trade requiring the work.
- c. Each trade shall bear the expense of all cutting, patching, repairing or replacing of the work of other trades required because of his fault, error or tardiness or because of any damage done by him.
- 15112 GENERAL PIPING INSTALLATION:
- a. The contractor shall furnish and install as shown on the drawings or as necessary to complete the working system in accordance with the intent of the drawings and specifications, a complete system of piping, all valved as indicated or as necessary to completely control the entire apparatus and all appurtenances. The piping drawings are diagrammatic and indicate the general location and connections. The piping may have to be offset, lowered, or raised as required or as directed at the site. This does not relieve the contractor from responsibility for the proper erection of systems of piping in every respect suitable for the work intended as described in the specifications and approved by the Engineer.
- b. Erection: Piping shall be properly supported and adequate provisions shall be made for expansion, contraction, slope and anchorage. All piping shall be cut accurately for fabrication to measurements established at the construction site. Pipe shall be worked into place without springing and/or forcing, properly clearing all windows, doors, and other openings and equipment. Cutting or other weakening of the building structure to facilitate installation will not be permitted. All pipes shall have burr and cutting slag removed by reaming or other cleaning methods. All changes in direction shall be made with fittings, except that bending of pipe will be permitted providing a hydraulic pipe bender is used. Bent pipe showing kinks, wrinkles, or other malformation will not be acceptable.
- c. Arrangement: All piping shall be arranged so as not to interfere with removal of other equipment or devices nor to block access to doors, windows, manholes, or other access openings. Piping shall be arranged so as to facilitate removal of tube bundles. Flanges or unions, as applicable for the type of piping specified, shall be provided in the piping at connections to all items of equipment. Piping shall be placed and installed so that there will be no interference with the installation of the equipment, ducts, etc. All piping shall be installed to insure noiseless circulation. All valves and specialties shall be placed to permit easy operation and access, and all valves shall be regulated, packed and glands adjusted at the completion of the work before final acceptance. All piping shall be erected and pitched to insure proper draining. Piping shall be installed so as to avoid liquid or air pockets throughout the work. Eccentric reducers shall be used wherever changes in pipe sizes occur in steam mains, and the reducers shall be located approximately 13" beyond the nearest upstream branch.
- (1) Expansion and contraction of piping shall be provided by expansion loops, bends, or expansion joints to prevent injury to connections, piping, equipment or the building.
- d. Unions shall be installed on all by-passes, ahead of all traps, at all connections to equipment, where shown on the drawings or where required to facilitate removal of equipment whether shown or not.
- e. Sleeves shall be provided around all pipes passing through walls, floors, ceiling, partitions, structural members or other building parts. Sleeves shall be standard weight galvanized iron pipe two sizes larger than the pipe or insulation so that pipe or insulation shall pass through freely with space for movement. Sleeves through floors shall be extended 1/4" above floor finish in movement. Sleeves through floors shall be extended 1/4" above floor finish in toilets or in rooms where domestic water is used. In other rooms, sleeves shall be flush with the floor; sleeves through outside walls shall be sealed with graphite coated asbestos packing and molten lead.
- f. Plates: Spring clamp plates (escutcheons) shall be provided where pipes are exposed in finish locations of the building and run through walls, floors or ceilings. Plates shall be chrome plated spun brass of plain pattern and shall be set tight on the pipe and to the building surface.
- g. Protection: All open ends of pipe and equipment shall be properly capped or plugged to keep dirt and other foreign materials out of the system. Plugs of rags, wool, cotton, waste or similar materials may not be used in plugging. All pipes not otherwise specified shall be uncoated.
- h. Hangers and Supports: The use of pipe hooks, chains, or perforated iron for support will not be permitted. The contractor shall provide inserts in the floor construction at the time the floors are poured and the hangers shall be attached to these inserts. Where inserts cannot be used, expansion shields may be used, provided the hanger is not attached rigidly to the bolt but is supported from an angle held in place by the expansion bolt. Hangers, rods and inserts shall be Underwriters Laboratories approved for the service intended.
- All the different service pipes, valves, fittings, ducts, etc., running parallel with each other and near together shall be in line with each other and shall be kept a sufficient distance from each other and the other work to permit finished covering not less than 1/2" between finished coverings on the different services.
- All hangers must be spaced not more than ten feet (10') apart on services. Soil pipe (cast iron bell and spigot) five feet (5') or less; copper pipe two inches (2") and smaller not more than five feet (5') apart; copper piping over two inches (2") not more than ten feet (10') apart; all steel piping one and one-fourth inches (1 1/4") and smaller not more than ten feet (10') apart.
- Generally, inserts equal to Grinnell #279 or 282, Modern #90, 510 or 511 shall be set at the time forms are in place.
- Individual hangers for overhead piping shall generally have adjustable swivel pipe rings with suspended rods of ample strength, equal to Grinnell #107 or #104. Such service pipes as are practicable shall be placed at the same elevation and the various trades shall cooperate with each other and install multiple trapeze hangers wherever possible.
- Piping near floor shall be supported from side wall or floor by approved wrought iron or pipe brackets, stanchions or hangers, in such manner as to maintain its alignment, while making suitable provisions for necessary expansion.
- Copper tubing, hangers, support rods, and other support accessories shall be as specified above, except that they shall be copper plated and otherwise fully suitable for use with copper tubing.
- i. Vertical Piping: Riser clamps shall be placed at each floor or ceiling level and at each coupling or fitting. Clamps shall be securely supported by structural members which in turn are supported directly from the building structure. Clamps for copper tubing shall be copper plated.
- j. Cleaning and Flushing: Contractor shall take every precaution to remove dirt, grease and all other foreign matter from each length of piping before making connections in the field. After each section of piping is installed, it shall be flushed with clean water except where specified otherwise.
- A temporary flushing connection shall be arranged for each section of piping and flushing arranged for all piping. Water required for flushing shall be furnished by the contractor. All temporary cross connections for flushing and drainage connections shall be furnished, installed and subsequently removed by the contractor.
- k. Pipe Identification: Stenciled legend identifying the fluid conveyed shall be painted on pipe in all exposed locations by the trade furnishing and installing the pipe, at intervals not to exceed 20 feet and in addition, at each valve, branch, expansion joint and anchor. Letters shall be sized in accordance with the following:
- | Outside Diameter of Pipe or Covering | Height of Legend Letters |
|--------------------------------------|--------------------------|
| Up to 1 1/4" | 1/2" |
| 1 1/2" to 2" | 3/4" |
| 2 1/2" to 6" | 1 1/2" |
| Over 6" | 2" |
- l. Pipe Sizes: If the size of any piping is not clearly evident in the drawings, the contractor shall request instructions from the Engineer as to the proper sizing. Any changes resulting from the contractor's failure to request clarification shall be at his expense.
- 15113 WELDING OPTION:
- a. All joints between sections of black steel pipe and between pipe and fittings one and one_half inches (1 1/2") and larger may be fusion-welded. The welding shall be in accordance with recommendations of the American Welding Society. All changes in direction and intersections of lines shall be made with welding fittings. Mitering of pipe to form elbows, notching straight runs to form tees, or any similar construction will not be permitted. Note that NO threaded connections will be allowed in steel piping. Screw connections in small piping must be between stainless steel corrosion resistant fittings.
- 15114 UNIONS:
- a. Unions or Flanges shall be used at connections to all equipment to facilitate dismantling and elsewhere as required in the erection of the pipe on installation of valves, but shall not be installed in concealed spaces unless suitable access is provided.
- b. Unions on ferrous pipe 2" or smaller shall be Crane No. 1280, 150 pound, malleable iron, ground joint unions. Unions on brass or copper pipe 2" or smaller shall be Crane 125 pounds, brass, ground joint unions. Unions on ferrous piping 2 1/2" or larger shall be Crane 125 pound, cast iron, gasket type, flange unions. Gaskets for flanged unions shall be of the best quality fiber, plastic or leather. Unions on galvanized piping shall be galvanized and unions on black piping shall be black. Where copper to steel pipe unions, couplings or joints occurring on equipment inside of building, which shall be placed in accessible places.
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REVISIONS / AUTHORIZATIONS

NO.	REVISIONS / AUTHORIZATIONS	DATE	BY

PROPRIETARY AT&T INFORMATION

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THIS INFORMATION MAY ONLY BE USED BY AUTHORIZED
PERSONNEL OF THE LOCAL GOVERNMENT AGENCY IN CONNECTION
WITH APPLICATION FOR PERMITS AND AUTHORIZATIONS FOR
BUILDINGS, CONSTRUCTION, AND/OR ZONING CHANGES.



AT&T

CORPORATE

REAL ESTATE

PROJECT TITLE:

PIPE & CHILLER REPLACEMENT

00

202 EAST 3RD STREET

LEES SUMMIT (JACKSON COUNTY)

MISSOURI US

KSCYMO4I 123785.03.01 EO5156

SHEET TITLE:

MECHANICAL

SPECIFICATIONS

AT&T PROJECT NUMBER:

AOIKYNV

DATE: **01-20-2020**

SCALE: **SEE DRAWING**

AT&T AUTHORIZATION:

MATT LONG

DRAWN BY: **GMT**

CHECKED BY: **GMT**

SHEET: **OF:**

SHEETS:

SHEET NO.

MS-1

15115 ELECTRIC MOTORS, HEATERS, MISCELLANEOUS DEVICES, AND CONNECTIONS. GENERALLY:

a. The Contractor furnishing the motor, heater and miscellaneous devices shall install it on suitable foundation complete and ready for electrical connections. The Contractor furnishing the motor shall furnish and deliver to the Electrical Contractor all starting equipment required for operation of the equipment, unless otherwise provided for in the Electrical Section of these specifications. Each and every motor shall be furnished with a starter with over and under voltage protection, unless otherwise specified herein. The labor and material for the electrical connection of all motors, heaters, devices, and the erection and connection of all motor starters and panelboards shall be done by the Electrical Contractor. The Contractor furnishing the motors, heaters, devices, and starters shall provide all labor and material for the installation of the interlock wiring between starters and all automatic controllers unless otherwise provided for under the Electrical Section of these specifications.

b. Starters which are interlocked for automatic operation shall have ON/OFF/AUTO switches, 120 volt control transformers and a N.O. auxiliary contact. All starters shall have pilot lights.

c. All controls and devices installed outdoors shall be completely weatherproofed.

d.This contractor shall notify the Electrical Contractor of any changes required in the electric plans because of substitution of equipment and/or variation in electrical requirements due to changes in equipment manufacture and shall accept all responsibility for such changes and variations.

e. Motors shall be furnished and installed under several sections of the specifications. Each motor 3/4 horsepower and larger, unless otherwise specified, shall be squirrel cage type provided with nameplate and designed for three phase, 60 cycle power in accordance with NEMA and IEEE standards. All motors smaller than 3/4 horsepower, unless otherwise specified, shall be 120 volts, 60 cycle, single phase. Each motor shall be at least of the horsepower specified and in addition shall be constructed for use at the altitude where the work is to be located. Motors shall be provided with ball, sleeve or roller bearings with dust proof and leak proof rings. Motors shall be guaranteed to operate continuously at full load with temperature rise in any part not to exceed 40 degrees C above ambient temperatures. Motors shall be commercially dynamically balanced and tested at the factory before shipment and shall be selected for quiet operation. Motors for V-belt drives shall be provided with a cast iron or steel base, with slide rail and adjustable screw device. The contractor shall line up motors and drives and place motors and equipment on foundations ready for operation.

f. Motor Power Factors: All motors shall have a high efficiency rating of 90% or better and suitable for use with variable frequency drives.

15116 VALVES AND STRAINERS:

a. All valves and other piping specialties, either as shown or required in the connection of the mechanical system or systems, except as may be otherwise specified elsewhere in these specifications, shall be Crane, Nordstrom, Nibco or equal.

b. Gate valves shall be used for blocking purposes and branch isolation only. Lubricated plug cocks and globe valves are to be used for balancing. Do not use globe valves except where specifically indicated.

c.(1) Gate Valves: 2" and smaller shall be Crane No. 428 or 438. Valves 3" and smaller may be Crane No. 1334 or 1324. Valves 2 1/2" or larger shall be Crane No. 465 1/2 or 461.

(2) Check Valves: 2" and smaller shall be Crane No. 37. Valves 3" and smaller may be Crane No. 1342. Valves 2 1/2" and larger shall be Crane No. 373.

(3) Balancing Cocks: 2" and smaller shall be equal to Nordstrom No. 114. Cocks 2 1/2" and larger shall be equal to Nordstrom No. 115.

(4) Butterfly valves for cond. and chill water service shall be as follows: Valves 2" through 6" shall be Norriseal full lube type R3310_4733_IN or approved equal. Allow for insulation.

(5) Air Valves: 3/4" and smaller shall be Crane Catalog no. 2180 or 2182 "GEM" ball valves.

d. Strainers:

(1) This Contractor shall furnish and install strainers which shall be equipped with Monel removable screens ahead of all equipment, control valves, and any other locations where shown on the drawings.

(2) Install each strainer 2" and larger with a three-quarter inch (3/4") nipple and blowoff wire.

(3) Strainers shall be Crane No. 988 1/2 "Y" type for pipe two inches (2") and under, and Crane No. 989 1/2 for pipe two and one-half inches (2 1/2") and over.

15117 LUBRICATION:

a. The contractor shall provide all oil for the operation of all equipment until acceptance. The contractor shall run in all bearings, and after they are run in, drain all oil from the bearings, flush out all bearings, and refill with new oil. The contractor shall be held responsible for all damage to bearings while the equipment is being operated by him up to the date of acceptance of the equipment. The contractor shall be required to protect all bearings during installation and shall thoroughly grease steel shafts to prevent corrosion. All motors and other equipment shall be provided with covers as required for proper protection during construction.

15118 CHARTS, DIAGRAMS AND SCHEMES:

a. Listed below shall be provided by the contractor, mounted in separate hardwood frames and racked in wood cabinet with glazed hardwood doors and bronze latch sets and installed where shown on the drawings or directed in the field. The frames shall be 22 inches by 17 inches (glazing dimensions) and the number, arrangement and details of construction shall be as approved by the Architect. All charts, diagrams and schemes shall be photographic positives prepared from original ink tracings.

b.Lubrication charts shall list all types lubricant for each piece of equipment, and recommended frequency of lubrication.

c. Valve tagging schedule.

d. Electrical diagrams as shown or specified.

e. Automatic Temperature Control Diagrams shall be identified as to name, sequence of operation, location and number of systems. Components of a control system shall be identified as to description, location, function, temperature setting, spring range, manufacturer's part number and manufacturer's technical literature for that component.

f. Piping schemes where required by the Detailed Specification Requirements.

15119 EQUIPMENT START-UP AND TESTING:

a. The contractor shall instruct the Owner's operating personnel during start-up and separate operating tests of each major item of equipment, including pumps, boilers, burners, chillers, compressors, deaerating heaters and oil heater sets. During the operating tests, the contractor shall prove the operation of each item of equipment to the satisfaction of the Engineer. At least seven days notice shall be given to the Engineer of equipment start-up and operating tests.

15120 SYSTEM OPERATING TESTS:

a. After the successful completion of all equipment start-up and test requirements, the following formal tests shall be performed on the complete Mechanical systems:

b. First Operating Test by Contractor: The contractor shall prove the operation of the Mechanical Systems of each individual item in the systems. At least 10 days notice shall be given the Engineer of such tests. Should any item of the systems fail to perform in an approved manner, this test shall be repeated until the operating test is approved by the Engineer. During this test, the contractor shall balance circulation of steam, condensate, heating and chilled water; air and all other fluids conveyed to provide proper quantities to all items of equipment. He shall adjust and set all balancing cocks, valves, dampers and similar items to insure that the Mechanical systems perform as intended.

c.Checking by Owner and Engineer: Following the successful completion of first operating tests by the contractor, the Owner and the Engineer shall have the privilege of making such tests as they may desire during a period of three weeks to ascertain in detail if any corrections are to be made to the system. At the end of the testing by the Owner and Engineer, the Engineer shall direct the contractor in writing to make such corrections to the systems as are within the scope of the contract.

d. Contractor's Corrections to Systems: The contractor shall then make all required corrections to the systems and shall notify the Engineer in writing that he has completed the corrections outlined and shall give at least seven days notice of final three-day operating test.

e. Three-day Operating Test: An operating test shall then be performed by the contractor to the satisfaction of the Engineer for a period of three days. Should any element of the systems not perform properly, the contractor shall make all required corrections, and the test shall be repeated until successfully performed.

15121 CATALOG DATA FOR OWNER:

a. The contractor shall provide in looseleaf binders a compilation of catalog data of each manufactured item of equipment used in the Mechanical work and shall present this compilation to the Engineer for transmittal to the Owner before final payment is made. Descriptive data and printed installation, operating and maintenance instructions for each item of equipment shall be included. A complete double index shall be provided as follows:

(1) Listing the products alphabetically by name.

(2) Listing the names of manufacturers whose products have been incorporated in the work alphabetically, together with their addresses, and the names and addresses of the local sales representative.

15122 AS-BUILT DRAWINGS:

a. The contractor shall, during the progress of the work, keep an accurate record of all changes and corrections from the layouts shown on the drawings. Record of changes may be kept by accurately making all changes on a set of prints during the progress of the job. Exact location of all underground utility service entrances and either connections to utility mains as well as all valves, etc., which will be concealed in the finished work shall be accurately indicated on the drawings by measured distances. Upon completion of the work and prior to final payment, the contractor shall furnish to the Owner one set of "as-built" prints legibly and accurately marked to indicate all changes, additions, deletions, etc., from the Contract Drawings.

15123 SHOP DRAWINGS:

a. The Contractor shall submit seven (7) copies to the Engineer for approval, a list of the equipment he proposes to furnish, together with descriptive literature, capacities, manufacturer's name, approximate delivery date and any other pertinent facts concerning the various items. The submittal shall consist of a tabulation of all items included, followed by catalog and data sheets, wiring diagrams, etc., all bound in one folder.

b. The product of any reputable manufacturer regularly engaged in the commercial production of the specified equipment will not be excluded on the basis of minor differences, provided all essential requirements of this specification relative to materials, capacity and performance are met. The bidder shall furnish a statement giving a complete description of all points wherein the equipment he proposes to furnish does not comply with the specifications, as well as any exception he may take to the specifications. Any exception proposed shall be submitted to Engineer for written approval. Failure to furnish such a statement will be interpreted to mean that bidder agrees to meet all requirements of the specifications.

c. Wherever the substituted equipment, actually furnished under these specifications, require the use of larger or more connections, or if they are different arrangement than those shown on plans or specified under these specifications, such additional or larger connections shall be installed to the complete satisfaction of the Engineer without added cost to the Owner.

d. Shop drawings and required field drawings as here before specified shall be submitted to the Architect for review and shall be submitted in pentad unless otherwise specified in the individual sub-sections. All shop drawings submitted shall bear signed certification to the effect that the Contractor has carefully checked these shop drawings and found them to be correct with respect to dimensions and available space and that the equipment complies with all requirements of the specifications. The Engineer will not review any shop drawings which are not accompanied by this certification.

15124 INTERRUPTION OF SERVICES:

a. This Contractor shall not interrupt any water, gas, sewer, heating air conditioning or ventilation in existing buildings without first arranging a schedule with the Owner.

15125 GUARANTEE:

a. This Contractor shall furnish a written certificate, guaranteeing all materials, equipment, and labor furnished by him to be free of all defects for a period of one (1) year from, and after, the date of final acceptance of the work by the Owner, and this Contractor shall further guarantee that if any defects appear within the stipulated guaranty period, such work shall be replaced without charge.

b. This guarantee shall be extended to include the capacity and integrated performance of the component parts of the various systems, in strict accordance with the true intent and purpose of the specifications. The Contractor shall conduct such tests as are hereinbefore specified, or as may be required by the Architects, to demonstrate the capacity and performance ability of the various systems and their component parts.

15126 NOISE AND VIBRATION CONTROL:

a. It is intended that the systems as installed shall be free from objectionable noise and vibration when the system is operating. This Contractor shall isolate equipment, piping, etc., as required, as to insure an acceptable noise and vibration level in all of the systems.

15127 OPEN ENDS:

a. This Contractor shall keep all ends of pipe, including those extending through and above the roofs, drains, equipment and fixture branches, closed with caps or plugs so as to prevent dirt or building material from entering the pipe and traps during the course of construction. The use of cloth, paper, or cans for plugs shall be prohibited.

15128 INSTRUCTIONS OF OWNER'S REPRESENTATIVES:

a. The contractor shall instruct the representative of the Owner in the proper operation and maintenance of all elements of the Mechanical systems. A competent representative of the contractor shall spend not less than three days in such formal instruction and shall spend such additional time as directed by the Engineer to fully prepare the Owner to operate and maintain the Mechanical Systems.

15129 VISIT SITE:

a. This contractor shall visit the site of the building before submitting a proposal on this work and shall thoroughly familiarize himself with the existing conditions and operations. Failure on his part to do this will not be cause for extras after the contract is signed by reason of unforeseen conditions.

SECTION 15200 MECHANICAL

15201 GENERAL CONDITIONS:

a. The General Conditions, Supplementary General Conditions for Mechanical work and any other pertinent documents issued by Bell Telephone shall apply to all work in this section whether attached hereto or not.

15202 EXTENT OF WORK:

a. The work under this section includes all labor and materials required for the installation of complete mechanical systems.

15203 LAYING OUT WORK:

a. Contractor shall carefully lay out his own work on the premises and make proper provisions for the work of other contractors. Offsets shall be made wherever it is necessary to clear finished rooms, structural members, or other obstructions, with no additional costs.

15204 LOCATIONS OF OUTLETS:

a. The location of all pipe, outlets, appliances, etc., shown on the plans is approximate only and understood to be subject to such revision as may be found necessary or desirable at the time the work is installed.

15205 LABOR:

a. All labor shall be performed in the best and most workmanlike manner by mechanics skilled in their respective trades. The standards of work required throughout shall be of such grade as will bring results of the first class only. Mechanics whose work is unsatisfactory to the Owner or the Engineer or are considered by the Engineer to be unskilled or otherwise objectionable shall be instantly dismissed from the work upon notice from the Engineer.

15206 MATERIALS:

a. When several materials are specified by name for one use, the contractor may select for use any of those so specified.

b. When only one material is specified by name, the contractor, should he desire to use another material in lieu thereof, shall request in writing the approval of same from the Engineer. No substitution shall be made without the written approval of the Engineer.

15207 MANUFACTURER'S DIRECTIONS:

a. All manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturers, unless herein specified to the contrary.

15208 TRANSPORTATION, SCAFFOLDING, ETC.:

a. This contractor shall furnish all necessary scaffolding, tackle, tools and appurtenances of all kinds, and all labor required for the safe and expeditious execution of his contract.

15209 FLOOR AND CEILING PLATES:

a. All exposed pipes passing through floors, ceilings, or walls shall be provided with floor and ceiling plates of approved pattern. In finished area plates shall be chrome plated; in unfinished areas plates shall be painted steel.

15210 DOMESTIC, CONDENSATE, CONDENSER, CHILL AND FIRE PROTECTION WATER PIPING: NOTE THAT ALL PIPING, FITTINGS, ETC. SHALL BE MANUFACTURED IN THE UNITED STATES

a. All domestic water, make-up water piping and condensate piping shall have type "L" copper with all joints made with "95-5" lead free solder. Fittings shall be wrought copper.

b. All condenser, chill and fire protection water piping shall be Schedule 40 black steel with standard cast iron or welding fittings.

c. Provide automatic air vents in all high points in the system. Provide isolation valves in all vents. Note that all air vents and pressure port nipples and extensions shall be stainless steel and welded to base piping with compatible filler rod. (Not fire protection system).

d. Provide drains in all low points of the system with hose bibb faucets. Note that drains shall have stainless steel nipples and extensions same as noted for vents. Provide stainless steel ball valve prior to hose bibb fitting to allow isolation and service of hose bibb type drain valve. Hose bibb is only for ease of connecting drain hose.

e. Test all water piping at 100 psig water for leaks. Repair leaks before calling Engineer for inspection. Do not insulate until Engineer accepts piping. Contractor shall remove insulation installed prior to inspection. Contractor may insulate mid-sections of pipe as long as all fittings, valves and joints are exposed.

15211 PIPING SYSTEM ACCESSORIES:

a. Thermometers. Terlice Catalog No. BX93403 1/2 in 9" aluminum case, adjustable angle, and brass separable socket. Ranges as follows: condenser water _ 0 to 160 degrees F.

b.Triple Duty Valves. Bell and Gossett angle or straight type.

c. Relief and Pressure Reducing Valves. Bell and Gossett Nos. D_175 or D_250.

d. Automatic Air Vents. Sarco No. 13N eliminator with copper overflow connector and 3/4" cock.

e. Flexible Pipe Connectors. Stainless steel reinforced corrugated stainless steel with adapters for threaded, soldered, or flanged connections. Hoses without reinforcement or adapters will not be acceptable. Connectors are for vibration isolation. Pipe shall be properly supported and aligned. Use manufacturer's recommended lengths.

f. Temperature and Pressure Ports. Install Pete type plugs at supply and return of all devices installed in system such as pumps, coils, condensers, etc..

15212 AUTOMATIC FLOW CONTROL VALVES:

a. Flow control valves shall be factory calibrated, direct acting, automatic pressure compensating type. Each valve shall limit flow rates to within + 5% accuracy, regardless of system pressure fluctuations. Valve control mechanism shall consist of a tamper proof, stainless steel cartridge assembly with open chambers and unobstructed flow passages. Cartridge assembly shall include a self-cleaning, spring loaded moving cup guided at two separate points and shall utilize the full available differential pressure to actuate without hysteresis or binding. Four differential pressure ranges shall be available with the minimum range requiring less than 2 psi. Each valve to be provided with a metal tag, chain and stamped for system identification. Pressure taps and quick disconnect valves shall be provided with ferrous bodies. All hydronic system flow control valves shall be of one manufacturer. Flow control valves shall be manufactured by Griswold Controls.

b. Furnish portable flow measuring apparatus, complete with carrying case, pressure gauge, 3-way valve, hoses and connections. Unit to be compatible with automatic flow control valves to indicate pressure differential to determine flow rate through the valve.

15213 ELECTRIC STRIP:

a. Apply electric strip to make-up water pipe, condenser water pipe and water treatment pipe located outdoors.

b. Electric strip shall be Chemelex self-limiting type for 115 volt. Thermostat shall be Robertshaw NEMA IV water tight, 30 _ 230 degrees F range, single pole, single throw. Strip shall be sized and installed per manufacturer's directions for application.

15214 FOUNDATIONS AND SUPPORTS:

a. Pumps, chillers, tanks, AH-unit, etc., shall be installed on 4" minimum concrete foundations on the concrete floor of the equipment room. Foundation bolts of the proper size, located by drawing a template, shall be imbedded in the concrete floor. A pipe sleeve about two and one-half diameters larger than the bolt shall be used to allow movement for final positions of the bolts. All bolts, nuts, washers and sleeves shall be galvanized. The top edges of concrete shall have a 45 degree 3/4" bevel to eliminate sharp corners and edges.

b. Suction and discharge pipes shall be supported independently near the pumps so that when the flange bolts are tightened no strain will be transmitted to the pump castings.

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DRAWINGS PREPARED FOR

CORPORATE

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PROJECT TITLE:
PIPE & CHILLER REPLACEMENT

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LEES SUMMIT (JACKSON COUNTY)
MISSOURI US
KSCYMO41 123785.03.01 E05156

SHEET TITLE:
MECHANICAL
SPECIFICATIONS

AT&T PROJECT NUMBER: AOIKYNV	DATE: 01-20-2020	SCALE: SEE DRAWING
AT&T AUTHORIZATION MATT LONG	DRAWN BY: GMT	CHECKED BY: GMT
SHEET MATT LONG	OF SHEETS	SHEET NO. MS-2

15215 COLD WATER PIPING

- a. This system shall consist of cold water piping as shown on the drawings, including distribution and connection to every fixture furnished, installed or connected under this contract.
- b. Isolation valves shall be provided for each group of fixtures and each separate riser. Valves shall be located in accessible locations and grouped together for easy maintenance and service. Provide Milcor access panels where valves are concealed.
- c. At the end of runout to each plumbing fixture group, provide a full sized air chamber on cold water lines. Provide drains in low points of systems. Special compression chambers shall be used as specified.
- d. Provide make-up water and supply to all equipment furnished by others where shown on the plans and/or as required with stop valves located as required for the equipment supplied.
- e. All pipes penetrating poured concrete floor shall be wrapped with 1/2" Armatflex II from two inches (2") below concrete to two inches (2") above finished floor. See paragraphs on General Piping and Sleeves for other conditions.
- f. Piping shall be Type "K" copper below grade and Type "L" copper above grade.

g. All copper piping shall be hand drawn except that under slab piping one_half inch (1/2"), three_quarter inch (3/4") and one inch (1") sizes shall be type "L" soft drawn. Wherever possible, all connections of pipe should be made above grade.

h. All water service piping shall be cement lined water service cast iron or type @K" copper piping with fittings designed for installation.

15216 STERILIZATION

a. The entire domestic hot and cold water piping systems shall be thoroughly sterilized with solution containing not less than 50 parts per million available chlorine. The chlorinating material shall be either liquid chlorine conforming to the requirements of Federal Specification C_C_114, Type II, Grade B. The sterilizing solution shall be allowed to remain in the system for a period of eight hours, during which time all valves and faucets shall be opened and closed several times. After sterilization, the solution shall be flushed from the system with clean water until the residual chlorine content is not greater than 0.2 part per million, unless otherwise directed. Satisfy all requirements of The Oklahoma State Board of Health, Plumbing Division.

15217 HOT WATER PIPING

- a. This system shall consist of hot water piping to hot water heaters with connections to fixtures where indicated on the plans and/or risers and/or schedules. Piping requirements same as cold water.
- b. Hot water piping is never run below grade or under concrete floors unless specifically specified.
- c. Hot water piping below grade or under floor is always insulated.
- d. Sterilize same as cold water piping.

15218 SYSTEM OF SANITARY WASTE AND VENT PIPING

a. This system shall consist of all sanitary, waste and vent piping from each and every fixture furnished, installed, or connected under this contract, and connecting to existing sewer lines as indicated on drawings. All fixtures and floor drains shall be separately trapped as close to the fixtures and in such manner that the discharge from any one fixture does not pass through more than one (1) trap before reaching the drains.

15219 PIPING

I. INTERIOR

a. Underground soil, waste, and drain pipe and fittings inside building and extending 5'0" outside, shall be service weight hub_and_spigot plain end cast iron soil pipe and fittings designed for gasket systems. Above slab soil, waste, vent and drain piping shall be service weight hub_and_spigot plain end cast iron soil pipe and fittings designed for gasket systems, no_hub pipe and fittings with neoprene gasket and steel corrugated clamps or DWV copper. Fittings for piping above ground shall be sweated copper drainage pattern for all copper drain and waste piping and cast iron soil fittings for cast iron pipe. Underground piping shall be 2" minimum size.

2. EXTERIOR

a. Underground soil, waste and drain pipe and fittings outside the building shall be service weight hub_and_spigot plain end cast iron soil pipe and fittings designed for gasket systems.

15220 INSTALLATION OF DRAINAGE AND VENT PIPING

a. Horizontal soil and waste pipes shall be given an even grade of 1/4" per foot where possible, but in no case less than 1/8" per foot. All main vertical soil and waste stacks shall be installed with provisions for expansion and shall be extended full size to and above roof line as vents, except where otherwise specifically indicated. Horizontal offsets in all sanitary and waste pipe shall be accomplished with 1/16, 1/8 or 1/6 bends, with preference given in the order named. Horizontal intersections shall be accomplished with 45 degree "Y" branches, or combination "Y" and eighth bends with preference given to the order named. Sanitary tees or crosses may be used on vertical lines for fixture connections. Intersections between vertical and horizontal lines shall be the same as for horizontal lines, except that long sweep bends will be permitted.

15221 PIPE ASSEMBLY

- a. i. Joints in bell and spigot vitrified clay pipe shall be made with bituminous joint compound or preformed rubber rings. The compound shall be heated to the proper temperature to permit rapid pouring and to obtain strong adhesion of the compound to the pipe.
- b. Cast iron plain end soil pipe and fittings shall be assembled using Ty_seal gaskets. Gaskets shall be installed strictly according to manufacturer's recommendations using approved Ty_tools and compression gasket lubricants.
- c. Cast iron no_hub soil pipe and fittings shall be assembled using the Tyler no_hub system complete with gaskets or neoprene, shield of type 301 stainless steel with worm drive clamps to make up tight joints. Install strictly according to manufacturer's recommendations.
- d. Copper pipe shall be assembled with sweat type fittings and using solder and Siflos and a suitable flux. Pipe ends shall be cut square, reamed to remove all burrs and cleaned bright with fine sand, paper and steel wool. Solder shall take up by capillary action, and joint shall be made tight without a built-up head. Joints between copper and cast iron pipe shall be made with appropriate caulking ferrules and sweat copper adapters.
- e. If rubber gasket concrete or clay pipe is used, installation and jointing shall be in strict conformance with manufacturer's recommendations.
- f. Where gasket type and no_hub type connections are used, extra precautions shall be taken to assure rigidity of the systems by providing extra hangers, braces, and use of lead caulked joints.

Control Valve Installation

- i. Valve submittals shall be coordinated for type, quantity, size, and piping configuration to ensure compatibility with pipe design.
- ii. All control valves shall be installed so that the stem position is not more than 60 degrees from the vertical up position.
- iii. Valves shall be installed in accordance with the manufacturer's recommendations.
- iv. Control valves shall be installed so that they are accessible and serviceable, and such that actuators may be serviced and removed without interference from structure or other pipes and/or equipment.

v. Isolation valves shall be installed such that control valve body may be serviced without draining the supply/return side piping system. Unions shall be installed at all connections to screwed type control valves.

vi. Provide tags for all control valves indicating service and number. Tags shall be brass, 1-1/2" in diameter, with 1/4" high letters. Securely fasten with chain and hook. Match identification numbers as shown on approved controls shop drawings.

15222 DRAINAGE SYSTEM TESTS

a. The drainage systems shall have all necessary openings plugged to permit the entire system to be filled with water to the level of the highest stack above the roof. The system shall hold this water for one hour without showing a drop greater than eight inches. All leaks shall be repaired and the system retested and proved tight before any fixtures are connected. The Contractor shall make any other tests which may be required under local codes.

DIVISION 15 SECTION 15300 PLUMBING FIXTURES AND ACCESSORIES

15301 GENERAL

a. Plumbing fixtures shall be furnished and installed complete with all trimmings, escutcheons, and fittings unless otherwise specified under the item. Fixtures shall have smooth impervious surfaces free from defects and concealed fouling surfaces. Generally, all fixtures except water closets and urinals shall have the water supply above the rim. Fixtures with the supply discharges below the rim shall be equipped with backflow preventors. Angle stops, straight stops, stops integral with the faucets, or concealed type of lockshield loose key pattern stops for concealed supplies shall be furnished and installed with all fixtures. Exposed traps and supply pipes for all fixtures and equipment shall be connected to the rough piping system at wall unless otherwise specified under the item. All fixtures and trimmings shall be designed to prevent the backflow of polluted water into the water supply system.

15302 FIXTURE CONNECTIONS

a. Connections between earthenware fixtures and flanges on soil pipe shall be made absolutely gas tight and watertight with a high quality closet setting compound or with gaskets. Rubber gaskets or putty will not be permitted. Closet bolts shall be not less than 1/4" in diameter and equipped with brass nuts and washer covered with chromium caps unless otherwise specified. Fixtures and outlet flanges shall be set the proper distance from floor or wall to make a first class joint with the closet setting compound or gasket and fixture. No fixture shall be set in place until Architect has examined and approved such flange. All exposed piping, fittings and trim shall be heavily chromium plated.

15303 FIXTURE AND EQUIPMENT SUPPORTS AND FASTENINGS

- a. All fixtures and equipment shall be supported and fastened in a satisfactory and workmanlike manner. Where secured to concrete or brick walls, they shall be fastened with brass bolts or machine screws in lead sleeve type anchorage units or with 1/4" brass expansion bolts. Expansion bolts shall be of sufficient length to extend at least 3" into solid concrete or brickwork.
- b. Where wood screws are used, screws shall go into solid wood, such as wood inserts, floor joists, studs, or solid pieces set between studs. Where through bolts are used, they shall be provided with plates or washers at back, set so that heads, nuts and washers will be concealed with plaster. Bolts and nuts shall be hexagon and exposed bolts, nuts, and screws shall be chromium plated and shall be provided with chromium plated brass washers.

15304 FIXTURES

a. (See plans for fixture specifications.)

15305 CLEANOUTS

- a. Wall Cleanouts. Zurn #Z1447 cleanout, tee, complete with polished nickel_bronze square access cover and recessed frame. Shoulder plug shall be tapered, straight threaded type which seals against caulked lead set in extension body.
- b. Floor Cleanouts (Composition Floor Covering). Zurn #Z1400 inlay type, "Duracoated", adjustable, cast iron body, cadmium_plated plugs (nickel_bronze access cover and frame). Access cover shall be specified under wall cleanouts; see architectural finish schedules for areas required.
- c. Floor Cleanouts: Zurn #Z1400 with scribed nickel_bronze access cover and round adjustable frame. Cleanout plug shall be as specified under wall cleanouts.
- d. Cleanouts to Grade. Zurn #Z1420_27 "Duracoated" cast iron body and extension body with cadmium_plated nonslip flush top. Cleanout plug shall be as specified under wall cleanouts.

15306 NON-CONDUCTING COVERING:

a. Cover all domestic water and condenser piping with Armstrong or approved insulation.

b. Covering shall be continuous through floors and walls, etc., except branches to fixtures shall be covered up to point where branch passes through wall to adjoining fixture. No unions of any kind shall be covered.

c. All sectional coverings shall finish round and smooth without bumps or depressions, and all ends and joints shall butt evenly and tightly together.

d. All condenser & chill water lines in air conditioned portions of the building, including above ceilings and in chases, shall be covered with 1" thickness, sectional fiberglass pipe insulation with A5J vapor barrier jacket, non_self_sealing. Seal laps with B_F 85_75N mastic. Staples will not be allowed. Domestic water and condensate piping in conditioned space shall have 1/2" thickness. Insulation thickness of condenser & chill water piping and make-up water piping outside building and in unconditioned such as shafts, chases, mechanical rooms etc shall have 2" thickness. The exception is condenser water piping located inside the building whether conditioned or not shall be 1" thick.

(1) Ends of pipe insulation shall be sealed off with Fiberglass vapor seal adhesive at all flanges, valves and fittings and at intervals of not more than 20 feet of continuous runs of pipe. All flanges and valves shall be insulated with molded or fabricated Fiberglass insulation to a thickness equal to that of the insulation on the adjoining pipe. Elbow fittings shall consist of molded factory fitting covers or mitered fitting covers, covered with a vapor seal of glassfab and mastic. Insulated fittings in exposed areas shall, in addition, be covered with a "Zeston" cover.

(2) Hangers for piping which is insulated with insulation shall be installed on exterior of insulation with a section of Foamglass installed at hangers and provided with 16 gauge G.I. saddle between bottom of insulation and hanger. Saddle and Foamglass shall be at least 3 times the nominal pipe diameter, with a minimum length of 12 inches.

e. Condenser and chill water piping located outside building shall be insulated with 2" thickness insulation. Insulation shall be applied with adhesive equal to Childers CP_80. Valves and elbows shall be cut from same material and thickness. Finish off with Childers VL_Cril reinforced with white glass cloth. Cover entire system with weatherproof .016 smooth aluminum jacket applied with #8 stainless steel screws at 4" on centers. Note that electric heat tape must be installed and tested prior to insulation. Condenser water and make-up water piping extending below grade shall be insulated with 24 thick foam glass insulation and sealed with asphaltic masking.

f. Internal duct insulation shall be Owens_Corning Aeroflex Type 200, all black, flexible duct liner 1" thick. Duct liner shall be installed by cutting side pieces of insulation to lap both top and bottom sections for maximum support. Install side pieces first. Attach side and bottom insulation with 4" strips of adhesive at 1' intervals. Attach top section of insulation with Stic_Klip fasteners secured by Miracle adhesive, or approved equal, and spaced one fastener per two square feet of insulation. Edges of insulation shall be butted with adhesive to insure a tight joint and provide a smooth surface.

1. Rectangular Supply and Return Duct from the Units shall be insulated internally with one inch (1") thick duct liner, flame spread classification less than 25. Do not increase duct sizes for insulation. Ducts shall be further insulated when indicated on the plans and to extent indicated.

a. Application of Duct Liner Insulation (Choose 1, or 2 and 3)

Method 1. All ducts requiring insulation liner shall be lined by cutting pieces to fit snugly against the interior duct surfaces. The liner shall be fastened to the duct with a heavy coat of quick_tacking rubber_based adhesive spread over the entire surface. The top and bottom pieces are to lap the side pieces and all exposed edges of the insulation at the duct ends shall be coated with adhesive. The heavy density surface shall face the air stream. The strength of Ultra_Liner fiber assures positive attachment to adhesive and will not shear.

Method 2. All ducts requiring insulation liner shall be lined by carefully adhering the liner in a continuous piece to clean flat metal sheets with a quick_tacking rubber_based adhesive and forming the liner with the metal through the brake. The smooth heavy density surface shall face the air stream.

Method 3. All ducts over 24" in width or breadth shall be lined in accordance with Method 1 or Method 2 in addition, the liner shall be secured with sheet metal screws and washers, or stud welded pins and clips.

g. DUCTWORK NOT INTERNALLY LINED (ROUND SUPPLY):

1. Ducts shall be insulated with 0.6 lb. density, 2" thick of General Purpose PP6 Textra Fine Fiberglass duct insulation with a factory-applied foil scrim Kraft facing, Type IV, as manufactured by PP6 Industries.

2. All joints shall be sealed by cementing 2" wide vapor seal tabs on the insulation or by taping with 3" wide strips of vapor barrier tape.

15307 PAINTING:

a. Remove all rust, oil and grease from exposed surfaces and clean all apparatus and materials installed under this section of the specifications.

b. Stencil painting for pipe identification shall be as covered under the Supplementary General Conditions for Mechanical and Electrical work and paint shall be equal to Cook A_Kryl_X Latex.

c. Painting of all mechanical equipment shall be specified on Drawings.

DIVISION 15 SECTION 15400 HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

15401 HEATING & AIR CONDITIONING EQUIPMENT

a. (See plans for additional equipment specifications.)

b. Circulating Pumps. The contractor shall furnish and install, as shown on the plans, circulating pumps each capable of delivering capacity scheduled, Bell and Gossett, or PAGO.

The pump shall be single stage, in cast iron, bronze fitted construction. The pump internals shall be capable of being serviced without disturbing piping connections or motor.

The impeller shall be of the enclosed type, dynamically and hydraulically balanced and keyed to the shaft and secured with a suitable locknut.

The pump shall employ a mechanical seal, with a carbon seal ring and ceramic (or Tungsten Carbide) seat.

The pump bearing frame assembly, as well as the motor, hall be furnished with oil lubricated sleeve bearings with readily accessible lubrication fittings or sealed ball bearings.

The pump and motor shall be mounted on a common baseplate of heavy structural steel design with securely welded cross_members and open grounding area. A flexible coupler, capable of absorbing torsional vibration, shall be employed between the pump and motor, and it shall be equipped with a suitable coupling guard as required. Pumps intended for chill water applications shall be provided with factory installed condensate tray with integral drain.

The pump shall be factory tested at the operating conditions, nameplated for quiet operation as a unit, thoroughly cleaned, and painted with one coat of machinery enamel prior to shipment. A set of installation instructions shall be included with the pump at the time of shipment.

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DRAWINGS PREPARED FOR

**CORPORATE
REAL ESTATE**

PROJECT TITLE:

PIPE & CHILLER REPLACEMENT

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202 EAST 3RD STREET
LEES SUMMIT (JACKSON COUNTY)
MISSOURI US
KSCYM04I 123785.03.01 E05156

SHEET TITLE:

**MECHANICAL
SPECIFICATIONS**

AT&T PROJECT NUMBER: AOIKYNV	DATE: 01-20-2020	SCALE: SEE DRAWING
AT&T AUTHORIZATION	DRAWN BY: GMT	CHECKED BY: GMT
MATT LONG	SHEET: OF: SHEETS	SHEET NO.
	AT&T DRAWING NO.:	MS-3

15402 EXHAUST FANS

- a. Furnish and install exhaust fans as scheduled and where indicated on the plans.

15403 FILTERS

- a. After the project is completed, remove filters from system; clean and install clean new filters; leave one complete extra set for each system with Owner.

15404 METAL DUCTWORK

- a. Ductwork shall be complete with grille, registers, diffusers, deflecting devices, turning vanes, controlling devices, splitters, flexible connections, louvers, etc.

- b. All the ductwork shall be installed in accordance with the arrangement and sizes as indicated on the drawings. The ductwork shall be complete with all necessary elbows, deflector plates, dampers, etc., and shall be constructed and erected in a neat and workmanlike manner. All longitudinal ducts shall be inside groove type; over these sliding slip joints shall be used. Transverse seams on joints shall be drive slip joints. No standing seams shall be permitted when duct is exposed. All dimensions on plans are actual outside.

- c. All ducts over 18" in either dimension shall be cross broken, except those where rigid board insulation is applied or area of duct where outlet or duct connection is to be installed.

- d. Ductwork and fittings shall be constructed of zinc coated copper bearing steel sheets of the following gauges:

1. Ducts with the longest side not over twelve inches (12") wide _ number twenty-six (#26) gauge.

2. Ducts with the longest side not over thirty inches (30") wide _ number twenty-four (#24) gauge.

3. Ducts with the longest side not over forty-two inches (42") wide _ number twenty-two (#22) gauge.

- e. On metal ducts wider than thirty inches (30"), extra galvanized sheet metal angle bracing shall be used to keep the ducts from buckling or vibrating. Use ASHRAE guide schedule on bracing.

- f. It shall be required that all ducts, both vertical and horizontal, shall be properly supported. All ducts shall be supported at least every four feet (4') with galvanized angles or heavy strips.

- g. Ductwork shall conform to the regulation of The National Board of Fire Underwriters For The Installation of Air Conditioning, Warm Air Heating, Etc., latest issue.

- h. Provide flexible canvas connections between ducts and fan equipment per ASHRAE guide recommendations.

- i. Where locking devices occur in ceiling or wall for dampers, they shall be of the flush type equal to ventlock #608 exposed damper regulator and approved by the Architect.

- j. All dimensions on plans are actual outside.

- k. Short round duct runouts shall be PPG Industries "glass-Flex flexible duct", Gustin-Bacon or Johns-Manville. Duct shall be one inch (1") thick, maximum 4'0".

Control Damper Installation

- A. Damper submittals shall be coordinated for type, quantity, and size to ensure compatibility with sheet metal design.
- B. Duct openings shall be free of any obstruction or irregularities that might interfere with blade or linkage rotation or actuator mounting. Duct openings shall measure 1/4" larger than damper dimensions and shall be square, straight, and level.
- C. Individual damper sections, as well as entire multiple section assemblies, must be completely square and free from racking, twisting, or bending. Measure diagonally from upper corners to opposite lower corners of each damper section. Both dimensions must be equal %1/8".
- D. Follow manufacturer's instructions for field installation of control dampers. Unless specifically designed for vertical blade application, dampers must be mounted with blade axis horizontal.
- E. Install extended shaft or jackshaft per manufacturer's instructions. (Typically, a sticker on the damper face shows recommended extended shaft location. Attach shaft on labeled side of damper to that blade.)
- F. Damper blades, axles, and linkage must operate without binding. Before system operation, cycle damper after installation to assure proper operation. On multiple section assemblies, all sections must open and close simultaneously.
- G. Provide a visible and accessible indication of damper position on the drive shaft end.
- H. Support duct-work in area of damper when required to prevent sagging due to damper weight.
- I. After installation of low-leakage dampers with seals, caulk between frame and duct or opening to prevent leakage around perimeter of damper.

15405 REGISTERS, GRILLES AND DIFFUSERS

- a. All grilles, registers and diffusers shall be as scheduled and where shown on the plans. They shall fit tightly against the mounting surfaces and shall be equipped with felt or rubber gaskets and shall have frames to match the mounting surfaces. Verify all surfaces.

- b. All air distribution devices shall be Titus or approved equal.

15406 BALANCING AND ADJUSTING

- a. All systems shall be balanced and adjusted to the satisfaction of the Owner and the Engineer. Include the following items:

1. Adjust all fan belts to the proper tension.
2. Check all motor amperages and set speeds to avoid overloading.
3. This Contractor shall have all air systems, including exhaust systems balanced to provide performance specified.
4. Check all systems for noise and vibration which may be objectionable.
5. After you are satisfied that all systems may be acceptable to the Design Engineer, call for an inspection.
6. Systems will not be accepted until properly balanced.
7. After completion of balancing, submit data sheets to Engineer for approval. Data sheets shall show all motor HP's, nameplate amps, initial and final amp readings, A.H. unit specified, submitted, initial and final performance data _ three readings on air balance showing specified, initial, middle and final.

15407 AIR SYSTEMS BALANCING PROCEDURE

- a. General
1. Open all volume controls, shut doors with door grilles, insert clean filters, set outside air and return air dampers.
2. Set patterns for sidewall supply grilles.
3. Set deflectrols, velocitrols or other devices at takeoffs for uniform flow through registers or diffusers.
4. Make preliminary settings on splitters.
5. Take first readings on all devices. Do not adjust as you go.
6. Analyze readings, total CFM, high and low CFM areas, etc.
7. Make adjustments on splitters and fan speed if necessary.
8. Take a second set of complete readings. Again, do not adjust as you go.
9. Analyze readings and make corrective adjustments on splitters and volume controls.
10. Take a third complete set of readings and a fourth if necessary.

b. NOTES:

1. Outside air quantity and duct leakage can be judged by subtracting total return air readings from total of supply readings.
2. Try to do as much balancing with splitters as possible and use volume controls on grilles and diffusers to trim. This will generally give a quieter job.
3. Use a velocity measuring device, such as an anor velometer, which will give instantaneous velocity reading.
4. It may be helpful to number each air distribution device, and mark the plans accordingly.
5. All restroom exhaust fans must be operating.

15408 WATER TREATMENT

- a. Cleanout and Preparation. Furnish and install NALCO or Western Water Treatment Program WC_1. Chemicals, service and equipment shall be supplied by a single water treatment company for undivided responsibility. Alternate bids shall be subject to approval of the Engineer and must meet the requirements specified here. Acceptance of alternate bids does not relieve the Contractor of any responsibility. Any expense incurred from the substitution of performance of alternate equipment shall be borne by the Contractor. The water treatment chemical and service supplier shall be a recognized specialist, active in the field of industrial water treatment, and shall have regional water analysis laboratories, development facilities and service department, plus full-time personnel within the trading area of the job site. Testing and Dosages: The necessary chemical formulation dosages and testing shall be as directed by the supplier.

Water Treatment Chemicals: All condenser & CHILL water lines and related equipment shall be thoroughly flushed out with Mogul's precleaning chilled loop chemicals designed to remove deposition from construction, such as pipe dope, oils, most loose mill scale, and other extraneous materials. The products used shall inhibit corrosion of the various metals in the system and shall be safe to handle and use. Effectiveness of the product shall be such that the water need only be at ambient temperatures. Add recommended dosages of Mogul products and circulate 6 to 8 hours. System shall then be drained, flushed and refilled with clean water, which should be properly treated to prevent scale and corrosion during operation of the condenser water system.

15409 AUTOMATIC TEMPERATURE CONTROLS

PART I: GENERAL

1.0 SECTION INCLUDES

- 1 Products Furnished But Not Installed Under This Section
- 2 Products Installed But Not Furnished Under This Section
- 3 Products Not Furnished or Installed But Integrated with the Work of this Section
- 4 Related Sections
- 5 Description
- 6 Approved Control System Contractor
- 7 Quality Assurance
- 8 Codes and Standards
- 9 System Performance
- 10 Submittals
- 11 Warranty
- 12 Ownership of Proprietary Material

1.1 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Division 15 - Hydronic Piping:
- 1.Control Valves
2. Flow Switches
3. Temperature Sensor Wells and Sockets
4. Flow Meters

- B. Division 15 - Refrigerant Piping:
- 1.Pressure and Temperature Sensor Wells and Sockets

- C. Division 15 - Ductwork Accessories:
- 1.Automatic Dampers
2. Airflow Stations
3. Terminal Unit Controls

1.2 PRODUCTS INSTALLED and FURNISHED UNDER THIS SECTION

- A. Division 15 - Refrigeration Equipment:
- 1.Refrigerant Leak Detectors

- B. Division 15 - Air Handling Equipment:
- 1.Thermostats
2. Sensors
3. Controllers

1.3 PRODUCTS NOT FURNISHED OR INSTALLED BUT INTEGRATED WITH THE WORK OF THIS SECTION

- A. Division 15 - Heat Generation Equipment
- 1.Boilers

- B. Division 15 - Refrigeration Equipment
- 1.Chiller controls

- C. Division 15 - Air Conditioning Equipment
- 1.Discharge Air Temperature Control
2. Economizer Control
3. Air volume control

- D. Division 15 - Variable Frequency Drives
- 1.Pump controls

- E. Division 16 - Utility Metering Equipment
- 1.Electrical meters

1.4 RELATED SECTIONS

- A. The General Conditions of the Contract, Supplementary Conditions, and General Requirements are a part of these Specifications and shall be used in conjunction with this Section as a part of the Contract Documents. Consult them for further instructions pertaining to this work. The Contractor is bound by the provisions of Division 0 and Division 1.

- B. The following sections constitute related work:

- 1.Division 1 - Commissioning
2. Division 15 - Basic Mechanical Requirements
3. Division 15 - Air Distribution Materials and Methods
4. Division 15 - Refrigeration Piping
5. Division 15 - Valves, Fittings, and Piping Accessories
6. Division 15 - Refrigeration Equipment
7. Division 15 - Air Handling Equipment
8. Division 15 - Air Distribution
9. Division 15 - Test and Balance
10. Division 16 - Basic Electrical Requirements
11. Division 16 - Basic Electrical Materials
12. Division 16 - General Wiring
13. Division 16 - Equipment and Motor Wiring
14. Division 16 - Uninterruptible Power Supply
15. Division 16 - Emergency Systems
16. Division 16 - Fire Alarm Systems

1.5 DESCRIPTION

- A. General: The control system shall be as indicated on the drawings and described in the specifications, and consist of a peer-to-peer network of digital building control panels and operator workstations. The operator workstation shall be a personal computer (PC) including a color monitor, mouse and keyboard. The PC shall provide users an interface with the system though dynamic color graphics of building areas and systems.

- B. Direct Digital Control (DDC) technology shall be used to provide the functions necessary for control of systems defined for control on this project.

- C. The control system shall accommodate simultaneous multiple user operation. Access to the control system data should be limited by operator password. An operator shall be able to log onto any workstation of the control system and have access to all designated data.

- D. The control system shall be designed such that each mechanical system will operate under stand-alone control. As such, in the event of a network communication failure, or the loss of other controllers, the control system shall continue to independently operate the unaffected equipment.

- E. Communication between the control panels and all workstations shall be over a high-speed network. All nodes on this network shall be peers. A modem or network communications card shall be provided to for remote access to the system.

1.6 APPROVED CONTROL SYSTEM CONTRACTORS AND MANUFACTURERS

- A. Approved Control System Contractors and Manufacturers:

Manufacturer
ANDOVER

I.The above list of manufacturers applies to operator workstation software, controller software, the custom application programming language, Building Controllers, Custom Application Controllers, and Application Specific Controllers. All other products specified herein (i.e., sensors, valves, dampers, and actuators) need not be manufactured by the above manufacturers.

1.0 QUALITY ASSURANCE

- A. System Installer Qualifications
1. The installer shall have an established working relationship with the Control System Manufacturer of not less than three years.
2. The installer shall have successfully completed Control System Manufacturer's classes on the control system. The installer shall present for review the certification of completed training, including the hours of instruction and course outlines upon request.
3. The installer shall have a factory approved office within 50 miles of the project site and provide 24-hour response in the event of a customer call.

1.8 CODES AND STANDARDS

- A. Work, materials, and equipment shall comply with the rules and regulations of all codes and ordinances of local, state and federal authorities. As a minimum, the installation shall comply with the current editions in effect 30 days prior to receipt of bids of the following codes:
1. National Electric Code (NEC)
2. International Building Code (IBC)
3. International Mechanical Code (IMC)
4. Underwriters Laboratories: Products shall be UL-916-PAZX listed.
5. ANSI/ASHRAE Standard 135-2004 (BACnet)
6. ANSI/EIA/CEA-T09.1 (LonTalk)

1.9 SYSTEM PERFORMANCE

- A. Performance Standards. The system shall conform to the following:

1. Graphic Display. The system shall display a graphic with a minimum of 20 dynamic points with current data displayed within 20 seconds of the request.
2. Graphic Refresh. The system shall update all dynamic points with current data within 30 seconds.
3. Object Command. The maximum time between the command of a binary object by the operator and the reaction by the device shall be 10 seconds. Analog objects shall start to adjust within 10 seconds.
4. Object Scan. All changes of state and change of analog values shall be transmitted over the high-speed network such that any data used or displayed at a controller or workstation will be current, within the prior 60 seconds.
5. Alarm Response Time. The maximum time from when an object goes into alarm to when it is annunciated at the workstation shall not exceed 45 seconds.
6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 seconds. The Contractor shall be responsible for selecting execution times consistent with the mechanical process under control.
7. Performance. Programmable controllers shall be able to execute DDG PID control loops at a selectable frequency from at least once every 5 seconds. The controller shall scan and update the process value and output generated by this calculation at this same frequency.
8. Multiple Alarm Annunciation. All workstations on the network shall receive alarms within 5 seconds of each other.
9. Reporting Accuracy. Table 1 lists minimum acceptable reporting accuracies for all values reported by the specified system.

Reporting Accuracy

Measured VariableReported AccuracySpace Temperature 0.5 C [1 F]Ducted Air 1.0 C [2 F]Outside Air 1.0C [2F]Water Temperature 0.5 C [1 F]Delta-T 0.1 C[0.25 F]Relative Humidity 5 % RH Water Flow 5% of full scaleAir Flow (terminal) 10% of reading *Note 1Air Flow (measuring stations) 5% of readingAir Pressure (ducts)25 Pa [0.1 "W.G.]Air Pressure (space)%3 Pa [%0.01 "W.G.]Water Pressure %2% of full scale *Note 2Electrical Power 5% of reading *Note 3 Carbon Monoxide (CO) 5% of reading Carbon Dioxide (CO2) 50 PPM

- Note 1: (10%-100% of scale) (cannot read accurately below 10%)
- Note 2: for both absolute and differential pressure
- Note 3: * not including utility supplied meters

1.10 SUBMITTALS

- A. Contractor shall provide shop drawings and manufacturers' standard specification data sheets on all hardware and software to be provided. No work may begin on any segment of this project until the Engineer and Owner have reviewed submittals for conformity with the plan and specifications. Six (6) copies are required. All shop drawings shall be provided to the Owner electronically as .dwg file formats.

- B. Quantities of items submitted shall be reviewed by the Engineer and Owner. Such review shall not relieve the contractor from furnishing quantities required for completion.

- C. Provide the Engineer and Owner, any additional information or data which is deemed necessary to determine compliance with these specifications or which is deemed valuable in documenting the system to be installed.

- D. Submit the following within 15 days of contract award:

1. A complete bill of materials of equipment to be used indicating quantity, manufacturer and model number.
2. A schedule of all control valves including the valve size, model number (including pattern and connections), flow, CV, pressure rating, and location.
3. A schedule of all control dampers. This shall include the damper size, pressure drop, manufacturer and model number.
4. Provide manufacturers cut sheets for major system components. When manufacturer's cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawings shall clearly reference the specification and/or drawing that the submittal is being submitted to cover. Include:


- a) Building Controllers
- b) Custom Application Controllers
- c)Application Specific Controllers
- d) Operator Interface Computer(s)
- e) Portable Operator Workstation
- f)Auxiliary Control Devices

- g) Proposed control system riser diagram showing system configuration, device locations, addresses, and cabling
- h)Detailed termination drawings showing all required field and factory terminations. Terminal numbers shall be clearly labeled

- i) Points list showing all system objects, and the proposed English language object names
- j) Sequence of operations for each system under control. This sequence shall be specific for the use of the Control System being provided for this project

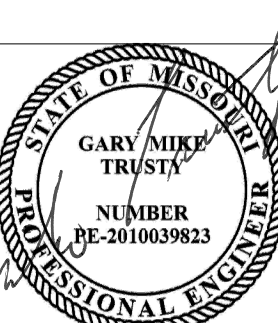
- k)Provide a BACnet Product Implementation Conformance Statement (PICS) for each BACnet device type in the submittal

- l) Color prints of proposed graphics with a list of points for display



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REVISIONS / AUTHORIZATIONS			
NO.	REVISIONS / AUTHORIZATIONS	DATE	BY

PROPRIETARY AT&T INFORMATION
NOT FOR GENERAL USE OR DISCLOSURE OUTSIDE OF AT&T
THIS INFORMATION MAY ONLY BE USED BY AUTHORIZED
PERSONNEL OF THE LOCAL GOVERNMENT AGENCY IN CONNECTION
WITH APPLICATION FOR PERMITS AND AUTHORIZATIONS FOR
BUILDINGS, CONSTRUCTION, AND/OR ZONING CHANGES.



AT&T
DRAWINGS PREPARED FOR
**CORPORATE
REAL ESTATE**

PROJECT TITLE:
PIPE & CHILLER REPLACEMENT
00
202 EAST 3RD STREET
LEES SUMMIT (JACKSON COUNTY)
MISSOURI US
KSCYM04I 123785.03.01 E05156

SHEET TITLE:
**MECHANICAL
SPECIFICATIONS**

AT&T PROJECT NUMBER: AOKYNNV	DATE: 01-20-2020	SCALE: SEE DRAWING
	DRAWN BY: GMT	CHECKED BY: GMT
AT&T AUTHORIZATION MATT LONG	SHEET: _____ OF: _____ SHEETS	SHEET NO. MS-4

E.Project Record Documents. Upon completion of installation submit three (3) copies of record (as-built) documents. The documents shall be submitted for approval prior to final completion and include:

- Project Record Drawings. These shall be as-built versions of the submittal shop drawings. One set of electronic media including CAD .DWG or .DXF drawing files shall also be provided.
- Testing and Commissioning Reports and Checklists.
- Operating and Maintenance (O & M) Manual. These shall be as-built versions of the submittal product data. In addition to that required for the submittals, the O & M manual shall include:
 - Names, address and 24-hour telephone numbers of Contractors installing equipment, and the control systems and service representative of each.
 - Operators Manual with procedures of operating the control systems including logging on/off, alarm handling, producing point reports, trending data, overriding computer control, and changing set points and other variables.
 - Programming Manual with a description of the programming language including syntax, statement descriptions including algorithms and calculations used, point database creation and modification, program creation and modification, and use of the editor.
 - Engineering, Installation and Maintenance Manual(s) that explains how to design and install new points, panels, and other hardware; preventative maintenance and calibration procedures; how to debug hardware problems; and how to repair or replace hardware.
 - A listing and documentation of all custom software created using the programming language including the point database. One set of magnetic media containing files of the software and database shall also be provided.
 - One set of electronic media containing files of all color-graphic screens created for the project.
 - Complete original issue documentation, installation, and maintenance information for all third party hardware provided including computer equipment and sensors.
 - Complete original issue media for all software provided including operating systems, programming language, operator workstation software, and graphics software.
 - Licenses and warranty documents for all equipment and systems.
 - Recommended preventive maintenance procedures for all system components including a schedule of tasks, time between tasks, and task descriptions.

F.Training Materials: The Contractor shall provide a course outline and training material for all training classes at least six weeks prior to the first class. The Owner reserves the right to modify any or all of the training course outline and training materials. Review and approval by Owner and Engineer shall be completed at least 3 weeks prior to first class.

I.1.1 WARRANTY

A. Warrant all work as follows:

- Labor & materials for control system specified shall be warranted free from defects for a period of twelve (12) months after final completion acceptance by the Owner. Control System failures during the warranty period shall be adjusted, repaired, or replaced at no charge or reduction in service to the Owner. The Contractor shall respond to the Owner's request for warranty service within 24 hours during customary business hours.
- At the end of the final start-up/testing, if equipment and systems are operating satisfactorily to the Owner and Engineer, the Owner shall sign certificates certifying that the control systems operation has been tested and accepted in accordance with the terms of this specification. The date of Owner's acceptance shall be the start of warranty.
- Operator workstation software, project specific software, graphics, database, and firmware updates shall be provided to the Owner at no charge during the warranty period. Written authorization by Owner must, however, be granted prior to the installation of such changes.
- The system provider shall provide a web-accessible system and support on-line resource that provides the Owner access to a question/answer forum, graphics library, user tips, upgrades, and manufacturer training schedules.

I.1.2 OWNERSHIP OF PROPRIETARY MATERIAL

- A. All project-developed hardware and software shall become the property of the Owner. These items include but are not limited to:
- Project graphic images
 - Record drawings
 - Project database
 - Project-specific application programming code
 - All documentation

PART 2: PRODUCTS

2.0SECTION INCLUDES

J. Materials

- Communication
- Operator Interface
- Application and Control Software
- Building Controllers
- Custom Application Controllers
- Application Specific Controllers
- Input/Output Interface
- Auxiliary Control Devices

2.1 MATERIALS

- A. All products used in this installation shall be new, currently under manufacture, and shall be applied in similar installations for a minimum of 2 years. The installation shall not be used as a test site for any new products unless explicitly approved by the Owner's representative in writing. Spare parts shall be available for at least 5 years after completion of this contract.

2.2 COMMUNICATION

- A. This project shall comprise of a network utilizing high-speed BACnet for communications between Building Controllers and PC Workstations. LonTalk sub-networks shall be used for communications between Building Controllers, Custom Application Controllers and Application Specific Controllers.

- B. The controls Contractor shall provide all communication media, connectors, repeaters, hubs, and routers necessary for the DDC system internetwork.

- C. All Building Controllers shall have a communications port for connections with the operator interfaces. This may be either a network interface node for connection to the Ethernet network or an RS-232 port for Point to Point connection.

- D. Remote operator interface via a 56K baud modem shall allow for communication with any and all controllers on this network as described in the following paragraph.

E.Communications services over the internetwork shall result in operator interface and value passing that is transparent to the internetwork architecture as follows:

- Connection of an operator interface device to any one building controller on the internetwork will allow the operator to interface with all other building controllers as if that interface were directly connected to the other controllers. Data, status information, reports, system software, custom programs, etc., for all building controllers shall be available for viewing and editing from any one building controller on the internetwork.
- All database values (i.e., points, software variable, custom program variables) of any one building controller shall be readable by any other building controller on the internetwork. This value passing shall be automatically performed by a controller when a reference to a point name not located in that any communications services to perform internetwork value passing.

F.The time clocks in all controllers shall be automatically synchronized daily.

2.3 OPERATOR INTERFACE

- A. Operator Interface. Furnish [2] PC based workstations as shown on the system drawings. Each workstation shall be able to access all information in the system. Workstations shall reside on the same high-speed network as the building controllers, and also be able to dial into the system.

- B. Workstation information access shall use the BACnet Protocol. Communication shall use the ISO 8802-3 (Ethernet) Physical/Data Link Layer protocol. Remote communications shall use the BACnet Point to Point Physical/Data Link Layer Protocol.

A. Hardware. Each operator workstation shall consist of the following:

- Personal Computer. Furnish IBM-compatible PCs to be used as DDC system workstation. The CPU shall be a minimum of an Intel Pentium 4 or AMD Athlon 64 processor and operate at a minimum 2.2 GHz. Include a minimum 512 Megabytes of RAM, 48X CD ROM drive, 80 Gigabyte hard disk, and two-button mouse. Furnish all required serial, parallel, and network communication ports, and all cables for proper system operation. The PC shall include a minimum 17", color monitor with 1024 x 768 screen resolution.
- Modems. Furnish auto-dial telephone modems and associated cables as required for communication to remote buildings, and workstations. The modem shall be capable of transmitting at up to 56K baud, and communicate over voice-grade telephone lines.

D. System Software

- Operating System. Furnish a commercially available, concurrent multi-tasking operating system. Acceptable operating systems are Microsoft Windows XP Professional.
- System Graphics. The Operator Workstation software shall be graphically oriented. The system shall allow display of up to 10 graphic screens at once for comparison and monitoring of system status. Provide a method for the operator to easily move between graphic displays and change the size and location of graphic displays on the screen. The system graphics shall be able to be modified while the system is on line. An operator with the proper password level shall be able to add, delete, or change dynamic points on a graphic. Dynamic points shall include analog and binary values, dynamic text, static text, and animation files. Graphics shall have the ability to show animation of equipment. Animation capabilities shall include the ability to show a sequence of images reflecting the position of analog outputs, such as valve or damper positions (VIT). Graphics shall be capable of launching other PC applications.
- Custom Graphics. Custom graphic files shall be created with the use of commonly available graphics packages such as Corel Point Shop Pro. The graphics generation package shall create and modify graphics that are saved in industry standard formats such as BMP, GIF and JPEG.
- Graphics Library. Furnish a complete library of standard HVAC equipment such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators, including 2-dimensional and 3-dimensional graphic depictions. The library shall include a minimum of 300 such files available for use by the Owner. This library shall also include standard graphical representations of equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. The library shall be furnished in a file format compatible with the graphics generation package program.
- Engineering Units. Allow for selection of the desired engineering units (i.e. Inch pound or SI) in the system. Unit selection shall be able to be customized by locality to select the desired units for each measurement. Engineering units on this project shall be Inch Pound.

E.System Applications. Each workstation shall provide operator interface and off-line storage of system information. Provide the following applications at each workstation.

- Automatic System Database Save and Restore. Each workstation shall store on the hard disk a copy of the current database of each building controller. This database shall be updated whenever a change is made in any panel in the system. The storage of this data shall be automatic and not require operator intervention. In the event of a database loss in a building management panel, the first workstation to detect the loss shall automatically restore the database for that panel.
- Manual Database Save and Restore. A system operator with the proper password clearance shall be able to archive the database from any system panel and store on magnetic media. The operator shall also be able to clear a panel database and manually initiate a download of a specified database to any panel in the system.
- System Configuration. The workstation software shall provide a graphical method of configuring the system. The user with proper security shall be able to add new devices, and assign modems to devices. This shall allow for future system changes or additions.
- On-Line Help and Training. Provide a Context sensitive, on line help system to assist the operator in operation and editing of the system. On-line help shall be available for all system functions and shall provide the relevant data for that particular screen. Additional help shall be available through the use of hypertext links onscreen.
- Security. Each operator shall be required to log on to the system with a user name and password in order to view, edit, add, or delete data. System security shall be selectable for each operator. The system supervisor shall have the ability to set security levels for all other operators. Each operator password shall be able to restrict the operator's access for viewing and/or changing each system application, full screen editor, and object. Each operator shall automatically be logged off of the system if no keyboard or mouse activity is detected. This auto logoff time shall be set per operator password. All system security data shall be stored in an encrypted format.
- System Diagnostics. The system shall automatically monitor the operation of all workstations, printers, modems, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.
- Alarm Notification. Alarm messages shall use full language, easily recognized descriptors for alarm. System shall allow the user to have up to 10 popup windows appear for incoming alarms. The popup dialog shall allow the user to silence and acknowledge alarms, view an expanded message or graphic, and add and save comments for the alarm.
- Alarm Processing. Any object in the system shall be configurable to alarm in and out of normal state. The operator shall be able to configure the alarm limits, warning limits, states, and reactions for each object in the system.
- Alarm Reactions. The operator shall be able to determine what actions, if any, are to be taken, by object, during an alarm. Actions shall include logging, printing, start a custom control program, displaying messages, dialing out to remote workstations, paging or text message to a cell phone, forwarding to an e-mail address, providing audible annunciation or displaying specific system graphics. Each of these actions shall be configurable by workstation and time of day. An object in alarm that has not been acknowledged within an operator specified time period shall be re-routed to an alternate operator specified alarm receipt device. For text messaging, the system shall support TAP protocol including parties T-E-I and B-n-I, such that if the system fails to dial out/connect with one party it will automatically try the other one.

- Alarm and Event Log. The operator shall be able to view all logged system alarms and events from any location in the system. The operator shall be able to sort and filter alarms from events. Alarms shall be sorted in up to 5 color-coded categories based on Owner preference (VIT). Include an alarm count summary for each alarm category on the system toolbar. An operator with the proper security level may acknowledge and clear alarms. All that have not been cleared by the operator shall be archived to the hard disk on the workstation. Provide a comment field in the event log that allows a user to add specific comments associated with any alarm.
- Trend Logs. The operator shall be able to define a trend log for any data in the system. This definition shall include interval, start-time, and stop-time. Trend intervals of 30 seconds, 1, 5, 15, 30, and 60 minutes as well as once a shift (8 hours), once a day, once a week, and once a month shall be selectable. Each trend shall accommodate up to 64 system objects. The system operator shall be able to determine how many samples are stored in each trend. Trend data shall be sampled and stored on the Building Controller panel and be archived on the workstation hard disk. Trend data shall be able to be viewed and G. printed from the operator interface software. Trends must be viewable in a text-based format or graphically. Trends shall also be storable in a tab delimited ASCII format for use by other industry standard word processing and spreadsheet packages.
- Dynamic Graphical Trending. The system shall have the ability to save the data collected by a trend object and display that collected data in a graphical chart. Trend viewing capabilities shall include the ability to show up to 10 points on a chart, to include live and/or historical data. Each data point trend line shall be an individual color, and include on-graph icons that represent associated events/alarms, manual overrides, and automated changes that have occurred over the time frame represented on the chart. Navigation and viewing functions shall include scrolling and zooming of x and y axes, and a trace display of the associated time stamp, and values for any selected point along the x-axis. Trend data shall be able to be stored for up to 10 years on the PC workstation.
- Object and Property Status and Control. Provide a method for the operator to view, and edit if applicable, the status of any object and property in the system. These statuses shall be available by menu, on graphics or through custom programs.
- Clock Synchronization. The real time clocks in all building controllers and workstations shall be synchronized on command of an operator. The system shall also be able to automatically synchronize all system clocks; daily from any operator designated device in the system. The system shall automatically adjust for daylight savings time if applicable.

- Reports and Logs. Provide a reporting package that allows the operator to select, modify, or create reports. Each report shall be definable as to data content, format, interval, and date. Report data shall be archived on the hard disk for historical reporting. Provide the ability for the operator to obtain real time logs of designated lists of objects. Reports and logs shall be stored on the PC hard disk in a format that is readily accessible by other standard software applications including spreadsheets and word processing. Reports and logs shall be readily printed to the system printer. The operator shall be able to designate reports that shall be printed or stored to disk at selectable intervals. Provide a means to list and access the last 10 reports viewed by the user.

- Custom Reports: Provide the capability for the operator to define any system data into a daily, weekly, monthly, or annual report. These reports shall be time and date stamped and shall contain a report title.

- Standard Reports. The following standard system reports shall be provided for this project. These reports shall be readily customized to the project by the owner.

- Electrical Meter Report: Provide a monthly report showing the daily electrical consumption and peak electrical demand for each building meter. Provide an annual (12 month) summary report showing the monthly electrical consumption and peak demand for each meter.
- All Points in Alarm Report: Provide an on demand report showing all current alarms.
- Evaporator Refrigerant Pressure and Temperature Report: Provide an on demand report showing all overrides in effect.
- Schedule Report: Provide a summary of all schedules including Holiday and Exception schedules.
- Commissioning Report: Provide a one time report that lists all equipment with the unit configuration and present operation.
- Gas Meter Report: Provide a monthly report showing the daily natural gas consumption for each meter. Provide an annual (12 month) report that shows the monthly consumption for each meter.
- Weather Data Report: Provide a monthly report showing the daily minimum, maximum and average outdoor air temperature and the number of heating and cooling degree days for each day. Provide an annual (12 month) report showing the minimum, maximum and average outdoor air temperature for the month and the number of heating and cooling degree days for the month.
- ASHRAE Standard 147 Report: Provide a daily report that shows the operating condition of each chiller as required by ASHRAE Standard 147. At minimum this report shall include:

- Chilled Water (or other fluid) inlet and outlet temperature
- Chilled Water (or other fluid) flow
- Chilled Water (or other fluid) inlet and outlet pressures
- Evaporator refrigerant pressure and temperature
- Condenser refrigerant pressure and liquid temperature
- Condenser water inlet and outlet temperatures
- Condenser water flow
- Oil pressure and temperature
- Oil level (if applicable)
- Compressor refrigerant discharge temperature
- Compressor refrigerant suction temperature
- Manual entry field for addition of refrigerant
- Manual entry field for addition of oil
- Manual entry field for vibration levels
- Motor amperes per phase
- Motor volts per phase
- Purge exhaust time or discharge count
- Ambient temperatures (dry bulb and wet bulb)
- Date and time data logged

F.Workstation Applications Editors. Each PC workstation shall support dedicated screens for editing of all system applications. Provide editors for each application at the PC workstation. The applications shall be downloaded and executed at the appropriate controller panels.

- Controller. Provide a full screen editor for each type custom application, and application specific controller that shall allow the operator to view and change the configuration, name, control parameters, and system set-points.
- Scheduling. An editor for the scheduling application shall be provided at each workstation. Provide a monthly calendar for each schedule. Exception schedules and holidays shall be shown clearly on the calendar. Provide a method for allowing several related objects to follow a schedule. An advance and delay time for each object shall be adjustable from this master schedule. An operator shall be able to modify the schedule. Schedules shall be able to be easily copied between objects and/or dates.
- Manual Control and Override. Provide a means of manually controlling analog and binary output points. Control overrides shall be performed through a simple, graphical on-off-auto editor for binary points, and auto-manual selector for analog control. Provide a icon indicator of override status when a point, unit controller or application has been overridden manually.
- Air System Equipment Coordination. Provide editor screens with monitoring and control functions that group together and coordinates the operation of air handling equipment and associated VAV boxes as specified in the sequence of operations. For each air system, the editor pages shall include:

- System mode of the air handling system
 - Listing and assignment of the associated air handler and VAV boxes
 - AHU supply air cooling and heating setpoints
 - AHU minimum, maximum and nominal static pressure setpoints
 - VAV box minimum and maximum flow, and drive open and close overrides
5. Chiller System. A chiller plant control application shall be configured using a full screen editor and shall provide operating status for the system. The display shall include:

- System mode of the chiller plant
- Chiller enable/disable status
- System supply water setpoint
- System supply and return water temperature
- System chilled water pump status
- System chilled water flow
- Bypass pipe flow rate (if applicable)
- Messages as to when an additional chiller will be added or removed from operational sequence
- Chiller or system failure information
- Chiller rotation information
- Override capabilities to force an added chiller, subtract a chiller, or change of sequence.
- Control to remove a chiller from a sequence temporarily for service purposes.

Custom Application Programming. Provide the tools to create, modify, and debug custom application programming. The operator shall be able to create, edit, and download custom programs at the same time that all other system applications are operating. The system shall be fully operable while custom routines are edited, compiled, and downloaded.


2.0APPLICATION AND CONTROL SOFTWARE

- A. Furnish the following applications software for building and energy management. All software applications shall reside and run in the system controllers. Editing of applications shall occur at the operator workstation.

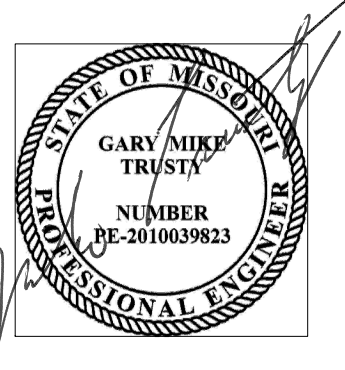
- B. System Security
- User access shall be secured using individual security passwords and user names.
 - Passwords shall restrict the user to only the objects, applications, and system functions as assigned by the system manager.
 - User logon/logoff attempts shall be recorded.
 - The system shall protect itself from unauthorized use by automatically logging off following the last keystroke. The delay time shall be user definable.

- C. Scheduling. Provide the capability to schedule each object or group of objects in the system. Each of these schedules shall include the capability for start, stop, optimal start, optimal stop, and night economizer actions. Each schedule may consist of up to 100 events. When a group of objects are scheduled together, provide the capability to define advances and delays for each member. Each schedule shall consist of the following:

- Weekly Schedule. Provide separate schedules for each day of the week.
- Exception Schedules. Provide the ability for the operator to designate any day of the year as an exception schedule. This exception schedule shall override the standard schedule for that day. Exception schedules may be defined up to a year in advance. Once an exception schedule is executed it will be discarded and replaced by the standard schedule for that day of the week.
- Holiday Schedules. Provide the capability for the operator to define up to 99 special or holiday schedules. These schedules may be placed on the scheduling calendar and will be repeated each year. The operator shall be able to define the length of each holiday period.
- Optimal Start. The scheduling application outlined above shall support an optimal start algorithm. This shall calculate the thermal characteristics of a zone and start the equipment prior to occupancy to achieve the desired space temperature at the specified occupancy time. The algorithm shall calculate separate sets of heating and cooling rates for zones that have been unoccupied for less than and greater than 24 hours. Provide the ability to modify the start algorithm based on outdoor air temperature. Provide an early start limit in minutes to prevent the system from starting before an operator determined time limit.



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KSCYMO4I 123785.03.01 EO5156
SHEET TITLE:
**MECHANICAL
SPECIFICATIONS**

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D. Remote Communications. The system shall have the ability to transmit alarms to multiple associated alarm receivers. Receivers shall include PC Workstations, email addresses, cell phones and alphanumeric pagers. The alarm message shall include the name of the alarm location, the device that generated the alarm, and the alarm message itself. The operator shall be able to remotely access and operate the system utilizing the system Ethernet communications, or dial up communications via modem, in the same format and method used on site as described under the Operator Interface section of this specification.

E. Demand Limiting. The demand limiting program shall monitor building power consumption from signals generated by a pulse generator (provided by others) mounted at the building power meter, or from a watt transducer or current transformer attached to the building feeder lines.

- The demand limiting program shall be based on a predictive sliding window algorithm. The sliding window duration and sampling interval shall be set equal to that of the local Electrical Utility.
- Control system shall be capable of demand limiting by resetting HVAC system setpoints to reduce load while maintaining a widened band of comfort control in the space.
- Input capability shall also be provided for an end-of-billing period indication.

F. Maintenance Management. The system shall monitor equipment status and generate maintenance messages based upon user designated run time, starts, and/or calendar date limits.

G. Chiller Sequencing. Provide applications software to properly sequence the chiller plant to minimize energy use. This application shall perform the following functions:

- The chiller plant control application shall have the ability to control up to 25 chillers as detailed in the sequence of operations.
- This application shall be able to control both constant and variable flow systems as well as parallel, series and decoupled piping configurations.
- The chiller plant control application shall be able to control multiple chiller plants per site.
- Diagnostics/Protection - The chiller plant application program shall be able to integrate individual chiller diagnostics into control action decisions.
- Event Processing - All chiller plant control and status events shall be recorded, at the operator's selection, in the building management system event log to facilitate troubleshooting.
- Alarm Indications - The chiller plant control status screens shall display chiller plant and individual chiller alarm messages.
- Add/Subtract actions - The status screens shall provide information on when the next chiller add or subtract action will occur. The operator shall have the ability to manually force a chiller addition or a chiller subtraction.

H. PID Control. A PID (proportional-integral-derivative) algorithm with direct or reverse action and anti-wind-up shall be supplied. The algorithm shall calculate a time-varying analog value used to position an output or stage a series of outputs. The controlled variable, set-point, and PID gains shall be user-selectable. The set-point shall optionally be chosen to be a reset schedule.

I. Timed Override. A standard application shall be utilized to enable/disable temperature control when a user selects on/cancel at the zone sensor, workstation, or the operator display. The amount of time that the override takes precedence will be selectable from the workstation.

J. Staggered Start. This application shall prevent all controlled equipment from simultaneously restarting after a power outage. The order in which equipment (or groups of equipment) is started, along with the time delay between starts shall be user-selectable.

K. System Calculations. Provide software to allow instantaneous power (e.g. KW), flow rates (e.g. L/s [GPM]) to be accumulated and converted to energy usage data. Provide an algorithm that calculates a sliding-window KW demand value. Provide an algorithm that calculates energy usage and weather data (heating and cooling degree days). These items shall all be available for daily, previous day, monthly and the previous month.

L. Anti-Short Cycling. All binary output points shall be protected from short cycling. This feature shall allow minimum on-time and off-time to be selected.

2.1 BUILDING CONTROLLERS

- A. General. Provide Building Controllers to provide the performance specified in section I of this division. Each of these panels shall meet the following requirements.
- The Building Automation System shall be composed of one or more independent, standalone, microprocessor based Building Controllers to manage the global strategies described in System software section.
 - The Building Controller shall have sufficient memory to support its operating system, database, and programming requirements.
 - The Controller shall provide a communications port for connection of the Portable Operators Terminal.
 - The operating system of the Controller shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.
 - Controllers that perform scheduling shall have a real time clock.
 - Data shall be shared between networked Building Controllers.
 - The Building Controller shall utilize industry recognized open standard protocols for communication to unit controllers.
 - The Building Controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the Controller shall:
 - Assume a predetermined failure mode.
 - Generate an alarm notification.
 - Create a retrievable file of the state of all applicable memory locations at the time of the failure.
 - Automatically reset the Building Controller to return to a normal operating mode.

B. Communications. Each Building Controller shall reside on a BACnet internetwork using the ISO 8802-3 (Ethernet) Physical/Data Link layer protocol. Each Building Controller shall also perform routing to a network of Custom Application and Application Specific Controllers. [Optional - Each Building Controller shall perform communications to a network of Custom Application and Application Specific Controllers using LonTalk FTT-IO and LonMark profiles.

B. Environment. Controller hardware shall be suitable for the anticipated ambient conditions, Controller used in conditioned ambient shall be mounted in an enclosure, and shall be rated for operation at 0 C to 50 C [32 F to 120 F].

A. Serviceability. Provide diagnostic LEDs for power, communications, and processor. The Building Controller shall have a display on the main board that indicates the current operating mode of the controller. All wiring connections shall be made to field removable, modular terminal strips or to a termination card connected by a ribbon cable. The primary logic board shall be removable without disconnecting field wiring.

B. Memory. The Building Controller shall maintain all BIOS and programming information in the event of a power loss for at least 72 hours.

C. Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shut-down below 80% nominal voltage

2.2 CUSTOM APPLICATION CONTROLLERS

A. General. Provide Custom Application Controllers to provide the performance specified in section I of this division. Each of these panels shall meet the following requirements.

- The Controller shall have sufficient memory to support its operating system, database, and programming requirements.
- Controllers that perform scheduling shall have a real time clock.
- The operating system of the Controller shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.
- The Controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall assume a predetermined failure mode, and generate an alarm notification.
- [Optional] Custom application controllers shall communicate using LonTalk. Controllers shall use FTT-IO transceivers. All communications shall be with the use of LonMark-approved SNVTs.

B. Environment. Controller hardware shall be suitable for the anticipated ambient conditions.

- Controller used in conditioned ambient shall be mounted in NEMA 1 type enclosures, and shall be rated for operation at 0 C to 50 C [32 F to 120 F].
- Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -40 C to 70 C [-40 F to 158 F].

C. Serviceability. Provide diagnostic LEDs for power, communications, and processor. All low voltage wiring connections shall be made such that the controller electronics can be removed and/or replaced without disconnection of field termination wiring.

D. Memory. The Controller shall maintain all BIOS and programming information in the event of a power loss for at least 72 hours.

E. Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage.

2.3 APPLICATION SPECIFIC CONTROLLERS

A. General. Application specific controllers (ASC) are microprocessor-based DDC controllers, which through hardware or firmware design are dedicated to control a specific piece of equipment. They are not fully user programmable, but are customized for operation within the confines of the equipment they are designed to serve.

- Each ASC shall be capable of stand-alone operation and shall continue to provide control functions without being connected to the network.
- Each ASC will contain sufficient I/O capacity to control the target system.

B. Environment. The hardware shall be suitable for the anticipated ambient conditions.

- Controller used in conditioned ambient spaces shall be mounted in NEMA 1 type rated enclosures. Controllers located where not to be disturbed by building activity (such as above ceiling grid), may be provided with plenum-rated enclosures and non-enclosed wiring connections for plenum cabling. All controllers shall be rated for operation at 0 C to 50 C [32 F to 120 F].
- Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures, and shall be rated for operation at -40 C to 65 C [-40 F to 150 F].

C. Serviceability. Provide diagnostic LEDs for power and communications. All wiring connections shall be clearly labeled and made to be field removable.

D. Memory. The Application Specific Controller shall maintain all BIOS and programming information in the event of a power loss for at least 90 days.

E. Immunity to Power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80%.

F. Transformer. Power supply for the ASC must be rated at minimum of 125% of ASC power consumption, and shall be fused or current limiting type.

2.4 INPUT/OUTPUT INTERFACE

A. Hard-wired inputs and outputs may tie into the system through Building, Custom, or Application Specific Controllers.

B. All input points and output points shall be protected such that shorting of the point to itself, another point, or ground will cause no damage to the controller. All input and output points shall be protected from voltage up to 24V of any duration, such that contact with this voltage will cause no damage to the controller.

C. Binary inputs shall allow the monitoring of on/off signals from remote devices. The binary inputs shall provide a wetting current of at least 12 mA to be compatible with commonly available control devices.

D. Pulse accumulation input points. This type of point shall conform to all the requirements of Binary Input points, and also accept up to 3 pulses per second for pulse accumulation, and shall be protected against effects of contact bounce and noise.

E. Analog inputs shall allow the monitoring of low voltage (0-10 Vdc), current (4-20 ma), or resistance signals (thermistor, RTD). Analog inputs shall be compatible with, and field configurable to commonly available sensing devices.

F. Binary outputs on custom application controllers shall have 3-mode (on/off/auto) program override control from the panel with output status lights.

G. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0-10 Vdc or a 4-20 ma signal as required to provide proper control of the output device. Analog outputs on custom application controllers shall have a 2-mode (auto/manual) program override control, with manual output adjustment over 0-100% of range.

2.5 AUXILIARY CONTROL DEVICES

A. Motorized dampers, unless otherwise specified elsewhere, shall be as follows:

- Damper frames shall be 16 gauge galvanized sheet metal or 1/8" extruded aluminum with reinforced corner bracing.
- Damper blades shall not exceed 8" in width or 48" in length. Blades are to be suitable for medium velocity performance (2,000 fpm). Blades shall be not less than 16 gauge.
- Damper shaft bearings shall be as recommended by manufacturer for application.
- All blade edges and top and bottom of the frame shall be provided with compressible seals. Side seals shall be compressible stainless steel. The blade seals shall provide for a maximum leakage rate of 10 CFM per square foot at 2.5" w.c. differential pressure.
- All leakage testing and pressure ratings will be based on AMCA Publication 500.
- Individual damper sections shall not be larger than 48" x 60". Provide a minimum of one damper actuator per section.

B. Control dampers shall be parallel or opposed blade types as scheduled on drawings.

C. Electric damper/valve actuators.

- The actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.
- Where shown, for power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing.
- All rotary spring return actuators shall be capable of both clockwise or counter clockwise spring return operation. Linear actuators shall spring return to the retracted position.
- Proportional actuators shall accept a 0-10 VDC or 0-20 ma control signal and provide a 2-10 VDC or 4-20 ma operating range.
- All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 60 in-lb. torque capacity shall have a manual crank for this purpose.
- Actuators shall be provided with a conduit fitting and a minimum 1m electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.
- Actuators shall be underwriters Laboratories Standard 873 listed.
- Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque.

D. Control Valves

- Control valves shall be two-way or three-way type for two-position or modulating service as scheduled or shown.
- Close-off (differential) Pressure Rating: Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings:
 - Water Valves:
 - Two-way: 150% of total system (pump) head.
 - Three-way: 300% of pressure differential between ports A and B at design flow or 100% of total system (pump) head.
 - Water Valves:
 - Body and trim style and materials shall be per manufacturer's recommendations for design conditions and service shown, with equal percentage ports for modulating service.
 - Sizing Criteria:
 - Two-position service: Line size.
 - Two-way modulating service: Pressure drop shall be equal to twice the pressure drop through heat exchanger (load), 50% of the pressure difference between supply and return mains, or [5] psi, whichever is greater.
 - Three-way Modulating Service: Pressure drop equal to twice the pressure drop through the coil exchanger (load), [5] psi maximum.
 - Valves 1/2" through 2" shall be bronze body or cast brass ANSI Class 250, spring loaded, Teflon packing, quick opening for two-position service. Two-way valves to have replaceable composition disc, or stainless steel ball.
- Water valves shall fail normally open or closed as scheduled on plans or as follows:
 - Heating coils in air handlers - normally open.
 - Chilled water control valves - normally closed.
 - Other applications - as scheduled or as required by sequence of operation.
- Zone valves shall be sized to meet the control application and they shall maintain their last position in the event of a power failure.

E. Binary Temperature Devices

- Low-Voltage Space Thermostats shall be 24 V, bimetal-operated, mercury-switch type, with either adjustable or fixed anticipation heater; concealed setpoint adjustment, 13½C-30½C (55½F-85½F) setpoint range, 1½C (2½F) maximum differential, and vented cover.
- Line-Voltage Space Thermostats shall be bimetal-actuated, open-contact type or bellows-actuated, enclosed, snap-switch type or equivalent solid-state type, with heat anticipator; UL listing for electrical rating, concealed setpoint adjustment, 13½C-30½C (55½F-85½F) setpoint range, 1½C (2½F) maximum differential, and vented cover.
- Low-Limit airstream thermostats shall be UL listed, vapor pressure type. Element shall be at least 6 m (20 ft) long. Element shall sense temperature in each 30 cm (1 ft) section and shall respond to lowest sensed temperature. Low-limit thermostat shall be manual reset only.

F. Temperature Sensors

- Temperature sensors shall be Resistance Temperature Device (RTD) or Thermistor.
- Duct sensors shall be rigid or averaging as shown. Averaging sensors shall be a minimum of 1.5m [5 feet] in length.
- Immersion sensors shall be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed.
- Space sensors shall be equipped with set-point adjustment, override switch, display, and/or communication port as shown on the drawings.
- Provide matched temperature sensors for differential temperature measurement. Differential accuracy shall be within 0.1 C [0.2 F].
- The space temperature, setpoint, and override confirmation will be annunciated by a digital display for each zone sensor. The setpoint will be selectable utilizing buttons.

G. Humidity Sensors

- Duct and room sensors shall have a sensing range of 20% to 80% with accuracy of ½% R.H.
- Duct sensors shall be provided with a sampling chamber.
- Outdoor air humidity sensors shall have a sensing range of 20% to 45% R.H. It shall be suitable for ambient conditions of -40 C to 75 C [-40 F to 170 F].
- Humidity sensor's drift shall not exceed 1% of full scale per year.

H. Static Pressure Sensors

- Sensor shall have linear output signal. Zero and span shall be field-adjustable.
- Sensor sensing elements shall withstand continuous operating conditions plus or minus 50% greater than calibrated span without damage.
- Water pressure sensor shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Sensor shall be complete with 4-20 ma output, required mounting brackets, and block and bleed valves. Mount in location accessible for service.
- Water differential pressure sensor shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Over-range limit (DP) and maximum static pressure shall be 3,000 psi. Transmitter shall be complete with 4-20 ma output, required mounting brackets, and five-valve manifold. Mount in a location accessible for service.

I. Low Limit Thermostats

- Safety low limit thermostats shall be vapor pressure type with an element 6m [20 ft] minimum length. Element shall respond to the lowest temperature sensed by any one foot section.
- Low limit shall be manual reset only.

J. Carbon Dioxide (CO2) Sensors

- Carbon Dioxide sensors shall measure CO2 in PPM in a range of 0-2000 ppm. Accuracy shall be +/- 3% of reading with stability within 5% over 5 years. Sensors shall be duct or space mounted as indicated in the sequence of operation.

K. Flow Switches

- Flow-proving switches shall be either paddle or differential pressure type, as shown.
- Paddle type switches (water service only) shall be UL listed, SPDT snap-acting with pilot duty rating (125 VA minimum). Adjustable sensitivity with NEMA 1 Type enclosure unless otherwise specified.
- Differential pressure type switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 Type enclosure, with scale range and differential suitable for intended application, or as specified.
- Current sensing relays may be used for flow sensing or terminal devices.

L. Relays

- Control relays shall be UL listed plug-in type with dust cover. Contact rating, configuration, and coil voltage suitable for application.
- Time delay relays shall be UL listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable plus or minus 200% (minimum) from set-point shown on plans. Contact rating, configuration, and coil voltage suitable for application. Provide NEMA 1 Type enclosure when not installed in local control panel.

M. Transformers and Power Supplies

- Control transformers shall be UL listed, Class 2 current-limiting type, or shall be furnished with over-current protection in both primary and secondary circuits for Class 2 service.
- Unit output shall match the required output current and voltage requirements. Current output shall allow for a 50% safety factor. Output ripple shall be 3.0 mv maximum Peak-to-Peak. Regulation shall be 0.10% line and load combined, at 50 microsecond response time for 50% load changes. Unit shall have built-in over-voltage protection.
- Unit shall operate between 0 C and 50 C.
- Unit shall be UL recognized.

N. Current Switches

- Current-operated switches shall be self-powered, solid state with adjustable trip current. The switches shall be selected to match the current of the application and output requirements of the DDC system.

O. LOCAL CONTROL PANELS

- All indoor control cabinets shall be fully enclosed NEMA 1 Type construction with hinged door, and removable sub-panels or electrical sub-assemblies.
- Interconnections between internal and face-mounted devices shall be pre-wired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL listed for 600-volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.
- Provide on/off power switch with over-current protection for control power sources to each local panel.

PART 3: EXECUTION

3.0 SECTION INCLUDES:

- | | |
|-----------------------------|---|
| 1. Examination | 9. Actuators |
| 2. Protection | 10. Warning Labels |
| 3. General Workmanship | 11. Identification of Hardware and Wiring |
| 4. Field Quality Control | 12. Controllers |
| 5. Wiring | 13. Programming |
| 6. Fiber Optic Cable | 14. Cleaning |
| 7. Installation of Sensors | 15. Training |
| 8. Flow Switch Installation | 16. Acceptance |

3.1 EXAMINATION

- The project plans shall be thoroughly examined for control device and equipment locations, and any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.
- The contractor shall inspect the site to verify that equipment is installable as shown, and any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.

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SHEET TITLE:

MECHANICAL
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3.2 PROTECTION

- A. The Contractor shall protect all work and material from damage by his/her work or workers, and shall be liable for all damage thus caused.
- B. The Contractor shall be responsible for his/her work and equipment until finally inspected, tested, and accepted. The Contractor shall protect his/her work against theft or damage, and shall carefully store material and equipment received on site that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.3 GENERAL WORKMANSHIP

- A. Install equipment, piping, wiring/conduit parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.
- B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.
- C. Install all equipment in readily accessible location as defined by chapter I article I.00 part A of the NEC. Control panels shall be attached to structural walls unless mounted in equipment enclosure specifically designed for that purpose. Panels shall be mounted to allow for unobstructed access for service.
- D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.
- E. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.4 FIELD QUALITY CONTROL

- A. All work, materials and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Part I of this Section.
- B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship. All visible piping and or wiring runs shall be installed parallel to building lines and properly supported.
- C. Contractor shall arrange for field inspections by local and/or state authorities having jurisdiction over the work.

3.5 WIRING

- A. All control and interlock wiring shall comply with the national and local electrical codes and Division I6 of these specifications. Where the requirements of this section differ with those in Division I6, the requirements of this section shall take precedence.
- B. Where Class 2 wires are in concealed and accessible locations including ceiling return air plenums, approved cables not in raceway may be used provided that:
- C. Circuits meet NEC Class 2 (current_limited) requirements. (Low_voltage power circuits shall be sub_fused when required to meet Class 2 current_limit.)
- D. All cables shall be UL listed for application, i.e., cables used in ceiling plenums shall be UL listed specifically for that purpose.
- E. Do not install Class 2 wiring in conduit containing Class I wiring. Boxes and panels containing high voltage may not be used for low voltage wiring except for the purpose of interfacing the two (e.g. relays and transformers).
- F. Where class 2 wiring is run exposed, wiring shall be run parallel along a surface or perpendicular to it, and bundled, using approved wire ties at no greater than 3 m [10 ft] intervals. Such bundled cable shall be fastened to the structure, using specified fasteners, at 1.5 m [5 ft] intervals or more often to achieve a neat and workmanlike result.
- G. All wire-to-device connections shall be made at a terminal blocks or terminal strip. All wire-to-wire connections shall be at a terminal block, or with a crimped connector. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.
- H. Maximum allowable voltage for control wiring shall be 120V. If only higher voltages are available, the Control System Contractor shall provide step down transformers.
- I. All wiring shall be installed as continuous lengths, where possible. Any required splices shall be made only within an approved junction box or other approved protective device.
- J. Install plenum wiring in sleeves where it passes through walls and floors. Maintain fire rating at all penetrations in accordance with other sections of this specification and local codes.
- K. Size of conduit and size and type of wire shall be the design responsibility of the Control System Contractor, in keeping with the manufacturer's recommendation and NEC.
- L. Control and status relays are to be located in designated enclosures only. These relays may also be located within packaged equipment control panel enclosures. These relays shall not be located within Class I starter enclosures.
- M. Follow manufacturer's installation recommendations for all communication and network cabling. Network or communication cabling shall be run separately from other wiring.
- N. Adhere to Division I6 requirements for installation of raceway.
- O. his Contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.
- P. Flexible metal conduits and liquid_tight, flexible metal conduits shall not exceed 3' in length and shall be supported at each end. Flexible metal conduit less than 1/2" electrical trade size shall not be used. In areas exposed to moisture, including chiller and boiler rooms, liquid_tight, flexible metal conduits shall be used.

3.6 FIBER OPTIC CABLE SYSTEM

- A. All cabling shall be installed in a neat and workmanlike manner. Minimum cable and unjacketed fibber bend radii as specified by cable manufacturer shall be maintained.
- B. Maximum pulling tensions as specified by the cable manufacturer shall not be exceeded during installation. Post installation residual cable tension shall be within cable manufacture's specifications.
- C. Fiber optic cabinets, hardware, and cable entering the cabinet shall be installed in accordance with manufacturers' instructions. Minimum cable and unjacketed fiber bend radii as specified by cable manufacturer shall be maintained.

3.7 INSTALLATION OF SENSORS

- A. Install sensors in accordance with the manufacturer's recommendations.
- B. Mount sensors rigidly and adequate for the environment within which the sensor operates.
- C. Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing.
- D. All wires attached to sensors shall be air sealed in their conduits or in the wall to stop air transmitted from other areas affecting sensor readings.
- E. Install duct static pressure tap with tube end facing directly down-stream of air flow.
- F. Sensors used in mixing plenums, and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip.
- G. All pipe mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat conducting fluid in thermal wells.
- H. Wiring for space sensors shall be concealed in building walls. EMT conduit is acceptable within mechanical and service rooms.
- I. Install outdoor air temperature sensors on north wall complete with sun shield at designated location.

3.8 FLOW SWITCH INSTALLATION

- A. Use correct paddle for pipe diameter.
- B. Install and adjust flow switch in accordance with manufacturers' instructions.
- C. Assure correct flow direction and alignment.
- D. Mount in horizontal piping _ flow switch on top of the pipe.

3.9 ACTUATORS

- A. Mount and link control damper actuators per manufacturer's instructions.

1. To compress seals when spring return actuators are used on normally closed dampers, power actuator to approximately 5% open position, manually close the damper, and then tighten the linkage.
2. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
3. Valves - Actuators shall be mounted on valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following manufacturer's recommendations.

3.10 WARNING LABELS

- A. Affix labels on each starter and equipment automatically controlled through the DDC System. Warning label shall indicate the following:

CAUTION

This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect to Off position before servicing.

- B. Affix labels to motor starters and control panels that are connected to multiple power sources utilizing separate disconnects. Labels shall indicate the following:

CAUTION

This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing.

3.11 IDENTIFICATION OF HARDWARE AND WIRING

- A. All wiring and cabling, including that within factory_fabricated panels, shall be labeled at each end within 2" of termination with a cable identifier and other descriptive information.
- B. Permanently label or code each point of field terminal strips to show the instrument or item served.
- C. Identify control panels with minimum 1-cm (1/2") letters on nameplates.
- D. Identify all other control components with permanent labels. Identifiers shall match record documents. All plug-in components shall be labeled such that removal of the component does not remove the label.

3.12CONTROLLERS

- A. Provide a separate Controller for each major piece of HVAC equipment. A custom application controller may control more than one system provided that all points associated with that system are assigned to the same controller. Points used for control loop reset such as outside air or space temperature are exempt from this requirement.
- B. Building Controllers and Custom Application Controllers shall be selected to provide a minimum of 15% spare I/O point capacity for each point type found at each location. If input points are not universal, 15% of each type is required. If outputs are not universal, 15% of each type is required. A minimum of one spare is required for each type of point used.

1. Future use of spare capacity shall require providing the field device, field wiring, points database definition, and custom software. No additional Controller boards or point modules shall be required to implement use of these spare points.

3.13PROGRAMMING

- A. Provide sufficient internal memory for the specified control sequences and trend logging. There shall be a minimum of 25% of available memory free for future use.
- B. Point Naming: System point names shall be modular in design, allowing easy operator interface without the use of a written point index.
- C. Software Programming

1. Provide programming for the system as written in the specifications and adhere to the sequence strategies provided. All other system programming necessary for the operation of the system but not specified in this document shall also be provided by the Control System Contractor. Imbed into any custom-written control programs sufficient comment statements or inherent flow diagrams to clearly describe each section of the program. The comment statements shall reflect the language used in the sequence of operations.

D. Operators' Interface

1. Standard Graphics. Provide graphics for each major piece of equipment and floor plan in the building. This includes each Chiller, Air Handler, VAV Terminal, Fan Coil, Boiler, and Cooling Tower. These standard graphics shall show all points dynamically as specified in the points list.
2. The controls contractor shall provide all the labor necessary to install, initialize, start-up, and trouble-shoot all operator interface software and their functions as described in this section. This includes any operating system software, the operator interface database, and any third party software installation and integration required for successful operation of the operator interface.
3. As part of this execution phase, the controls contractor will perform a complete test of the operator interface. Test duration shall be a minimum of 16 hours on-site. Tests shall be made in the presence of the Owner or Owner's representative.

- E. Demonstration: A complete demonstration and readout of the capabilities of the monitoring and control system shall be performed. The contractor shall dedicate a minimum of 16 hours on_site with the Owner and his representatives for a complete functional demonstration of all the system requirements. This demonstration constitutes a joint acceptance inspection, and permits acceptance of the delivered system for on_line operation.

3.14CLEANING

- A. This contractor shall clean up all debris resulting from his or her activities daily. The contractor shall remove all cartons, containers, crates, etc. under his control as soon as their contents have been removed. Waste shall be collected and placed in a location designated by the Construction Manager or General Contractor.

- B. At the completion of work in any area, the Contractor shall clean all of his/her work, equipment, etc., making it free from dust, dirt and debris, etc.

- C. At the completion of work, all equipment furnished under this Section shall be checked for paint damage, and any factory finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.15 TRAINING

- A. Provide a minimum of 4 classroom training sessions, 4 hours each, throughout the contract period for personnel designated by the Owner. Computer-based audio-visual training may be substituted for up to 8 hours of hands on training.
- B. Train the designated staff of Owner's representative and Owner to enable them to proficiently operate the system; create, modify and delete programming; add, remove and modify physical points for the system, and perform routine diagnostic and troubleshooting procedures.
- C. Additional training shall be available in courses designed to meet objectives as divided into three logical groupings; participants may attend one or more of these, depending on the level of knowledge required:

1. Day-to-day Operators
2. Advanced Operators
3. System Managers/Administrators

- D. Provide course outline and materials as per Part I of this Section. The instructor shall provide one copy of training material per student.
- E. The instructor(s) shall be factory-trained instructors experienced in presenting this material.
- F. Classroom training shall be done using a network of working controllers representative of the installed hardware or at the customer's site.
- G. This training shall be made available in addition to the interactive audio-visual tutorial, provided with the system.

3.16ACCEPTANCE

- A. The control systems will not be accepted as meeting the requirements of Completion until all tests described in this specification have been performed to the satisfaction of both the Engineer and Owner. Any tests that cannot be performed due to circumstances beyond the control of the Contractor may be exempt from the Completion requirements if stated as such in writing by the Owner's representative. Such tests shall then be performed as part of the warranty.

PART 4: SEQUENCE OF OPERATIONS & FIRE ALARM INTERFACE

4.1 Duct Smoke Detection

- A. Coordinate with the fire alarm contractor to insure that he provides complete submittal data to controls system contractor for coordination of duct smoke detector interface to HVAC systems. The Fire Alarm Contractor shall provide a dry-contact alarm output for alarm indication to the control system. The Controls Contractor shall extend control interface to fire alarm control panel and coordinate final connection and testing with fire alarm contractor.

4.2 SEQUENCE OF OPERATION - PARALLEL CHILLER SYSTEM

Variable Primary Pumping

- A. General - The chiller plant control system shall monitor and control the chilled water system including the new and existing chillers, pumps, cooling towers, and variable speed drives as appropriate.

- B. The chiller plant control system shall have a fully editable user interface set-up via point and click on a standard windows screen. It shall not require special software tools or a building automation system technician to operate.

- C. The chiller plant control system shall include the following features:

1. Operator interface
2. System Start/Stop
3. Chiller and pump sequencing
4. Demand limiting
5. System soft start
6. Automatic rotation of chillers and pumps
7. Failure recovery diagnostics/protection
8. Energy optimization routines
9. System and chiller status reports

- D. System Control Configuration Overview - Control of the system components shall be as follows:

1. The chillers shall receive enable/disable signals either through a command via a communication link or via a hardwired binary input.
2. A chiller binary output shall control the operation of the chiller evaporator isolation valve and/or call for pump operation.
3. The pump(s) speed shall be modulated to control the chilled water system supply / return pressure differential to the required setpoint.
4. The system minimum flow by-pass valve shall be a normally open valve.
5. The system minimum flow by-pass valve shall be modulated to the fully open position whenever the system is shutdown to ensure minimum flow and prevent the possibility of water hammer whenever a pump is started.
6. The system minimum flow by-pass valve position shall be modulated to ensure operating chiller(s) flow does not drop below the manufacturer's minimum recommended flow. Control shall be based on flow through the chiller evaporator by direct measurement using a calibrated flow meter.
7. Flow rate fluctuation through the chiller shall not exceed 30 percent of the design flow rate per minute.
8. A chiller binary output shall control the operation of the chiller condenser isolation valve and/or call for pump operation.
9. During cold start-up the condenser water flow through the chiller shall be modulated per the manufacturer's recommendations to maintain the no less than the minimum condenser/evaporator refrigerant pressure differential.

- E. Operator Interface - The chiller plant control system shall include the following operator interface elements:

1. Operational status screen to include:

- Chiller System Status (Off/Soft Start/Normal/Ambient Lockout/Shutdown in Progress)
- Chiller Plant Supply Water Setpoint
- Chilled Water System Supply Water Temperature
- Chilled Water System Return Water Temperature
- Predictive chiller addition / subtraction status messages (i.e. @Next Chiller will be added if the system supply water temp exceeds 43.5 degrees for 10 minutes.A)
- Individual Chiller Failure Reset (Push Button)
- All Chiller Failure Reset (Push Button)
- System Pump Failure Reset (Push Button)
- Manual Addition of Chiller (Push Button)
- Manual Subtraction of Chiller (Push Button)
- Manual Rotation of Chiller Sequence (Push Button)

2. Screen that allows editing of the following data (to be performed without entering program code editor):

- Supply Water Setpoint
- System Soft Loading Parameters
- Ambient Lockout Parameters
- Chiller Addition Parameters
- Chiller Subtraction Parameters
- Auto Rotation Parameters
- Alarm Handling Setup
- Security Setup


3. Individual Chiller Graphic(s) to include all data listed on the supplementary Chiller System Point List, including:

- Chiller Name
- Chiller Operating Mode
- Chilled Water Setpoint
- Chiller RLA %
- Entering Chiller Water Temperature
- Leaving Chilled Water Temperature
- Evaporator Flow Rate
- Evaporator Flow Status
- Condenser Flow Status

- F. System Start/Stop - The chilled water system shall start in response to a binary signal from an external source such as the building automation system with the option to use outside ambient temperature lockout.

1. Upon the start of the chilled water system the chiller plant control system shall automatically start Trend Log Reports to include:

- a. Hourly logging of system shall include the following points:
- Outside Air Dry Bulb
- Outside Air Wet Bulb
- System Chilled Water Setpoint
- System Chilled Water Supply
- System Chilled Water Return Temperature
- System Condenser Water Supply Temperature
- System Condenser Water Return Temperature
- Operating Status of each chiller
- Operating Status of system pumps

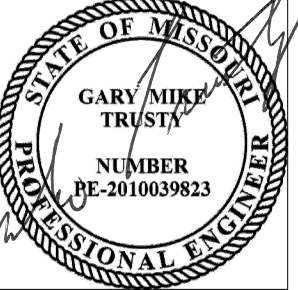


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NO.	REVISIONS / AUTHORIZATIONS	DATE	BY

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AT&T

CORPORATE

REAL ESTATE

PROJECT TITLE:

PIPE & CHILLER REPLACEMENT

00

202 EAST 3RD STREET

LEES SUMMIT (JACKSON COUNTY)

MISSOURI US

KSCYMO4I 123785.03.01 EO5156

SHEET TITLE:

MECHANICAL

SPECIFICATIONS

AT&T PROJECT NUMBER: AOIKYNV	DATE: 01-20-2020	SCALE: SEE DRAWING
AT&T AUTHORIZATION	DRAWN BY: GMT	CHECKED BY: GMT
MATT LONG	SHEET: OF: SHEETS	SHEET NO.
	AT&T DRAWING NO.:	MS-7

6. Sequencing - The chiller plant control system will start and stop the chilled water pumps and chillers based upon system load.

1. When the chilled water system is enabled the chiller plant control system shall:
- a.Send an Enable signal to the lead chiller.

b.Upon receiving the enable signal the chiller shall enable the chiller evaporator isolation valve.

c.The isolation valve shall be controlled to 100% open.

d.When the isolation valve is confirmed to be 100% open, the chiller plant control system shall start the lead chilled water pump in the sequence.

e.The chilled water pump shall be controlled to maintain the design pressure setpoint for the system.

f.Upon confirmation of evaporator water flow the chiller shall enable the chiller condenser isolation valve and call for the lead condenser pump operation.

g.Upon confirmation of condenser water flow the chiller shall continue its pre-start sequence and start its compressor(s).

h.Upon the start of each chiller the Chiller Plant Control system shall automatically start chiller specific Trend Log Reports to include:

i. Hourly logging of chiller

-Unit Chilled Water Setpoint

-Compressor(s) RLA

-Evaporator Entering Water Temp

-Evaporator Leaving Water Temp

-Evaporator Flow Rate

-Evaporator Approach Temp

-Condenser Entering Water Temp

-Condenser Leaving Water Temp

-Condenser Approach Temp

ii. Five-minute logging of chiller:

-Unit Chilled Water Setpoint

-Compressor(s) RLA

-Evaporator Entering Water Temp

-Evaporator Leaving Water Temp

-Evaporator Flow Rate

2. The chiller plant control system shall initiate the start of the next system chilled water pump when the pressure setpoint is not met for 5 minutes.
3. The chiller plant control system shall initiate the shutdown of the next system chilled water pump whenever excess pump capacity exists for 5 minutes as determined by the pump speed, the system pressure, and the number of pumps running.
4. The chiller plant control system shall initiate the start of the next chiller in the sequence whenever the chilled water load, as determined by the system supply water temperature, is not met for 20 minutes.
- a.The chiller plant control system will unload operating chillers to an operator editable current limit prior to starting a lag chiller.

b.Lag chillers shall start in a similar manner to the lead chiller start sequence.
5. The chiller plant control system shall initiate the shut down of the next chiller in the sequence whenever excess chilled water capacity exists, as determined by percent run load amps, for 20 minutes.
6. Upon sensing a chiller failure the chiller plant control system shall shut down the failed chiller immediately and initiate the start of the next chiller in the rotation sequence.
7. The chiller plant control system shall control individual chiller setpoints to maintain the system supply water temperature at setpoint.
8. The design system chilled water setpoint shall be 44 degrees F and editable by the operator.

H. System Soft Start - The chiller plant control system will initiate a @soft start^ mode whenever the system chilled water temperature exceeds the specified chilled water system setpoint by 20 degrees F at system start-up. The chiller plant control application will add cooling capacity during soft start mode only if return water temperature is not declining at a rate of at least 0.5 degrees F per minute. This prevents the unnecessary operation of chillers and limits system electrical demand during chilled water loop pull down.

J. Automatic rotation of chillers and pumps.

1. Chiller rotation shall be initiated based on an operator entered day interval or by the cycling of a binary point. The method of sequence shall be operator selectable.
- 2.Chiller cycling caused by normal system load fluctuations shall cause the chillers to change rotation sequence or at the operator's option chillers may be forced into the new rotation sequence at the time of sequence change.
- 3.Pump rotation shall be initiated by a schedule or by the cycling of a binary point.

K. Diagnostics/Protection - The Building Automation System shall be able to alarm from all sensed points and diagnostic alarms monitored by the chiller controller.

L. Chiller Status Report - Provide an operating status report for each chiller. The report(s) shall provide the present for the following information to provide the operator with critical chiller operating data.

- Compressor On/Off Status
- Compressor Starts/Run Hours
- Compressor Phase 1/2/3 Percent RLA - separate for each compressor
- Compressor Current Draw - RLA Percent
- Active Chiller Diagnostics or Alarms
- Leaving Chilled Water Temperature
- Entering Chilled Water Temperature
- Evaporator Flow Rate
- Chilled Water Setpoint
- Refrigerant Temperature Evaporator/Condenser - Separate for each circuit
- Operating Mode
- Chiller Model and Serial Number
- Outside Air Dry Bulb
- Outside Air Wet Bulb
-

M. Demand Limiting - As part of the demand limiting scheme on the building, the chiller plant control system shall be able to monitor and reduce peak power demand through the limiting of chiller current draw.

15020 REFRIGERANT PIPING:

A. MATERIALS:

INSTALLED BY MECHANICS SKILLED IN THIS TYPE OF WORK. TYPE "L", "ACR" COPPER TUBING, CLEANED, DRIED, AND CHARGED WITH NITROGEN AT THE FACTORY, ASSEMBLED WITH WROUGHT COPPER FITTINGS FOR REFRIGERATION USE.

B. INSTALLATION OF REFRIGERATION:

1. LAY OUT THE REFRIGERANT PIPING SYSTEM IN A MANNER TO PREVENT LIQUID REFRIGERANT FROM ENTERING THE COMPRESSOR AND SO THAT OIL WILL RETURN TO THE COMPRESSOR. SLOPE ALL HORIZONTAL SUCTION LINES TOWARD THE COMPRESSOR.

2. TAKE SPECIAL CARE TO KEEP ALL TUBING CLEAN AND DRY. IF, FOR ANY REASON, SEALED-AT-THE-MILL TUBING IS NOT USED, CLEAN THE TUBING AS FOLLOWS:

- (A) WIPE EACH TUBE INTERNALLY WITH A DRY, LINTLESS CLOTH FOLLOWED WITH A CLEAN LINTLESS CLOTH SATURATED WITH FREON-113. REPEAT UNTIL THE SATURATED CLOTH IS NOT DISCOLORED BY DIRT.
- (B) WIPE WITH A CLEAN CLOTH SATURATED WITH COMPRESSOR OIL AND SQUEEZED DRY.
- (C) WIPE WITH A DRY, LINTLESS CLOTH.

3. INSTALL ALL REFRIGERANT PIPING STRAIGHT AND FREE FROM KINKS AND RESTRICTIONS, PROPERLY SUPPORTED TO MINIMIZE VIBRATION. FURNISH AND INSTALL STRAPS OR HANGERS AT 5 FEET SPACING FOR 1/2" LINES, 6 FEET SPACING FOR 1" LINES, AND 8 FEET FOR 1-1/2" AND LARGER LINES.

4. MAKE ALL COPPER-TO-COPPER SOLDERED JOINTS WITH "SILFO6 15" OR "SILVALOY 15". COPPER-TO-BRASS JOINTS MAY BE SOLDERED WITH "EASY-FLO". PASS A SLOW STREAM OF DRY NITROGEN THROUGH THE TUBING AT ALL TIMES WHILE SOLDERING TO ELIMINATE THE FORMATION OF COPPER OXIDE INSIDE THE TUBING.

C. TESTING:

1. WHEN THE REFRIGERANT CONNECTIONS HAVE BEEN COMPLETED, THE COMPRESSOR SUCTION AND DISCHARGE VALVES (OR RECEIVER OUTLET VALVE IN THE CASE OF A CONDENSING UNIT) SHALL BE CLOSED AND THE BALANCE OF THE SYSTEM SHALL BE TESTED TO 150 PSI PRESSURE (OR HIGHER IF REQUIRED BY CODE) WITH ALL OTHER VALVES WIDE OPEN.
2. ACCOMPLISH THE PRESSURE TEST BY ALTERNATELY ADDING REFRIGERANT AND NITROGEN. USE 2 OR 3 POUNDS OF REFRIGERANT AND ENOUGH NITROGEN TO BRING THE PRESSURE UP TO THE REQUIRED AMOUNT.
3. CAREFULLY TEST ALL JOINTS, USING A HALIDE TORCH OR AN ELECTRONIC LEAK DETECTOR. IF ANY LEAKS ARE FOUND, MARK THE SPOT.
4. AFTER ALL JOINTS ARE TESTED, DISCHARGE THE GAS AND REPAIR ALL LEAKS, THEN REPEAT THE TEST.
5. WHEN TESTING HAS BEEN COMPLETED, BLOW OFF THE PRESSURE IN THE SYSTEM TO THE ATMOSPHERE.

D. EVACUATING:

1. EVACUATE THE REFRIGERANT SYSTEM AT LEAST 3 TIMES, USING A VACUUM PUMP MADE BY A VACUUM PUMP MANUFACTURER SUCH AS "AIRSERGO", "CENCO", "KENNEY", OR "STROKES". DO NOT, UNDER ANY CIRCUMSTANCES, USE THE SYSTEM COMPRESSOR TO EVACUATE THE SYSTEM.

2. CONNECT THE VACUUM PUMP TO THE SYSTEM THROUGH 5/8 INCH O.D. OR LARGER LINE CONNECTED TO A FLANGE ADAPTOR INSTALLED BETWEEN THE SUCTION SERVICE VALVE AND THE COMPRESSOR SUCTION PORT. CONNECT A SECOND LINE TO THE CHARGING VALVE IN THE LIQUID LINE TO ALLOW EVACUATION FROM BOTH HIGH AND LOW SIDES SIMULTANEOUSLY. THIS SECOND LINE SHALL BE THE SAME SIZE AS THE LIQUID LINE. DURING EVACUATION, DO NOT OPERATE HERMETIC OR SEMI-HERMETIC MOTORS, BECAUSE OF THE DANGER OF INSULATION BREAKDOWN IN VERY DEEP VACUUM. TO SAFEGUARD AGAINST THIS, PULL THE DISCONNECT SWITCH AND REMOVE THE FUSES, OR MAKE SURE THAT THE CIRCUIT BREAKER IS IN THE "OFF" POSITION.

3. EVACUATE EACH OF THE THREE TIMES TO AT LEAST 500 MICRONS (1/2 MM. OF MERCURY) ABSOLUTE PRESSURE. MEASURE THE VACUUM WITH AN ELECTRONIC VACUUM GAGE, OR OTHER SUITABLE VACUUM INDICATOR WHICH CAN BE READ ACCURATELY BELOW 500 MICRONS. RECOMMENDED TYPES ARE "TELEVAC" BY THE FREDERICKS COMPANY, BETHAYRES, PA, "KENNEY", "NRC", "HASTINGS", OR "AIRSERGO". PROVE THE FIRST VACUUM BY HOLDING IT AT LEAST ONE HOUR WITH NO INCREASE IN PRESSURE (TAKING ALL CHANGES IN AMBIENT TEMPERATURE INTO ACCOUNT).

4. BREAK EACH EVACUATION WITH THE REFRIGERANT TO BE USED IN THE SYSTEM, CHARGED THROUGH A DRIER.

E. CHARGING:

1. AFTER THE THIRD EVACUATION, ADD THE PROPER AMOUNT OF REFRIGERANT, CHECK THE OIL LEVEL IN THE COMPRESSOR, AND ADD OR REMOVE OIL AS NECESSARY TO BRING THE LEVEL IN THE COMPRESSOR TO THE MIDDLE OF THE SIGHT GLASS.
2. USE ONLY OIL RECOMMENDED BY THE MANUFACTURER OF THE COMPRESSOR AND DELIVERED TO THE JOB SITE IN SEALED CONTAINERS WITH ALL LABELS INTACT AND LEGIBLE AT THE TIME OF USE.
3. CHARGE ALL REFRIGERANT INTO THE SYSTEM THROUGH A DRIER AND USING ONLY REFRIGERANT DELIVERED TO THE JOB SITE IN FACTORY CHARGED CYLINDERS.
4. DO NOT START MOTORS UNTIL LUBRICATION HAS BEEN CHECKED AND THE PROPER OIL AND/OR GREASE HAS BEEN ADDED WHERE REQUIRED.


F. CFC REGULATIONS:

THE CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLIANCE WITH ALL FEDERAL, STATE AND LOCAL REGULATIONS PERTAINING TO THE CONTAINMENT AND RECOVERY OF REFRIGERANTS. PROVIDE WRITTEN STATEMENT OF COMPLIANCE.

15411 FINALLY:

a. Systems shall not be accepted for final payment until the following have been submitted and approved by this Engineer.

1. Construction Drawings (As_Built)
2. Guarantee
3. Operation and Maintenance Instructions
4. Systems Balancing and Electrical Data

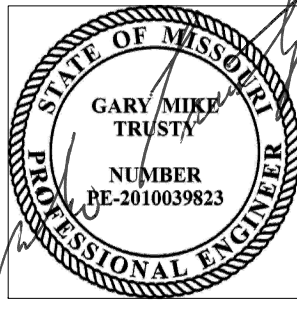


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PROJECT TITLE:

PIPE & CHILLER REPLACEMENT
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202 EAST 3RD STREET
LEES SUMMIT (JACKSON COUNTY)
MISSOURI US
KSCYMO41 123185.03.01 E05156

SHEET TITLE:

MECHANICAL
SPECIFICATIONS

AT&T PROJECT NUMBER: AOIKYNV	DATE: 01-20-2020	SCALE: SEE DRAWING
	DRAWN BY: GMT	CHECKED BY: GMT
AT&T AUTHORIZATION	SHEET: OF: SHEETS	SHEET NO.
MATT LONG	AT&T DRAWING NO.:	MS-8

ELECTRICAL SYMBOLS

	EXISTING 1'x4' LIGHT FIXTURE
	1'x4' LIGHT FIXTURE TO BE REMOVED.
	1'x 4' FLUORESCENT LIGHT FIXTURE WITH FIXTURE TYPE DESIGNATION.
	1'x 4' FLUORESCENT LIGHT FIXTURE WITH FIXTURE TYPE DESIGNATION. THIS FIXTURE IS USED AS AN EMERGENCY LIGHT. LIGHT CONTROLLED FROM BREAKER IN PANELBOARD.
	EXISTING 2'x4' LIGHT FIXTURE
	2'x4' LIGHT FIXTURE TO BE REMOVED
	2'x 4' FLUORESCENT LIGHT FIXTURE WITH FIXTURE TYPE DESIGNATION.
	2'x 4' FLUORESCENT LIGHT FIXTURE WITH FIXTURE TYPE DESIGNATION. FIXTURE FED BY UPS POWER. COORDINATE ACCESS TO CIRCUITRY WITH OWNER.
	2'x 4' FLUORESCENT LIGHT FIXTURE WITH FIXTURE TYPE DESIGNATION. FIXTURE TO BE USED AS AN EMERGENCY LIGHT. LIGHT CONTROLLED FROM BREAKER IN PANELBOARD.
	WALL MOUNTED EMERGENCY LIGHT FIXTURE
	EMERGENCY LIGHT FIXTURE.
	WALL MOUNT INCANDESCENT OR HID LIGHT FIXTURE
	CEILING MOUNT INCANDESCENT OR HID LIGHT FIXTURE
	WALL MOUNT DC POWERED LIGHT FIXTURE
	CEILING MOUNT DC POWERED LIGHT FIXTURE
	SURFACE MOUNTED EXIT LIGHT.
	CEILING MOUNTED EXIT LIGHT
	LIGHT SWITCH, TOGGLE TYPE, SINGLE POLE, 20 AMP, 120-277 VOLT AC, HUBBELL CAT. NO. HBL1221W
	3-WAY LIGHT SWITCH, TOGGLE TYPE, 20 AMP, 120-277 VOLT AC, HUBBELL CAT. NO. HBL1223W
	4-WAY LIGHT SWITCH, TOGGLE TYPE, 20 AMP, 120-277 VOLT AC, HUBBELL CAT. NO. HBL1224
	WEATHERPROOF LIGHT SWITCH, 20A, 120-277 VOLT AC, HUBBELL CAT. NO. HBL1221GY.
	LIGHT SWITCH DESIGNATED TO CONTROL DC POWERED LIGHT FIXTURE
	LIGHT SWITCH WITH BUILT-IN TIMER DEVICE
	MOTOR STARTING SWITCH RATED AT VOLTAGE DESIGNATED
	LOW VOLTAGE LIGHT SWITCH
	PANELBOARD, 277/480 VOLT, 3-PHASE, 4-WIRE
	PANELBOARD, 120/208 VOLT, 3-PHASE, 4-WIRE
	CONTROL PANEL.
	NON-FUSED DISCONNECT SWITCH.
	FUSED DISCONNECT SWITCH.
	ENCLOSED CIRCUIT BREAKER DISCONNECT SWITCH.
	COMBINATION MOTOR STARTER/DISCONNECT SWITCH.
	DUPLEX CONVENIENCE RECEPTACLE
	WEATHER PROOF, GROUNDING TYPE DUPLEX RECEPTACLE WITH GROUND FAULT INTERRUPTER, 20 AMP, 120 VOLT AC, NEMA 5-20 R, HEAVY DUTY, HUBBEL CAT. NO. GF5362GY.
	WEATHERPROOF, GROUNDING TYPE DUPLEX RECEPTACLE WITH GROUND FAULT INTERRUPTER, 20 AMP, 120 VOLT AC, NEMA 5-20 R, HEAVY DUTY, HUBBEL CAT. NO. GF5362GY.
	FLOOR DUPLEX CONVENIENCE RECEPTACLE
	FOURPLEX CONVENIENCE RECEPTACLE
	MOTOR.
	HYDROGEN DETECTOR
	PULL BOX.
	MOTOR STARTER.
	TRANSFORMER.
	OCCUPANCY SENSOR
	JUNCTION BOX
	SPEAKER
	SECURITY CAMERA

ELECTRICAL SYMBOLS

	CONDUIT AND CIRCUITRY TO BE REMOVED.
	BRANCH CIRCUIT WIRING RUN IN CONCEALED CONDUIT WHERE POSSIBLE.
	BRANCH CIRCUIT CONDUCTORS: GROUND, NEUTRAL, HOT (OR SWITCHED HOT) #10 AWG U.N.O.
	SINGLE BRANCH CIRCUIT HOME RUN IN SINGLE CONDUIT WITH PANELBOARD DESIGNATION AND CIRCUIT BREAKER No.
	MULTIPLE BRANCH CIRCUIT HOME RUNS IN SINGLE CONDUIT WITH PANELBOARD DESIGNATION AND CIRCUIT BREAKER No. # OF ARROW HEADS EQUALS # OF HOMERUNS IN CONDUIT.
	BRANCH CIRCUIT UNDERFLOOR/BELOW GRADE CONDUIT
#18 shielded twisted (U.N.O.) symbol"/>	#18 SHIELDED TWISTED (U.N.O.)
	24VDC MOISTURE DETECTOR POWER
	LIGHTNING PROTECTION SYSTEM ROOF CONDUCTOR
	GROUNDING SYSTEM CONDUCTOR (BELOW GRADE)
	GROUNDING THERMOWELD CONNECTION (BELOW GRADE)
	BOLTED GROUND CONNECTION (BELOW GRADE)
	AIR TERMINAL FOR LIGHTNING PROTECTION SYSTEM
	GROUND ROD
	TERMINAL BLOCK (BY OTHERS)
	RELAY COIL
	KIRK KEY INTERLOCK
	NORMALLY OPEN CONTACTS
	NORMALLY CLOSED CONTACTS
	SWITCH
	TWO-POSITION SELECTOR SWITCH
	THREE-POSITION SELECTOR SWITCH
	FUSE
	EARTH GROUND
	RACK-OUT STYLE CIRCUIT BREAKER MCCB - MOLDED CASE CIRCUIT BREAKERS ICCB - INSULATED CASE CIRCUIT BREAKER LVPCB - LOW VOLTAGE POWER CIRCUIT BREAKER
	ELECTRICALLY OPERATED CIRCUIT BREAKER MCCB - MOLDED CASE CIRCUIT BREAKERS ICCB - INSULATED CASE CIRCUIT BREAKER LVPCB - LOW VOLTAGE POWER CIRCUIT BREAKER
	BOLT-ON STYLE CIRCUIT BREAKER MCCB - MOLDED CASE CIRCUIT BREAKERS ICCB - INSULATED CASE CIRCUIT BREAKER LVPCB - LOW VOLTAGE POWER CIRCUIT BREAKER
	PLUG-IN STYLE CIRCUIT BREAKER MCCB - MOLDED CASE CIRCUIT BREAKERS ICCB - INSULATED CASE CIRCUIT BREAKER LVPCB - LOW VOLTAGE POWER CIRCUIT BREAKER
	TRANSFORMER
	CONTROL MODULE
	DOOR SECURITY CARD READER.
	EMBARRASSMENT ALARM.
	EXIT REQUEST PUSHBUTTON.
	ELECTRIFIED LOCKSET WITH INTERNAL EXIT REQUEST.
	END SWITCH.
	DOOR CONTACT
	TELE/DATA OUTLET
	TELEPHONE OUTLET.
	DATA OUTLET
	FLOOR TELE/DATA OUTLET
	VARIABLE FREQUENCY DRIVE.
	VARIABLE SPEED DRIVE.
	CONTROL POWER TRANSFORMER
	LIQUID CRYSTAL DISPLAY MONITOR
	LOAD SHARING MODULE
	DIGITAL VOLTAGE REGULATOR
	AUTOMATIC-OPEN-CLOSED CONTROL PANEL
	DIGITAL METER
	END OF LINE RESISTOR.

ELECTRICAL SYMBOLS

	REMOTE INDICATING LIGHT
	WATERFLOW ALARM SWITCH
	CONTROL VALVE TAMPER SWITCH
	ADDRESSABLE RELAY
	ADDRESSABLE CONTROL MODULE
	ADDRESSABLE MONITORING MODULE
	KNOX BOX
	PULL STATION
	FIREFIGHTER'S PHONE JACK
	FIREFIGHTER'S 2-WAY COMMUNICATION HANDSET
	HEAT DETECTOR
	HEAT DETECTOR (E INDICATES ELEVATOR RECALL)
	HEAT DETECTOR (E INDICATES ELEVATOR RECALL)
	SMOKE DETECTOR
	SMOKE DETECTOR (E INDICATES ELEVATOR RECALL)
	SMOKE DETECTOR (AC INDICATES INSTALLED ABOVE CEILING)
	SMOKE DETECTOR (U INDICATES INSTALLED IN SUBFLOOR)
	SMOKE DETECTOR (P INDICATES INSTALLED ON PENDENT)
	DUCT MOUNTED SMOKE DETECTOR (SD=SUPPLY/RD=RETURN)
	FLAME DETECTOR
	WALL MOUNTED AUDIBLE NOTIFICATION APPLIANCE
	WALL MOUNTED VISIBLE NOTIFICATION APPLIANCE
	WALL MOUNTED AUDIBLE/VISIBLE NOTIFICATION APPLIANCE
	CEILING MOUNTED AUDIBLE NOTIFICATION APPLIANCE
	CEILING MOUNTED VISIBLE NOTIFICATION APPLIANCE
	CEILING MOUNTED AUDIBLE/VISIBLE NOTIFICATION APPLIANCE
	FIRE ALARM CIRCUIT END OF LINE RESISTOR
	KEYED BYPASS SWITCH
	EARLY WARNING FIRE DETECTION CONTROL PANEL/UNIT
	EARLY WARNING FIRE DETECTION ANNUNCIATOR PANEL
	RECESSED EARLY WARNING FIRE DETECTION ANNUNCIATOR PANEL
	EARLY WARNING FIRE DETECTION TRANSPONDER
	AMPLIFIER PANEL
	REMOTE POWER SUPPLY
	AIR SAMPLING SMOKE DETECTOR
	PLAN NOTE DESIGNATION.
	CONNECT TO EXISTING
	EQUIPMENT DESIGNATION.
	SECTION/ELEVATION REFERENCE NUMBER.
	SECTION/ELEVATION SHEET NUMBER
	ELECTRICAL EQUIPMENT SERVED BY
	ELECTRICAL EQUIPMENT BEING SERVED

ANSI/IEEE STANDARD DEVICE NUMBERS

IN NORTH AMERICA PROTECTIVE RELAYS ARE GENERALLY REFERRED TO BY STANDARD DEVICE NUMBERS. LETTERS ARE SOMETIMES ADDED TO SPECIFY THE APPLICATION (IEEE STANDARD C37.2-2008).

DEVICE NUMBERS (THE MORE COMMONLY USED ONES ARE IN BOLD>)


1-MASTER ELEMENT	50-INSTANTANEOUS OVERCURRENT
2-TIME DELAY STARTING OR CLOSING	51-AC TIME OVERCURRENT RELAY
3-CHECKING OR INTERLOCKING RELAY	52-AC CIRCUIT BREAKER
4-MASTER CONTACTOR	53-FIELD EXCITATION RELAY
5-STOPPING DEVICE	55-POWER FACTOR RELAY
6-STARTING CIRCUIT BREAKER	56-FIELD APPLICATION RELAY
7-RATE OF CHANGE RELAY	59-OVERTVOLTAGE RELAY
8-CONTROL POWER DISCONNECT DEVICE	60-VOLTAGE OR CURRENT BALANCE RELAY
9-REVERSING DEVICE	62-TIME-DELAY STOPPING OR OPENING RELAY
10-UNIT SEQUENCE DEVICE	63-PRESSURE SWITCH
11-UNIT SEQUENCE SWITCH	64-GROUND DETECTOR RELAY
12-OVERSPEED DEVICE	65-GOVERNOR
13-SYNCHRONOUS-SPEED DEVICE	66-NOTCHING OR JOGGING DEVICE
14-UNDERSPEED DEVICE	67-AC DIRECTIONAL OVERCURRENT RELAY
15-SPEED AND FREQUENCY WATCHING DEVICE	68-BLOCKING OR "OUT OF STEP" RELAY
16-SATA COMMUNICATIONS DEVICE	69-PERMISSIVE CONTROL DEVICE
20-ELECTRIC OPERATED VALVE (SOLENOID VALVE)	74-ALARM RELAY
21-DISTANCE RELAY	75-POSITION CHANGING MECHANISM
23-TEMPERATURE CONTROL DEVICE	76-DC OVERCURRENT RELAY
24-VOLTS PER HERTZ RELAY	78-PHASE-ANGLE MEASURING RELAY
25-SYNCHRONIZED OR SYNCHRONISM-CHECK DEVICE	79-AC-RECLOSEING RELAY
26-APARATUS THERMAL DEVICE	81-FREQUENCY RELAY
27-UNDERVOLTAGE RELAY	83-AUTOMATIC SELECTIVE CONTROL OR TRANSFER RELAY
30-ANNUCATOR RELAY	84-OPERATING MECHANISM
32-DIRECTIONAL POWER RELAY	85-PILOT COMMUNICATIONS, CARRIER OR PILOT-WIRE RELAY
36-POLARITY OR POLARIZING VOLTAGE DEVICE	86-LOCKOUT RELAY
37-UNDERCURRENT OR UNDERPOWER RELAY	87-DIFFERENTIAL PROTECTIVE RELAY
38-BEARING PROTECTIVE DEVICE	89-LINE SWITCH
39-MECHANICAL CONDUCTION MONITOR	90-REGULATING DEVICE
40-FIELD (OVER/UNDER EXCITATION) RELAY	91-VOLTAGE DIRECTIONAL RELAY
41-FIELD CIRCUIT BREAKER	92-VOLTAGE AND POWER DIRECTIONAL RELAY
42-RUNNING CIRCUIT BREAKER	94-TRIPPING TRIP-FREE RELAY
43-MANUAL TRANSFER OR SELECTOR DEVICE	
46-REV. PHASE OR PHASE BAL. CURRENT RELAY	B - BUS
47-PHASE-SEQ. OR PHASE-BAL. VOLTAGE RELAY	F - FIELD
48-INCOMPLETE-SEQUENCE RELAY	G - GROUND OF GENERATOR
49-MACHINE OR TRANSFORMER THERMAL RELAY	N - NEUTRAL
	T - TRANSFORMER

ELECTRICAL NOTATIONS

A	AMPS
ADA	AMERICAN WITH DISABILITIES ACT
ABF	ABOVE BASED FLOOR
AFT	ABOVE FINISHED FLOOR.
ANSI	AMERICAN NATIONAL STANDARDS INSTITUTE
CPT	CONTROL POWER TRANSFORMER
EO	ELECTRICALLY OPERATED
ESFR	EARLY SUPPRESSION FAST RESPONSE
ETR	EXISTING TO REMAIN
EWFD	EARLY WARNING FIRE DETECTION
FHC	FIRE HOSE CABINET
FP	FIRE PROTECTION
GC	GENERAL CONTRACTOR
ICC	INDEPENDENT CONTROLS CONTRACTOR
I/C	INDICATES SINGLE CONDUCTOR CABLE.
IDC	INITIATING DEVICE CIRCUIT
J	JUNCTION BOX
KK	KIRK KEY INTERLOCK
LSIG	LONG TIME, SHORT TIME, INSTANTANEOUS, AND GROUND FAULT CIRCUIT BREAKER TRIP SETTINGS
NAC	NOTIFICATION APPLIANCE CIRCUIT
NEC	NATIONAL ELECTRIC CODE (NFPA 70)
NECA	NATIONAL ELECTRIC CONTRACTORS ASSOCIATION
NEMA	NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION
NETA	NATIONAL ELECTRICAL TESTING ASSOCIATION
NFPA	NATIONAL FIRE PROTECTION AGENCY
NICET	NATIONAL INSTITUTE FOR CERTIFICATION IN ENGINEERING TECHNOLOGIES
NO	NORMALLY OPEN
NC	NORMALLY CLOSED
MAX	MAXIMUM
MIN	MINIMUM
OC	ON CENTER
PART	PARTIAL HOMERUN
REV	REVISION
SBTC	SOLID BARE TINNED COPPER
SLC	SIGNALING LINE CIRCUIT
ST12	SHUNT TRIP, 120V, 1PH, 60 HZ
ST24	SHUNT TRIP, 24VAC
TSP	TWISTED SHIELDED PAIR
TYP	TYPICAL
UL	UNDERWRITERS LABORATORIES, INC.
UNO	UNLESS NOTED OTHERWISE
V	VOLTS
"A" OR "A"	THESE LETTERS ADJACENT TO ANY SYMBOL INDICATES DEVICE BOTTOM TO BE MOUNTED 4" ABOVE COUNTERTOP BACKSPASH.
"AG"	THESE LETTERS ADJACENT TO ANY SYMBOL INDICATES DEVICE BOTTOM TO BE MOUNTED 4" ABOVE COUNTERTOP BACKSPASH.
"G"	THESE LETTERS ADJACENT TO ANY SYMBOL INDICATES GROUND FAULT INTERRUPTER.
"IG"	THESE LETTERS ADJACENT TO ANY SYMBOL INDICATES ISOLATED GROUND DEVICE.
"TL"	THESE LETTERS ADJACENT TO ANY SYMBOL INDICATES LOCKING OR TWIST-LOCK TYPE DEVICE.
"WP"	THESE LETTERS ADJACENT TO ANY SYMBOL INDICATES WEATHER-PROOF ENCLOSURE.
"WG"	THESE LETTERS ADJACENT TO ANY SYMBOL INDICATES WEATHER-PROOF ENCLOSURE WITH GROUND FAULT INTERRUPTER.
"XP"	THESE LETTERS ADJACENT TO ANY SYMBOL INDICATES EXPLOSION-PROOF ENCLOSURE.
60"	DIMENSIONS ADJACENT TO ANY SYMBOL INDICATES MOUNTING HEIGHT TO CENTERLINE OF DEVICE.
RE-1-E101	REFERENCE DESIGNATION
SHEET NUMBER	
DETAIL/PLAN NUMBER	

GENERAL NOTES:

1) THE SYMBOLS SHOWN ON THIS SHEET ARE A COMPLETE LIST OF SYMBOLS USED BY InSite Group, Inc. AND NOT ALL SYMBOLS OR ABBREVIATIONS MAY BE USED ON THIS PROJECT.



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REVISIONS / AUTHORIZATIONS

NO.	REVISIONS / AUTHORIZATIONS	DATE	BY

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**AT&T** CORPORATE
REAL ESTATE

PROJECT TITLE: **PIPE AND CHILLER REPLACEMENT**

00
202 EAST 3RD STREET
LEES SUMMIT (JACKSON COUNTY)
MISSOURI US

KSCYM041 123785.03.01 E05156

SHEET TITLE:
**ELECTRICAL SYMBOLS
& ABBREVIATIONS**

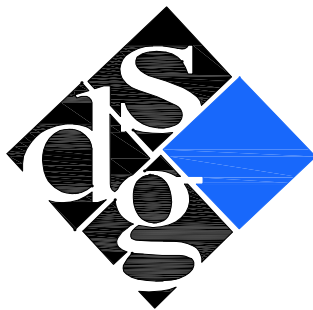
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AT&T AUTHORIZATION: MATT LONG	DRAWN BY: SVL	CHECKED BY: DJZ
SHEET: - OF: - SHEETS		SHEET NO. E001

- GENERAL NOTES:**
 - THESE PLANS ARE SCHEMATIC IN NATURE AND ARE INTENDED TO DEPICT GENERAL SCOPE OF WORK. ALL WORK SHALL BE PERFORMED PER ALL LOCAL AND STATE CODES AND REGULATIONS.
 - COORDINATE ALL WORK WITH OWNER, ARCHITECT, ENGINEER, EQUIPMENT MANUFACTURERS, AND ALL OTHER TRADES.
 - ALL WALL PENETRATIONS AND/OR FLAWS WITHIN WALLS/FLOORS RESULTING FROM THE REMOVAL OF EQUIPMENT SHALL BE PATCHED AND PAINTED WITH LIKE MATERIAL TO MATCH ADJACENT SURFACES.
 - PROVIDE ALL NECESSARY VENTILATION WITHIN CONSTRUCTION AREA ALLOWING FOR SPACE TO MAINTAIN NEGATIVE SPACE PRESSURE WITH RESPECT TO THE ADJACENT SPACES. PROVIDE MEANS TO CONTROL DUST FROM MIGRATING OUTSIDE OF THE CONSTRUCTION AREA TO EXISTING/ADJACENT SPACES.
 - ALL FIRE RATED ASSEMBLIES SHALL BE MAINTAINED. CAULK AROUND DUCTWORK AND PIPING PENETRATIONS WITH 3M CP-25 FIRE BARRIER CAULK (THICKNESS AS REQUIRED AND RECOMMENDED BY MANUFACTURER) TO MAINTAIN FIRE RESISTANCE RATING OF THE FIRE RATED ASSEMBLY.
 - PROVIDE AND INSTALL NEW PLASTIC LAMINATE LABELS ON ALL NEW AND EXISTING EQUIPMENT DIRECTLY RELATED TO PROJECT SCOPE. LABELS SHALL MATCH EXISTING BUILDING NOMENCLATURE. REMOVE EXISTING LABELS FOR REPLACEMENT.
 - THE OWNER AND ENGINEER ARE NOT RESPONSIBLE FOR THE CONTRACTOR'S SAFETY PRECAUTIONS OR TO MEANS, METHODS, TECHNIQUES, CONSTRUCTION SEQUENCES, OR PROCEDURES REQUIRED TO PERFORM HIS/HER WORK
 - THE OWNER HAS THE OPTION TO RETAIN EQUIPMENT REMOVED DURING DEMOLITION. COORDINATE WITH OWNER PRIOR TO DISPOSAL OF ANY EQUIPMENT. RE: SPECIFICATIONS FOR ADDITIONAL INFORMATION.
 - DRAWINGS ARE DESIGNED FOR THE MANUFACTURER'S MATERIALS, EQUIPMENT, OR SERVICES NAMED ON PLANS AND ANY CHANGES AND THEIR ASSOCIATED COSTS REQUIRED TO ACCOMMODATE OTHER APPROVED EQUIVALENT MATERIAL OR EQUIPMENT AS WELL AS SPACE REQUIREMENTS FOR THE OTHER APPROVED EQUIVALENT MUST BE ASSUMED BY THE CONTRACTOR IN HIS/HER BID.
 - INSTALL ALL EQUIPMENT WHILE MAINTAINING ALL REQUIRED CLEARANCES PER MANUFACTURER'S WRITTEN INSTRUCTIONS AND PER LOCAL CODES.
 - ALL EXTERIOR PENETRATIONS SHALL BE SEALED WEATHER/WATER TIGHT.
 - ALL EXISTING EQUIPMENT/SYSTEMS SHALL REMAIN OPERATIONAL THROUGHOUT CONSTRUCTION. SHUTDOWNS OF CRITICAL EQUIPMENT/SYSTEMS TO FACILITATE CONSTRUCTION SHALL BE SCHEDULED WITH OWNER. ALL WORK SHALL BE COMPLETED IN A MANNER ALLOWING FOR MINIMAL DOWN TIME. WHEN PERFORMING WORK THAT REQUIRES THE SYSTEM TO BE SHUTDOWN, THE CONTRACTOR SHALL PERFORM WORK DURING OWNER APPROVED WORK WINDOW.
 - MAINTAIN AREAS FREE OF DEBRIS ACCUMULATION. KEEP WORK AREAS NEAT AND ORDERLY AS MUCH AS REASONABLY POSSIBLE.
 - PROVIDE NECESSARY MEANS (DUST PARTITION WALLS, BARRIERS, HEPA VACUUMS, ETC.) TO PREVENT DUST FROM ENTERING INTO OR FALLING ON OWNER'S EQUIPMENT DURING DEMOLITION AND NEW WORK. PROVIDE NECESSARY METHOD OF PROCEDURES TO OWNER FOR REVIEW PRIOR TO CONSTRUCTION. RE: ARCHITECTURAL SHEETS FOR ADDITIONAL INFORMATION.
 - CONTRACTOR SHALL BE AVAILABLE FOR ALL BAS, PLC, AND MECHANICAL EQUIPMENT VALIDATION, COMMISSIONING, AND TESTING AND PROVIDE MAN POWER TO ASSIST EQUIPMENT MANUFACTURER WITH SET-UP, TESTING, AND CLEAN-UP ACTIVITIES.
 - ALL WORK SHALL BE COMPLETED DURING OWNER APPROVED WORK WINDOW.
 - CONTRACTOR SHALL PAY ALL PERMITTING COSTS ASSOCIATED WITH WORK.
 - CONTRACTOR WILL NOT BE PERMITTED TO USE ANY OWNER PROVIDED TELEPHONE OR INTERNET SERVICES. CONTRACTOR MUST FURNISH THESE UTILITIES IF NEEDED. CONTRACTOR WILL BE ALLOWED TO USE 120V UTILITY POWER RECEPTACLES WITH PRIOR APPROVAL FROM OWNER. CONTRACTOR SHALL UTILIZE EXTENSION CORDS WITH GFCI PROTECTION.
 - ALL NEW EQUIPMENT, WIRING, AND TERMINATIONS SHALL BE TESTED/COMMISSIONED UNDER LOAD.
 - OWNER EQUIPMENT LAYOUT IS SHOWN FOR REFERENCE ONLY. CONTRACTOR SHALL FIELD VERIFY EXACT LOCATIONS OF EQUIPMENT.
 - CONTRACTOR SHALL COORDINATE AND PERFORM HOURLY FIRE WATCH IN ENTIRE BUILDING AT ANY GIVEN TIME WHEN THE FIRE DETECTION AND / OR FIRE SUPPRESSION SYSTEM IS DISABLED. COORDINATE ALL REQUIREMENTS WITH OWNER.
 - THE DRAWINGS, SPECIFICATIONS, REFERENCED STANDARDS, ETC. ARE COMPLEMENTARY OF ONE ANOTHER. IN THE EVENT OF CONFLICT BETWEEN ANY PORTION OF THESE DOCUMENTS, THE ARCHITECT/ENGINEER SHALL BE CONTACTED FOR FORMAL INTERPRETATION OF THE REQUIREMENTS. THE CONTRACTOR SHALL BE DEEMED TO HAVE PROVIDED THE MOST DETAILED AND EXPENSIVE INTERPRETATION OF THE REQUIREMENT IN BID. ANY WORK INSTALLED IN CONFLICT WITH THE ARCHITECT/ENGINEER INTERPRETATION SHALL BE CORRECTED BY THE CONTRACTOR AT THE CONTRACTOR'S EXPENSE AND AT NO EXPENSE TO THE OWNER.
 - THE AGREEMENT BETWEEN THE CONTRACTOR AND THE OWNER IS A SINGLE PRIME CONTRACT. THE CONTRACTOR IS RESPONSIBLE FOR THE COMPLETE SCOPE OF WORK, INCLUDING ANY REQUIRED COORDINATION WITH SUBCONTRACTORS. THE CONSTRUCTION DOCUMENTS AND ARCHITECT/ ENGINEER DO NOT DELINEATE BETWEEN SUBCONTRACTORS RESPONSIBILITY, AND ANY INFERENCE TO DIVISION OF WORK IS A SUGGESTION ONLY. NEITHER THE OWNER NOR THE ARCHITECT/ENGINEER WILL OFFER ANY OPINIONS OR PROPOSED RESOLUTION CONCERNING ASSIGNMENT OF WORK TO SUBCONTRACTORS. IN THE EVENT OF MISSING OR CONFLICTING SCOPE PROVIDED BY THE CONTRACTOR OR ANY SUBCONTRACTORS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE WORK.
 - ALL EQUIPMENT SHALL BE LISTED BY A NATIONALLY RECOGNIZED TESTING LABORATORY APPROVED BY THE AUTHORITY HAVING JURISDICTION.
- ALL REQUIRED ABATEMENT OF EXISTING EQUIPMENT, INSULATION, ETC. SHALL BE COORDINATED WITH OWNER.
 - RE: SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
 - THE CONTRACTOR SHALL STORE AND PROTECT FROM DAMAGE ALL EQUIPMENT AND MATERIALS AFTER DELIVERY TO THE JOB SITE. COVER WITH WATERPROOF, TEAR-RESISTANT, HEAVY TARP OR POLYETHYLENE PLASTIC AS REQUIRED TO PROTECT FROM PLASTER, DIRT, PAINT, WATER, OR PHYSICAL DAMAGE.
 - EXISTING CONDITIONS: EACH BIDDER SHALL INSPECT THE SITE AS REQUIRED FOR KNOWLEDGE OF EXISTING CONDITIONS AND FAILURE TO OBTAIN SUCH KNOWLEDGE SHALL NOT RELIEVE THE SUCCESSFUL BIDDER OF THE RESPONSIBILITY TO MEET THE EXISTING CONDITIONS IN PERFORMING THE WORK UNDER THE CONTRACT.
 - SUBSTITUTIONS: ALL PRODUCTS PROPOSED FOR USE, INCLUDING THOSE SPECIFIED BY REQUIRED ATTRIBUTES AND PERFORMANCE, SHALL REQUIRE APPROVAL BY THE ENGINEER BEFORE BEING INCORPORATED INTO THE WORK. WHERE THE PHRASE "OR EQUAL" OR "APPROVED EQUAL" OCCURS IN THE CONTRACT DOCUMENTS, DO NOT ASSUME THAT MATERIALS, EQUIPMENT, OR METHODS WILL BE APPROVED AS EQUAL UNLESS THE ITEM HAS BEEN SPECIFICALLY APPROVED FOR THIS WORK BY THE ENGINEER / ARCHITECT.
 - ALL WORK SHALL CONFORM TO THE REQUIREMENTS OF ALL APPLICABLE CODES, ORDINANCES, AND REGULATIONS INCLUDING THE CURRENT RULES AND REGULATIONS OF THE NATIONAL ELECTRIC CODE, THE NATIONAL FIRE PROTECTION ASSOCIATION, MECHANICAL CODE, OSHA, AND ALL STATE AND LOCAL LAWS, CODES, AND ORDINANCES.
 - ALL FIXTURES, APPLIANCES, EQUIPMENT, AND MATERIALS WHICH ARE SUBJECT TO UNDERWRITERS LABORATORY TESTS SHALL BEAR SUCH APPROVAL.
 - SHOP DRAWINGS, SAMPLES, AND COORDINATION DRAWINGS: THE CONTRACTOR SHALL SUBMIT FOR APPROVAL, ELECTRONIC COPIES OF MANUFACTURER'S SHOP DRAWINGS FOR ALL MAJOR ITEMS OF EQUIPMENT TO BE FURNISHED UNDER THIS CONTRACT, AND ALL MAJOR ITEMS REQUIRING COORDINATION BETWEEN CONTRACTORS. BEFORE SUBMITTING SHOP DRAWINGS AND MATERIAL LISTS, THE CONTRACTOR SHALL VERIFY THAT ALL THE EQUIPMENT IS MUTUALLY COMPATIBLE AND SUITABLE FOR INTENDED USE, AND SHALL FIT THE AVAILABLE SPACE AND ALLOW AMPLE ROOM FOR MAINTENANCE. THE ENGINEER'S CHECKING AND SUBSEQUENT APPROVAL OF SUCH SHOP DRAWINGS SHALL NOT RELIEVE THE CONTRACTOR FROM RESPONSIBILITY FOR ERRORS IN DIMENSIONS, DETAILS, SIZE OF MEMBERS, QUANTITIES, OMISSIONS OF COMPONENTS OR FITTINGS, OR FOR COORDINATING ITEMS WITH ACTUAL BUILDING CONDITIONS. THE CONTRACTOR SHALL PROCEED WITH THE PROCUREMENT AND INSTALLATION OF EQUIPMENT/MATERIAL ONLY AFTER RECEIVING APPROVED SHOP DRAWINGS RELATIVE TO EACH ITEM.
 - ACCEPTANCE OF THE WORK SHALL BE SUBJECT TO THE ENGINEERS/ARCHITECTS APPROVAL OF SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. SHOP DRAWINGS SHALL INCLUDE MANUFACTURERS DETAIL DRAWINGS OF EQUIPMENT AND MATERIAL AND CONTRACTORS SHOP DETAILS FOR INSTALLATION OF MATERIAL AND EQUIPMENT. DESCRIPTIVE LITERATURE SHALL INCLUDE CATALOG DATA COVERING DESIGN, SIZE AND CAPACITY OF MATERIAL AND EQUIPMENT. SUBMITTALS SHALL INCLUDE THE MANUFACTURERS MODEL NUMBER, CAPACITY, PERFORMANCE DATA, ELECTRICAL CHARACTERISTICS, ETC., ALL CLEARLY SHOWN AND MARKED FOR THE SPECIFIC ITEM OF EQUIPMENT BEING FURNISHED ON THIS PROJECT.
 - RECORD DRAWINGS: THE CONTRACTOR SHALL KEEP DAY-TO-DAY RECORD OF ALL CHANGES OR VARIATIONS MADE FROM THE CONTRACT DOCUMENTS AND AT THE END OF THE PROJECT SHALL PROVIDE THE OWNER/ARCHITECT/ENGINEER WITH REPRODUCIBLE SETS AS REQUESTED.
 - OPERATION AND MAINTENANCE INSTRUCTIONS: THE CONTRACTOR SHALL, DURING THE COURSE OF CONSTRUCTION, COLLECT AND COMPIL A COMPLETE BROCHURE OF ALL EQUIPMENT FURNISHED AND INSTALLED ON THIS PROJECT. THIS BROCHURE SHALL INCLUDE OPERATIONAL AND MAINTENANCE INSTRUCTIONS, MANUFACTURERS CATALOG SHEETS, WIRING DIAGRAMS, PARTS LISTS, APPROVED SHOP DRAWINGS, AND DESCRIPTIVE LITERATURE ALL AS FURNISHED BY THE EQUIPMENT MANUFACTURER. MANUAL SHALL INCLUDE AN INSIDE COVER SHEET THAT LIST THE PROJECT NAME, DATE, OWNER, ARCHITECT, MECHANICAL CONSULTANT, GENERAL CONTRACTOR, MECHANICAL CONTRACTOR, AND AN INDEX OF CONTENTS. ALL LITERATURE SHALL BE BOUND IN APPROVED BINDERS AND THREE (3) HARD COPIES AND (3) ELECTRONIC COPIES ON CD'S SHALL BE SUBMITTED TO THE OWNER AT THE TERMINATION OF THE WORK. CONTRACTOR SHALL ALSO PROVIDE ADEQUATE VERBAL INSTRUCTIONS OF SYSTEM OPERATION TO OWNER'S REPRESENTATIVE AT THE TERMINATION OF THE WORK.
 - DEMONSTRATION AND TRAINING: CONTRACTOR SHALL PROVIDE OWNER WITH INSTRUCTIONAL TRAINING PROGRAM ON ALL MAJOR EQUIPMENT ITEMS PROVIDED AND INSTALLED UNDER CONTRACT. TRAINING SHALL BE PROVIDED BY A FACTORY-AUTHORIZED SERVICE REPRESENTATIVE. THE TRAINING SESSION SCHEDULE SHALL BE COORDINATED WITH OWNER AND OWNER'S OPERATIONS TO MINIMIZE DISRUPTING OWNER'S OPERATIONS. CONTRACTOR TO PROVIDE A TRAINING SESSION FOR EACH WORK SHIFT TO ENSURE ALL EMPLOYEES HAVE THE OPPORTUNITY TO ATTEND THE TRAINING DURING THEIR NORMAL WORK HOURS (COORDINATE REQUIRED NUMBER OF WORK SHIFTS WITH OWNER). AT THE COMPLETION OF TRAINING, SUBMIT COMPLETE TRAINING MANUAL(S) FOR OWNER'S USE IN PDF ELECTRONIC FILE FORMAT ON COMPACT DISK, AND (1) HARD COPY PREPARED AND BOUND.
 - FIRESTOPPING: FIRESTOPPING IS DEFINED HEREIN AS THE PROCESS OF FURNISHING AND INSTALLING A MATERIAL, OR COMBINATION OF MATERIALS, IN VARIOUS CONSTRUCTIONS TO MAINTAIN EFFECTIVE BARRIER AGAINST THE SPREAD OF FLAME, SMOKE, AND GASSES AND TO RETAIN THE INTEGRITY OF TIME-RATED CONSTRUCTION. IT SHALL BE USED IN SPECIFIC LOCATIONS AS SPECIFIED HEREIN.
 - CONDUIT/PIPING/DUCT PENETRATIONS THROUGH TIME-RATED PARTITIONS OF FIRE WALLS SHALL BE FIRESTOPPED.
 - PENETRATIONS THROUGH VERTICAL PIPE SHAFTS SHALL BE FIRESTOPPED.
 - MATERIAL OF FIRESTOPPING SHALL BE ASBESTOS FREE AND CAPABLE OF MAINTAINING AN EFFECTIVE BARRIER AGAINST FLAME, SMOKE, AND GASES IN COMPLIANCE WITH THE REQUIREMENTS ASTM E814, UL NO 1479.

- ELECTRICAL GENERAL NOTES:**
 - COORDINATE POWER REQUIREMENTS AND FINAL LOCATIONS OF ALL EQUIPMENT, DEVICES, ETC. WITH FINAL EQUIPMENT SELECTION AND INSTALL ALL NECESSARY DEVICES ALLOWING FOR END TERMINATIONS/CONNECTIONS.
 - TYPE WRITTEN PANELBOARD REGISTRIES SHALL BE PROVIDED ON INTERIOR DOOR OF EACH PANELBOARD AND SHALL BE PLACED IN PLASTIC COVER. UPDATE ALL EXISTING PANELBOARD SCHEDULES DIRECTLY AFFECTED BY PROJECT SCOPE WITH NEW REGISTRY.
 - ROUTE ALL CIRCUITRY PARALLEL AND PERPENDICULAR TO BUILDING LINES & AS HIGH OR LOW AS POSSIBLE. ALL CIRCUITRY AND CONDUIT SHALL BE SIZED PER NEC REQUIREMENTS.
 - FURNISH, INSTALL AND CONNECT ALL WIRE, WIREWAY, CONDUIT, CONNECTORS, OUTLETS, ETC. NECESSARY TO ACHIEVE A COMPLETE ELECTRICAL INSTALLATION ALTHOUGH SUCH WORK IS NOT SPECIFICALLY SHOWN OR SPECIFIED. EQUIPMENT SHALL BE INSTALLED PER CODE REQUIREMENTS AND MANUFACTURER'S WRITTEN INSTRUCTIONS, PROVIDING A SOUND, SECURE, AND COMPLETE INSTALLATION.
 - ALL INTERIOR WIRING SHALL BE IN **EMT CONDUIT WITH COMPRESSION FITTINGS** AND SHALL BE CONCEALED IF POSSIBLE. IF NOT CONCEALED, CONDUITS SHALL BE PAINTED TO MATCH ADJACENT SURFACE IN FINISHED AREAS.
 - PROVIDE PULL BOXES FOR CONDUIT AND WIRE RUNS AS REQUIRED PER NEC. RE: NEC2005 SECTIONS 314 PULL AND JUNCTION BOXES AND CONDUIT BODIES, 358 BENDS-NUMBER IN ONE RUN.
 - EXISTING DEVICE WIRING SHOWN FOR REFERENCE ONLY. CONTRACTOR SHALL FIELD VERIFY CONDUIT AND CIRCUITRY ROUTING.
 - ALL CIRCUITS SHALL BE ROUTED IN DEDICATED RACEWAY AND PULL BOXES. CIRCUITS ARE NOT ALLOWED TO BE ROUTED IN A COMMON PULLBOX.
 - COORDINATE POWER WIRING FOR BAS CONTROL DEVICES WITH MECHANICAL AND CONTROLS CONTRACTORS.
 - ALL CIRCUIT BREAKERS INSTALLED WITH A FRAME SIZE 100 AMPS AND HIGHER SHALL BE PRIMARY INJECTION TESTED AT 100% OF RATING PER IEEE STANDARDS. PROVIDE TEST REPORT FOR OWNER AND ENGINEERS REVIEW.**
 - ALL CONDUITS SHALL BE LABELED AT LOCATION OF CONDUIT PENETRATIONS AT DISTRIBUTION EQUIPMENT, WALLS, CEILINGS, ETC. WITH SOURCE OF POWER, AND DESTINATION.
 - ALL WORK REQUIRING THE OPENING OR INTERNAL INVESTIGATIONS OF ELECTRICAL EQUIPMENT IS CLASSIFIED AS WORK ON OR NEAR ENERGIZED EQUIPMENT AND ANY PERSON ASSOCIATED WITH THIS WORK MUST COMPLY WITH THE FACILITIES ELECTRICAL SAFETY PROGRAM.
 - ALL EXISTING CONDUIT AND CONDUCTOR SIZES ARE SHOWN FOR REFERENCE ONLY AND SHALL BE FIELD VERIFIED.
 - PROVIDE JUNCTION BOX COVERS WITH LABELS IDENTIFYING FUNCTION AND CIRCUIT NUMBER (IF APPLICABLE) WITH MINIMUM 1/4" HIGH LETTERING. PAINT ALL JUNCTION BOX COVERS WITH SEPARATE IDENTIFYING COLORS AS FOLLOWS: FIRE ALARM SYSTEMS, RED, VESDA SYSTEMS; ORANGE, BAS SYSTEM; BLACK, SECURITY; YELLOW, LIGHTING; BLUE.

- CONSTRUCTION PHASING GENERAL NOTES:**
 - A BRIEF DESCRIPTION BELOW ILLUSTRATES THE GENERAL SCOPE OF CONSTRUCTION THAT INCLUDES MODIFICATIONS TO THE EXISTING ELECTRICAL DISTRIBUTION SYSTEM SERVING THE CHILLED WATER PLANT. CONSTRUCTION IS TO BE SEQUENCED IN (2) MAIN PHASES:

PHASE 1: WORK TO BE PERFORMED WHILE OLD CHILLER 1 IS BEING REMOVED/NEW CHILLER 1 IS BEING INSTALLED. EXACT WORK WINDOW SHALL BE COORDINATED WITH OWNER:
 - REMOVE EXISTING ELECTRICAL FEED FROM CHILLER 1 THAT IS TO BE REMOVED BY MECHANICAL CONTRACTOR.
 - REMOVE EXISTING ELECTRICAL FEED FROM CONDENSING UNIT 1 THAT IS TO BE REMOVED BY MECHANICAL CONTRACTOR.
 - DE-ENERGIZE SECONDARY CHILLED WATER PUMP 1 WHILE CHILLER 1 IS BEING REMOVED. REMOVE EXISTING VFD AND ELECTRICAL FEED.
 - DE-ENERGIZE PRIMARY CHILLED WATER PUMP 1 WHILE CHILLER 1 IS BEING REMOVED. PROVIDE NEW MOTOR STARTER AND ELECTRICAL FEED AND POWER PUMP FROM SWITCHBOARD DP2 (OLD SWITCHBOARD DP2 SECTION B).
 - PROVIDE NEW FUSED SWITCH IN SWITCHBOARD DP2 SECTION B. INSTALL NEW VFD AND ELECTRICAL FEED TO SECONDARY CHILLED WATER PUMP 1 AND ENERGIZE PUMP.
 - DE-ENERGIZE SECONDARY CHILLED WATER PUMP 2 ONCE SECONDARY CHILLED WATER PUMP 1 IS OPERATIONAL. REMOVE EXISTING VFD AND ELECTRICAL FEED. INSTALL NEW VFD AND TEMPORARILY POWER PUMP FROM EXISTING FEED FROM DP2 SECTION A.
 - INSTALL NEW PANELBOARD DP3 AND ASSOCIATED ELECTRICAL FEED FROM EXISTING PANEL DP1.
 - INSTALL NEW ELECTRICAL FEEDERS TO NEW CHILLER 1 AND ITS ASSOCIATED CONDENSING UNIT FROM SWITCHBOARD DP2 (OLD SWITCHBOARD DP2 SECTION B).
PHASE 2: WORK IS TO BE PERFORMED AFTER NEW CHILLER 1 HAS BEEN INSTALLED. EXACT WORK WINDOW SHALL BE COORDINATED WITH OWNER:
 - DE-ENERGIZE AND DISCONNECT EXISTING CHILLER 2 FROM SWITCHBOARD DP2 SECTION A AND PROVIDE NEW FEED FROM NEW PANEL DP3.
 - INSTALL NEW ELECTRICAL FEED AND MOTOR STARTER FOR PRIMARY CHILLED WATER PUMP 2 FROM NEW PANEL DP3.
 - DE-ENERGIZE AND DISCONNECT EXISTING CONDENSING UNIT 2 FROM SWITCHBOARD DP2 SECTION A AND PROVIDE NEW FEED FROM NEW PANEL DP3.
 - PROVIDE PERMANENT POWER TO VFD SERVING SECONDARY CHILLED WATER PUMP 2 FROM NEW PANEL DP3.
 - REMOVE EXISTING SWITCHBOARD DP2 SECTION A IN ITS ENTIRETY.
NOTE: ALL WORK SHALL BE CLOSELY COORDINATED WITH MECHANICAL CONTRACTOR AND OWNER.




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REVISIONS / AUTHORIZATIONS

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PROJECT TITLE: PIPE AND CHILLER REPLACEMENT

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SHEET TITLE:
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260500 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 – GENERAL

- 1.1 SUMMARY
- A. SECTION INCLUDES:
- ELECTRICAL EQUIPMENT COORDINATION AND INSTALLATION.
 - COMMON ELECTRICAL INSTALLATION REQUIREMENTS.
- 1.2 COORDINATION
- A. COORDINATE ARRANGEMENT, MOUNTING, AND SUPPORT OF ELECTRICAL EQUIPMENT:
- TO ALLOW MAXIMUM POSSIBLE HEADROOM UNLESS SPECIFIC MOUNTING HEIGHTS THAT REDUCE HEADROOM ARE INDICATED.
 - TO PROVIDE EASE OF DISCONNECTING THE EQUIPMENT WITH MINIMUM INTERFERENCE TO OTHER INSTALLATIONS.
 - TO ALLOW RIGHT OF WAY FOR PIPING AND CONDUIT INSTALLED AT REQUIRED SLOPE.
 - SO CONNECTING RACEWAYS, CABLES, WIREWAYS, CABLE TRAYS, AND BUSWAYS WILL BE CLEAR OF OBSTRUCTIONS AND OF THE WORKING AND ACCESS SPACE OF OTHER EQUIPMENT.
- B. COORDINATE INSTALLATION OF REQUIRED SUPPORTING DEVICES AND SET SLEEVES IN CAST-IN-PLACE CONCRETE, MASONRY WALLS, AND OTHER STRUCTURAL COMPONENTS AS THEY ARE CONSTRUCTED.
- C. COORDINATE LOCATION OF ACCESS PANELS AND DOORS FOR ELECTRICAL ITEMS THAT ARE BEHIND FINISHED SURFACES OR OTHERWISE CONCEALED.
- D. COORDINATE SLEEVE SELECTION AND APPLICATION OF FIRESTOPPING SPECIFIED IN DIVISION 07 AND ARCHITECTURAL DRAWINGS.

PART 2 – EXECUTION

- 2.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION
- A. COMPLY WITH NECA 1.
- B. MEASURE INDICATED MOUNTING HEIGHTS TO BOTTOM OF UNIT FOR SUSPENDED ITEMS AND TO CENTER OF UNIT FOR WALL MOUNTING ITEMS.
- C. HEADROOM MAINTENANCE: IF MOUNTING HEIGHTS OR OTHER LOCATION CRITERIA ARE NOT INDICATED, ARRANGE AND INSTALL COMPONENTS AND EQUIPMENT TO PROVIDE MAXIMUM POSSIBLE HEADROOM CONSISTENT WITH THESE REQUIREMENTS.
- D. UNDER RAISED FLOOR: IF MOUNTING IS UNDER RAISED ACCESS FLOORING, ARRANGE AND INSTALL COMPONENTS AS LOW AS POSSIBLE AND UNDER ALL OF OWNER'S IT EQUIPMENT WHIPS AND CABLING IF POSSIBLE.
- E. EQUIPMENT: INSTALL TO FACILITATE SERVICE, MAINTENANCE, AND REPAIR OR REPLACEMENT OF COMPONENTS OF BOTH ELECTRICAL EQUIPMENT AND OTHER NEARBY INSTALLATIONS. CONNECT IN SUCH A MANNER AS TO FACILITATE FUTURE DISCONNECTING WITH MINIMUM INTERFERENCE WITH OTHER ITEMS / TRADES IN THE VICINITY.
- F. RIGHT OF WAY: GIVE RIGHT OF WAY TO PIPING SYSTEMS INSTALLED AT A REQUIRED SLOPE.
- G. INTERIOR PENETRATIONS OF NON-FIRE-RATED WALLS AND FLOORS: SEAL ANNULAR SPACE BETWEEN SLEEVE AND RACEWAY OR CABLE, USING JOINT SEALANT APPROPRIATE FOR SIZE, DEPTH, AND LOCATION OF JOINT.
- H. PENETRATIONS OF FIRE-RATED-ASSEMBLY: MAINTAIN INDICATED FIRE RATING OF WALLS, PARTITIONS, CEILINGS, AND FLOORS AT RACEWAY AND CABLE PENETRATIONS. INSTALL SLEEVES AND SEAL RACEWAY AND CABLE PENETRATION SLEEVES WITH FIRESTOPPING MATERIALS TO MAINTAIN ORIGINAL OR NEW FIRE RESISTANCE RATING OF ASSEMBLY.
- I. ROOF-PENETRATION SLEEVES: SEAL PENETRATION OF INDIVIDUAL RACEWAYS AND CABLES WITH FLEXIBLE BOOT-TYPE FLASHING UNITS APPLIED IN COORDINATION WITH ROOFING WORK AND TO COMPLY WITH ANY ACTIVE FACILITY ROOFING WARRANTY.
- J. ABOVEGROUND, EXTERIOR WALL PENETRATIONS: SEAL PENETRATIONS USING STEEL PIPE SLEEVES AND MECHANICAL SLEEVE SEALS PER MANUFACTURER'S WRITTEN INSTRUCTIONS.
- K. UNDERGROUND, EXTERIOR WALL PENETRATIONS: INSTALL CAST-IRON PIPE SLEEVES AND MECHANICAL SLEEVE SEALS PER MANUFACTURER'S WRITTEN INSTRUCTIONS.

END OF SECTION 260500

260519 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 – GENERAL

- 1.1 SUMMARY
- A. SECTION INCLUDES:
- BUILDING WIRES AND CABLES RATED 600V AND LESS
 - CONNECTORS, SPLICES, AND TERMINATIONS RATED 600V AND LESS.
- 1.2 ACTION SUBMITTALS
- A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED.
- 1.3 INFORMATIONAL SUBMITTALS
- A. 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.

PART 2 – PRODUCTS

- 2.1 CONDUCTORS AND CABLES
- A. COPPER CONDUCTORS: COMPLY WITH NEMA WC 70.
- B. CONDUCTOR INSULATION: COMPLY WITH NEMA WC 70 FOR TYPES THHN-THWN AND XHHW.
- 2.2 CONNECTORS AND SPLICES (UPON PRIOR APPROVAL BY OWNER AND ENGINEER)
- A. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:
- HUBBELL POWER SYSTEMS, INC.
 - 3M; ELECTRICAL PRODUCTS DIVISION.
- 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 AND BRANCH CIRCUITS: COPPER. SOLID FOR #10 AWG AND SMALLER; STRANDED FOR #8 AWG AND LARGER.
- 3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS.
- A. SERVICE ENTRANCE: TYPE THHN-THWN, OR TYPE XHHW (UNDERGROUND); SINGLE CONDUCTORS IN RACEWAY.
- B. EXPOSED FEEDERS: TYPE THHN-THWN, SINGLE CONDUCTORS IN RACEWAY.
- C. FEEDERS CONCEALED IN CEILINGS, WALLS, PARTITIONS, AND CRAWLSPACES: TYPE THHN-THWN, SINGLE CONDUCTORS IN RACEWAY. TYPE AC AND TYPE MC CABLES ARE ACCEPTABLE FOR APPLICATIONS WITH PRIOR APPROVAL FROM OWNER AND ENGINEER.
- D. FEEDERS CONCEALED IN CONCRETE, BELOW SLABS-ON-GRADE, AND UNDERGROUND: TYPE THHN-THWN, SINGLE CONDUCTORS IN RACEWAY.
- E. EXPOSED BRANCH CIRCUITS, INCLUDING IN CRAWLSPACES: TYPE THHN-THWN, SINGLE CONDUCTORS IN RACEWAY.
- F. BRANCH CIRCUITS CONCEALED IN CEILINGS, WALLS, AND PARTITIONS: TYPE THHN-THWN, SINGLE CONDUCTORS IN RACEWAY. TYPE AC AND TYPE MC CABLES ARE ACCEPTABLE FOR APPLICATIONS WITH PRIOR APPROVAL FROM OWNER AND ENGINEER.
- G. BRANCH CIRCUITS CONCEALED IN CONCRETE, BELOW SLABS-ON-GRADE, AND UNDERGROUND: TYPE THHN-THWN, SINGLE CONDUCTORS IN RACEWAY.
- H. CORD DROPS AND PORTABLE APPLIANCE CONNECTIONS: TYPE SO, HARD SERVICE CORD WITH STAINLESS STEEL, WIRE-MESH, STRAIN RELIEF DEVICE AT TERMINATIONS TO SUIT APPLICATION.
- I. CLASS 1 CONTROL CIRCUITS: TYPE THHN-THWN, IN RACEWAY.
- J. CLASS 2 CONTROL CIRCUITS: TYPE THHN-THWN, IN RACEWAY.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. CONCEAL CABLES IN FINISHED WALLS, CEILINGS, AND FLOORS, UNLESS NOTED OTHERWISE (UNO).
- B. USE MANUFACTURER-APPROVED PULLING COMPOUND OR LUBRICANT WHERE NECESSARY; COMPOUND USED MUST NOT DEGRADATE CONDUCTOR INSULATION. DO NOT EXCEED MANUFACTURER'S RECOMMENDED MAXIMUM PULLING TENSIONS OR SIDEWALL PRESSURE VALUES.
- C. USE PULLING MEANS, INCLUDING FISH TAPE, CABLE, ROPE, AND BASKET-WEAVE WIRE/CABLE GRIPS, THAT WILL NOT DAMAGE CABLE OR RACEWAY.
- D. INSTALL EXPOSED CABLES PARALLEL AND PERPENDICULAR TO SURFACES OF EXPOSED STRUCTURAL MEMBERS, AND FOLLOW SURFACE CONTOURS WHERE POSSIBLE.
- E. 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.
- F. MAKE SPLICES AND TAPS THAT ARE COMPATIBLE WITH CONDUCTOR MATERIAL AND THAT POSSESS EQUIVALENT OR BETTER MECHANICAL STRENGTH AND INSULATION RATINGS THAN UNSPLICED CONDUCTORS.
- G. WIRING AT OUTLETS: INSTALL CONDUCTOR AT EACH OUTLET WITH AT LEAST 12 INCHES OF SLACK.

3.4 FIELD QUALITY CONTROL

- A. PERFORM TESTS AND INSPECTIONS AND PREPARE TEST REPORTS.
- AFTER INSTALLING CONDUCTORS AND CABLES AND BEFORE ELECTRICAL CIRCUITRY HAS BEEN ENERGIZED, TEST EACH CONDUCTOR FOR COMPLIANCE WITH REQUIREMENTS.
 - PERFORM EACH VISUAL AND MECHANICAL INSPECTION AND ELECTRICAL TEST STATED IN NETA ACCEPTANCE TESTING SPECIFICATION. CERTIFY COMPLIANCE WITH TEST PARAMETERS.
 - INFRARED SCANNING: AFTER SUBSTANTIAL COMPLETION, BUT NOT MORE THAN 60 DAYS AFTER FINAL ACCEPTANCE, PERFORM AN INFRARED SCAN OF EACH SPLICE AND EQUIPMENT TERMINATION SERVED BY A CIRCUIT BREAKER WITH A 100A FRAME AND LARGER.
 - INSTRUMENT: USE AN INFRARED SCANNING DEVICE DESIGNED TO MEASURE TEMPERATURE OR TO DETECT SIGNIFICANT DEVIATIONS FROM NORMAL VALUES. PROVIDE CALIBRATION RECORD FOR EACH DEVICE.
 - RECORD OF INFRARED SCANNING: PREPARE A CERTIFIED REPORT THAT IDENTIFIES SPLICES/EQUIPMENT CHECKED AND THAT DESCRIBES SCANNING RESULTS. INCLUDE NOTIFICATION OF DEFICIENCIES DETECTED, REMEDIAL ACTION TAKEN, AND OBSERVATIONS AFTER REMEDIAL ACTION.
- B. TEST REPORTS: PREPARE A WRITTEN REPORT TO RECORD THE FOLLOWING:
- TEST PROCEDURES USED.
 - TEST RESULTS THAT COMPLY WITH REQUIREMENTS.
 - TEST RESULTS THAT DO NOT COMPLY WITH REQUIREMENTS AND CORRECTIVE ACTION TAKEN TO ACHIEVE COMPLIANCE WITH REQUIREMENTS.

END OF SECTION 260519

SECTION 260523 – CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 – GENERAL

1.1 SUMMARY

- A. SECTION INCLUDES:
- MULTI-PAIR OPTICAL-FIBER CABLING.
 - UTP CABLING.
 - RS-485 CABLING.
 - LOW-VOLTAGE CONTROL CABLING.
 - CONTROL-CIRCUIT CONDUCTORS.
 - IDENTIFICATION PRODUCTS.

1.2 ACTION SUBMITTALS

- A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT.

1.3 INFORMATIONAL SUBMITTALS

- A. SOURCE QUALITY-CONTROL REPORTS.
- B. FIELD QUALITY-CONTROL REPORTS.

PART 2 – PRODUCTS

2.1 SYSTEM DESCRIPTION

- 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.

2.2 PERFORMANCE REQUIREMENTS

- A. FLAME TRAVEL AND SMOKE DENSITY IN PLENUMS: AS DETERMINED BY TESTING IDENTICAL PRODUCTS ACCORDING TO NFPA 262 BY A QUALIFIED TESTING AGENCY. IDENTIFY PRODUCTS FOR INSTALLATION IN PLENUMS WITH APPROPRIATE MARKINGS OF APPLICABLE TESTING AGENCY.
- FLAME TRAVEL DISTANCE: 60 INCHES (1520 MM) OR LESS.
 - PEAK OPTICAL SMOKE DENSITY: 0.5 OR LESS.
 - AVERAGE OPTICAL SMOKE DENSITY: 0.15 OR LESS.
- B. FLAME TRAVEL AND SMOKE DENSITY FOR RISER CABLES IN NON-PLENUM BUILDING SPACES: AS DETERMINED BY TESTING IDENTICAL PRODUCTS ACCORDING TO UL 1666.
- C. FLAME TRAVEL AND SMOKE DENSITY FOR CABLES IN NON-RISER APPLICATIONS AND NON-PLENUM BUILDING SPACES: AS DETERMINED BY TESTING IDENTICAL PRODUCTS ACCORDING TO UL 1685.

2.3 UTP CABLE

- A. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:

- ALPHA WIRE COMPANY; A DIVISION OF BELDEN INC.
- BELDEN INC.
- GENESIS CABLE PRODUCTS; HONEYWELL INTERNATIONAL, INC.
- MOHAWK; A DIVISION OF BELDEN INC.
- NEXANS; BERK-TEK PRODUCTS.
- 3M.
- TYCO ELECTRONICS/AMP NETCONNECT; TYCO INTERNATIONAL LTD.

- B. DESCRIPTION: 100-OHM, FOUR-PAIR UTP, 25-PAIR UTP COVERED WITH A THERMOPLASTIC JACKET.
- COMPLY WITH ICEA S-90-661 FOR MECHANICAL PROPERTIES OF CATEGORY 5E CABLES.
 - COMPLY WITH ICEA S-102-700 FOR MECHANICAL PROPERTIES OF CATEGORY 6 CABLES.
 - COMPLY WITH TIA-568-C.1 FOR PERFORMANCE SPECIFICATIONS.
 - COMPLY WITH TIA-568-C.2, CATEGORY 5E.
 - LISTED AND LABELED BY AN NRTL ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION AS COMPLYING WITH UL 444 AND NFPA 70 FOR THE FOLLOWING TYPES:
 - COMMUNICATIONS, PLENUM RATED: TYPE CM OR TYPE CMX IN METALLIC CONDUIT INSTALLED PER NFPA 70, ARTICLE 300.22, "WIRING IN DUCTS, PLENUMS, AND OTHER AIR-HANDLING SPACES."
 - COMMUNICATIONS, RISER RATED: TYPE CMP OR TYPE CMR IN METALLIC CONDUIT INSTALLED PER NFPA 70, ARTICLE 300.22, "WIRING IN DUCTS, PLENUMS, AND OTHER AIR-HANDLING SPACES."
 - COMMUNICATIONS, GENERAL PURPOSE: TYPE CM, TYPE CMG, TYPE CMP, TYPE CMR, OR TYPE CMX IN METALLIC CONDUIT INSTALLED PER NFPA 70.

2.4 RS-485 CABLE

- A. PLENUM-RATED CABLE: NFPA 70, TYPE CMP.
- PAIRED, TWO PAIRS, NO. 22 AWG, STRANDED (7X30) TINNED-COPPER CONDUCTORS.
 - FLUORINATED ETHYLENE PROPYLENE INSULATION.
 - UNSHIELDED.
 - FLUORINATED ETHYLENE PROPYLENE JACKET.
 - FLAME RESISTANCE: NFPA 262.

2.5 LOW-VOLTAGE CONTROL CABLE

- A. PLENUM-RATED, PAIRED CABLE: NFPA 70, TYPE CMP.
- MULTI-PAIR, TWISTED, NO. 16 AWG, STRANDED (19X29) TINNED-COPPER CONDUCTORS.
 - PVC INSULATION.

- PVC JACKET.
- FLAME RESISTANCE: COMPLY WITH NFPA 262.

2.6 CONTROL-CIRCUIT CONDUCTORS

- A. CLASS 1 CONTROL CIRCUITS: STRANDED COPPER, TYPE THHN-2-THWN-2, IN RACEWAY, COMPLYING WITH UL 83.
- B. CLASS 2 CONTROL CIRCUITS: STRANDED COPPER, TYPE THHN-2-THWN-2, IN RACEWAY, COMPLYING WITH UL 83.
- C. CLASS 3 REMOTE-CONTROL AND SIGNAL CIRCUITS: STRANDED COPPER, TYPE THHN-2-THWN-2, IN RACEWAY, COMPLYING WITH UL 83.
- D. CLASS 2 CONTROL CIRCUITS AND CLASS 3 REMOTE-CONTROL AND SIGNAL CIRCUITS THAT SUPPLY CRITICAL CIRCUITS: CIRCUIT INTEGRITY (CI) CABLE.
- SMOKE CONTROL SIGNALING AND CONTROL CIRCUITS.

2.7 SOURCE QUALITY CONTROL

- A. FACTORY TEST UTP CABLES ACCORDING TO TIA-568-C.2.
- B. FACTORY TEST OPTICAL-FIBER CABLES ACCORDING TO TIA-568-C.3.
- C. CABLE WILL BE CONSIDERED DEFECTIVE IF IT DOES NOT PASS TESTS AND INSPECTIONS.
- D. PREPARE TEST AND INSPECTION REPORTS.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. TEST CABLES ON RECEIPT AT PROJECT SITE.

- TEST EACH PAIR OF UTP CABLE FOR OPEN AND SHORT CIRCUITS.

3.2 INSTALLATION OF RACEWAYS AND BOXES

- A. COMPLY WITH REQUIREMENTS IN SECTION 260533 "RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS" FOR RACEWAY SELECTION AND INSTALLATION REQUIREMENTS FOR BOXES, CONDUITS, AND WIREWAYS AS SUPPLEMENTED OR MODIFIED IN THIS SECTION.
- 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.
 - OUTLET BOXES FOR OPTICAL-FIBER CABLES SHALL BE NO SMALLER THAN 4 INCHES (102 MM) SQUARE BY 1-1/2 INCHES (38 MM) DEEP WITH EXTENSION RING SIZED TO BRING EDGE OF RING TO WITHIN 1/8 INCH (3.1 MM) OF THE FINISHED WALL SURFACE.
 - FLEXIBLE METAL CONDUIT SHALL NOT BE USED.
- B. COMPLY WITH TIA-569-B FOR PULL-BOX SIZING AND LENGTH OF CONDUIT AND NUMBER OF BENDS BETWEEN PULL POINTS FOR HEATING.
- C. INSTALL MANUFACTURED CONDUIT SWEEPS AND LONG-RADIUS ELBOWS IF POSSIBLE.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. COMPLY WITH NECA 1 AND NFPA 70.

B. GENERAL REQUIREMENTS FOR CABLING:

- TERMINATE ALL CONDUCTORS AND OPTICAL FIBERS; NO CABLE SHALL CONTAIN UNTERMINATED ELEMENTS. MAKE TERMINATIONS ONLY AT INDICATED OUTLETS, TERMINALS, AND PATCH PANELS.
- CABLES MAY NOT BE SPLICED.
- DO NOT INSTALL BRUISED, KINKED, SCORED, DEFORMED, OR ABRADED CABLE. DO NOT SPlice CABLE BETWEEN TERMINATION, TAP, OR JUNCTION POINTS. REMOVE AND DISCARD CABLE IF DAMAGED DURING INSTALLATION AND REPLACE IT WITH NEW CABLE.
- COLD-WEATHER INSTALLATION: BRING CABLE TO ROOM TEMPERATURE BEFORE DEREELING. DO NOT USE HEAT LAMPS FOR HEATING.
- PULLING CABLE: COMPLY WITH BICSI ITSMM, CH. 5, "COPPER STRUCTURED CABLING SYSTEMS" AND CH. 6, "OPTICAL FIBER STRUCTURED CABLING SYSTEMS." MONITOR CABLE PULL TENSIONS.
- SUPPORT: DO NOT ALLOW CABLES TO LIE ON REMOVABLE CEILING TILES.
- SECURE: FASTEN SECURELY IN PLACE WITH HARDWARE SPECIFICALLY DESIGNED AND INSTALLED SO AS TO NOT DAMAGE CABLES.

C. UTP CABLE INSTALLATION:

- COMPLY WITH TIA-568-C.2.
- INSTALL TERMINATION HARDWARE AS SPECIFIED IN SECTION 271500 "COMMUNICATIONS HORIZONTAL CABLING" UNLESS OTHERWISE INDICATED.
- DO NOT UNTWIST UTP CABLES MORE THAN 1/2 INCH (12 MM) AT THE POINT OF TERMINATION TO MAINTAIN CABLE GEOMETRY.

3.4 REMOVAL OF CONDUCTORS AND CABLES

- A. REMOVE ABANDONED CONDUCTORS AND CABLES. ABANDONED CONDUCTORS AND CABLES ARE THOSE INSTALLED THAT ARE NOT TERMINATED AT EQUIPMENT AND ARE NOT IDENTIFIED FOR FUTURE USE WITH A TAG.

3.5 CONTROL-CIRCUIT CONDUCTORS

- A. MINIMUM CONDUCTOR SIZES:
- CLASS 1 REMOTE-CONTROL AND SIGNAL CIRCUITS; NO 14 AWG.
 - CLASS 2 LOW-ENERGY, REMOTE-CONTROL, AND SIGNAL CIRCUITS; NO 16 AWG.
 - CLASS 3 LOW-ENERGY, REMOTE-CONTROL, ALARM, AND SIGNAL CIRCUITS; NO 12 AWG.

3.6 FIRESTOPPING

- A. COMPLY WITH REQUIREMENTS IN SECTION 078413 "PENETRATION FIRESTOPPING."
- B. COMPLY WITH TIA-569-B, ANNEX A, "FIRESTOPPING."
- C. COMPLY WITH BICSI ITDM, "FIRESTOPPING" CHAPTER.

3.7 GROUNDING

- A. FOR LOW-VOLTAGE CONTROL WIRING AND CABLING, COMPLY WITH REQUIREMENTS IN SECTION 260526 "GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS."

3.8 IDENTIFICATION

- A. COMPLY WITH REQUIREMENTS FOR IDENTIFICATION SPECIFIED IN SECTION 260553 "IDENTIFICATION FOR ELECTRICAL SYSTEMS."

3.9 FIELD QUALITY CONTROL

- A. PERFORM THE FOLLOWING TESTS AND INSPECTIONS:
- VISUALLY INSPECT UTP AND OPTICAL-FIBER CABLE JACKET MATERIALS FOR UL OR THIRD-PARTY CERTIFICATION MARKINGS. INSPECT CABLING TERMINATIONS TO CONFIRM COLOR-CODING FOR PIN ASSIGNMENTS, AND INSPECT CABLING CONNECTIONS TO CONFIRM COMPLIANCE WITH TIA-568-C.1.
 - VISUALLY INSPECT CABLE PLACEMENT, CABLE TERMINATION, GROUNDING AND BONDING, EQUIPMENT AND PATCH CORDS, AND LABELING OF ALL COMPONENTS.
 - TEST UTP CABLING FOR DIRECT-CURRENT LOOP RESISTANCE, SHORTS, OPENS, INTERMITTENT FAULTS, AND POLARITY BETWEEN CONDUCTORS. TEST OPERATION OF SHORTING BARS IN CONNECTION BLOCKS. TEST CABLES AFTER TERMINATION BUT NOT AFTER CROSS-CONNECTION.
 - TEST INSTRUMENTS SHALL MEET OR EXCEED APPLICABLE REQUIREMENTS IN TIA-568-C.2. PERFORM TESTS WITH A TESTER THAT COMPLIES WITH PERFORMANCE REQUIREMENTS IN "TEST INSTRUMENTS (NORMATIVE)" ANNEX, COMPLYING WITH MEASUREMENT ACCURACY SPECIFIED IN "MEASUREMENT ACCURACY (INFORMATIVE)" ANNEX. USE ONLY TEST CORDS AND ADAPTERS THAT ARE QUALIFIED BY TEST EQUIPMENT MANUFACTURER FOR CHANNEL OR LINK TEST CONFIGURATION.

- B. DOCUMENT DATA FOR EACH MEASUREMENT. PRINT DATA FOR SUBMITTALS IN A SUMMARY REPORT THAT IS FORMATTED USING TABLE 10.1 IN BICSI ITDM AS A GUIDE, OR TRANSFER THE DATA FROM THE INSTRUMENT TO THE COMPUTER, SAVE AS TEXT FILES, PRINT, AND SUBMIT.

- C. END-TO-END CABLING WILL BE CONSIDERED DEFECTIVE IF IT DOES NOT PASS TESTS AND INSPECTIONS.

- D. PREPARE TEST AND INSPECTION REPORTS.

END OF SECTION 260523

260526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 SUMMARY

- A. SECTION INCLUDES GROUNDING SYSTEMS AND EQUIPMENT.

1.2 ACTION SUBMITTALS

- A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED.

1.3 INFORMATIONAL SUBMITTALS

- A. FIELD QUALITY CONTROL REPORTS.

1.4 QUALITY ASSURANCE

- A. ELECTRICAL COMPONENTS, DEVICES, ACCESSORIES: LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.
- B. COMPLY WITH UL 467 FOR GROUNDING AND BONDING MATERIALS AND EQUIPMENT.

PART 2 – PRODUCTS

2.1 CONDUCTORS

- A. INSULATED CONDUCTORS: COPPER WIRE OR CABLE INSULATED FOR 600V UNLESS OTHERWISE REQUIRED BY APPLICABLE CODE OR AUTHORITIES HAVING JURISDICTION.

- B. BARE COPPER CONDUCTORS:
- SOLID CONDUCTORS: ASTM B 3.
 - STRANDED CONDUCTORS: ASTM B 8.
 - TINNED CONDUCTORS: ASTM B 33.
 - BONDING CABLE: 28 KCMIL, 14 STRANDS OF NO. 17 AWG CONDUCTOR, 1/4" IN DIAMETER.
 - BONDING CONDUCTOR: NO. 4 OR NO. 6 AWG, STRANDED CONDUCTOR.
 - BONDING JUMPER: COPPER TAPE, BRAIDED CONDUCTORS TERMINATED WITH COPPER FERRULES, 1-5/8 INCHES WIDE AND 1/16 INCH THICK.
 - TINNED BONDING JUMPER: TINNED-COPPER TAPE, BRAIDED CONDUCTORS TERMINATED WITH COPPER FERRULES, 1-5/8 INCH WIDE AND 1/16 INCH THICK.

2.2 CONNECTORS

- A. LISTED AND LABELED BY AN NRTL 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, PRESSURE TYPE WITH AT LEAST TWO BOLTS.
- 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.

2.3 GROUNDING ELECTRODES

- A. GROUND RODS: COPPER-CLAD STEEL; 3/4 INCH DIAMETER BY 10 FEET LONG UNLESS OTHERWISE INDICATED ON CONSTRUCTION DRAWINGS.

PART 3 – EXECUTION

3.1 APPLICATIONS

- A. CONDUCTORS: INSTALL SOLID CONDUCTOR FOR NO. 8 AWG AND SMALLER, AND STRANDED CONDUCTORS FOR NO. 6 AWG AND LARGER UNLESS OTHERWISE INDICATED.
- B. UNDERGROUND GROUNDING CONDUCTORS: INSTALL BARE TINNED-COPPER CONDUCTOR, NO. 2/0 AWG MINIMUM UNLESS OTHERWISE INDICATED. BURY AT MINIMUM 24 INCHES BELOW GRADE.
- C. ISOLATED GROUNDING CONDUCTORS: GREEN-COLORED INSULATION WITH CONTINUOUS YELLOW STRIPE. ON FEEDERS WITH ISOLATED GROUND, IDENTIFY GROUNDING CONDUCTOR WHERE VISIBLE TO NORMAL INSPECTION WITH ALTERNATING BANDS OF GREEN AND YELLOW TAPE, WITH AT LEAST THREE BAND OF GREEN AND TWO BANDS OF YELLOW.
- D. CONDUCTOR TERMINATIONS AND CONNECTIONS:
- PIPE AND EQUIPMENT GROUNDING CONDUCTOR TERMINATIONS: BOLTED CONNECTORS.
 - UNDERGROUND CONNECTIONS: WELDED CONNECTORS EXCEPT AT TEST WELLS AND AS OTHERWISE INDICATED.
 - CONNECTIONS TO GROUND RODS AT TEST WELLS: BOLTED CONNECTORS.
 - CONNECTIONS TO STRUCTURAL STEEL: WELDED CONNECTORS.

3.2 EQUIPMENT GROUNDING

- A. INSTALL INSULATED EQUIPMENT GROUNDING CONDUCTORS WITH THE FOLLOWING ITEMS, IN ADDITION TO THOSE REQUIRED BY NFPA 70:
- FEEDER AND BRANCH CIRCUITS.
 - LIGHTING CIRCUITS.
 - RECEPTACLE CIRCUITS.
 - SINGLE PHASE MOTOR AND APPLIANCE BRANCH CIRCUITS.
 - THREE PHASE MOTOR AND APPLIANCE BRANCH CIRCUITS.
 - FLEXIBLE RACEWAY RUNS.
 - ARMORED AND METAL CLAD BUS RUNS.
 - BUSWAY SUPPLY CIRCUITS: INSTALL INSULATED EQUIPMENT GROUNDING CONDUCTOR FROM GROUNDING BUS IN THE SWITCHGEAR, SWITCHBOARD, OR DISTRIBUTION PANELBOARD TO EQUIPMENT GROUNDING BAR TERMINAL ON BUSWAY.
 - COMPUTER AND RACK MOUNTED ELECTRONIC EQUIPMENT CIRCUITS: INSTALL INSULATED EQUIPMENT GROUNDING CONDUCTOR IN BRANCH CIRCUIT RUNS FROM EQUIPMENT AREA POWER PANELS AND POWER DISTRIBUTION UNITS.
- B. AIR DUCT EQUIPMENT CIRCUITS: INSTALL INSULATED EQUIPMENT GROUNDING CONDUCTOR TO DUCT MOUNTED ELECTRICAL DEVICES OPERATING AT 120V AND MORE, INCLUDING AIR CLEANERS, HEATERS, DAMPERS, HUMIDIFIERS, AND OTHER DUCT ELECTRICAL EQUIPMENT. BOND CONDUCTOR TO EACH UNIT AND TO AIR DUCT AND CONNECTED METALLIC PIPING.
- C. WATER HEATER, HEAT-TRACING, AND ANTI-FROST HEATING CABLES: INSTALL A SEPARATE INSULATED EQUIPMENT GROUNDING CONDUCTOR TO EACH ELECTRIC WATER HEATER AND HEAT TRACING CABLE. BOND CONDUCTOR TO HEATER UNITS, PIPING, CONNECTED EQUIPMENT, AND COMPONENTS.
- D. METAL POLES SUPPORTING OUTDOOR LIGHTING FIXTURES: INSTALL GROUNDING ELECTRODE AND A SEPARATE INSULATED EQUIPMENT GROUNDING CONDUCTOR IN ADDITION TO GROUNDING CONDUCTOR INSTALLED WITH BRANCH CIRCUIT CONDUCTORS.

3.3 INSTALLATION

- A. GROUNDING CONDUCTORS: ROUTE ALONG SHORTEST AND STRAIGHTEST PATHS POSSIBLE UNLESS OTHERWISE INDICATED OR REQUIRED BY CODE. AVOID OBSTRUCTION ACCESS OR PLACING CONDUCTORS WHERE THEY MAY BE SUBJECT TO DAMAGE.
- B. GROUND RODS: DRIVE RODS UNTIL TOPS ARE 2 INCHES BELOW FINISHED FLOOR OR FINAL GRADE UNLESS OTHERWISE INDICATED.
- INTERCONNECT GROUND RODS WITH GROUNDING ELECTRODE CONDUCTOR BELOW GRADE AND AS OTHERWISE INDICATED. MAKE CONNECTIONS WITHOUT EXPOSING STEEL OR DAMAGING COATING IF ANY.
- C. TEST WELLS: GROUND DRIVEN THROUGH DRILLED HOLE IN BOTTOM OF HANDHOLE AND SHALL BE AT LEAST 12 INCHES DEEP WITH COVER.
- D. BONDING STRAPS AND JUMPERS: INSTALL IN LOCATIONS ACCESSIBLE FOR INSPECTION AND MAINTENANCE EXCEPT WHERE ROUTED THROUGH SHORT LENGTHS OF CONDUIT.
- E. GROUNDING AND BONDING FOR PIPING
- METAL WATER SERVICE PIPE: INSTALL INSULATED COPPER GROUNDING CONDUCTORS IN CONDUIT FROM BUILDING'S MAIN SERVICE EQUIPMENT OR GROUNDING BUS TO MAIN METAL WATER SERVICE ENTRANCES TO BUILDING. CONNECT GROUNDING CONDUCTORS TO MAIN METAL WATER SERVICE PIPE(S) USING A BOLTED CLAMP CONNECTOR OR BOLT A LUG TYPE CONNECTOR TO A PIPE FLANGE USING ONE OF THE LUG BOLTS OF THE FLANGE. WHERE A DIELECTRIC MAIN WATER FITTING IS INSTALLED, CONNECT GROUNDING CONDUCTOR ON STREET SIDE OF THE FITTING. BOND METAL GROUNDING CONDUCTOR CONDUIT OR SLEEVE TO CONDUCTOR AT EACH END.
 - WATER METER PIPING: USE BRAIDED-TYPE BONDING JUMPERS TO ELECTRICALLY BYPASS WATER METERS. CONNECT TO PIPE WITH A BOLTED CONNECTOR.
 - BOND EACH ABOVEGROUND PORTION OF GAS PIPING SYSTEM DOWNSTREAM FROM EQUIPMENT SHUTOFF VALVE.
- F. BONDING INTERIOR METAL DUCTS: BOND METAL AIR DUCTS TO EQUIPMENT GROUNDING CONDUCTORS OF ASSOCIATED FANS, BLOWERS, ELECTRIC HEATERS, AND AIR CLEANERS. INSTALL BONDING JUMPER TO BOND ACROSS FLEXIBLE DUCT CONNECTIONS TO ACHIEVE CONTINUITY.

3.4 LABELING

- A. COMPLY WITH REQUIREMENTS IN ASSOCIATED IDENTIFICATION SPECIFICATIONS AND AS OTHERWISE NOTED IN CONSTRUCTION DOCUMENTS.

3.5 FIELD QUALITY CONTROL

- A. PERFORM THE FOLLOWING TESTS AND INSPECTIONS AND PREPARE TEST REPORTS:
- AFTER INSTALLING GROUNDING SYSTEM BUT BEFORE PERMANENT ELECTRICAL CIRCUITS HAVE BEEN ENERGIZED, TEST FOR COMPLIANCE WITH REQUIREMENTS.
 - INSPECT PHYSICAL AND MECHANICAL CONDITION. VERIFY TIGHTNESS OF ACCESSIBLE, BOLTED, ELECTRICAL CONNECTIONS WITH A CALIBRATED TORQUE WRENCH ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS.
 - TEST COMPLETED GROUNDING SYSTEM AT EACH LOCATION WHERE A MAXIMUM GROUND RESISTANCE LEVEL IS SPECIFIED AT TERMINAL, AND AT AT LEAST ONE ADDITIONAL LOCATION. TEST AT GROUND TEST WELLS. MAKE TESTS AT GROUND RODS BEFORE ANY CONDUCTORS ARE CONNECTED.
- B. REPORT MEASURED GROUND RESISTANCES THAT EXCEED THE FOLLOWING VALUES:
- POWER AND LIGHTING EQUIPMENT OR SYSTEM WITH CAPACITY OF 500KVA AND LESS: 10 OHMS.
 - POWER AND LIGHTING EQUIPMENT OR SYSTEM WITH CAPACITY OF 500-1000KVA: 5 OHMS.
 - POWER AND LIGHTING EQUIPMENT OR SYSTEM WITH CAPACITY MORE THAN 1000KVA: 3 OHMS.
 - POWER DISTRIBUTION UNITS OR PANELBOARDS SERVING ELECTRONIC EQUIPMENT: 1 OHM.
- C. EXCESSIVE GROUND RESISTANCE: IF RESISTANCE TO GROUND EXCEEDS SPECIFIED VALUES, NOTIFY ENGINEER PROMPTLY AND INCLUDE RECOMMENDATIONS TO REDUCE GROUND RESISTANCE.

END OF SECTION 260526

260529 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 SUMMARY

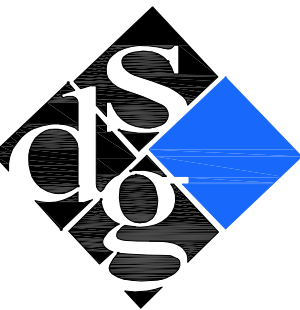
- A. SECTION INCLUDES:
- HANGERS AND SUPPORTS FOR ELECTRICAL EQUIPMENT AND SYSTEMS.
 - CONSTRUCTION REQUIREMENTS FOR CONCRETE BASES.

1.2 PERFORMANCE REQUIREMENTS

- A. DESIGN SUPPORTS FOR MULTIPLE RACEWAYS CAPABLE OF SUPPORTING COMBINED WEIGHT OF SUPPORTED SYSTEMS AND ITS CONTENTS.
- B. DESIGN EQUIPMENT SUPPORTS CAPABLE OF SUPPORTING COMBINED OPERATING WEIGHT OF SUPPORTED EQUIPMENT AND CONNECTED SYSTEMS AND COMPONENTS.

1.3 ACTION SUBMITTALS

- A. PRODUCT DATA: FOR STEEL SLOTTED SUPPORT SYSTEMS.
- B. SHOP DRAWINGS: SHOW FABRICATION AND INSTALLATION DETAILS AND INCLUDE CALCULATIONS FOR THE FOLLOWING: TRAPEZE HANGERS, STEEL SLOTTED CHANNEL SYSTEMS, EQUIPMENT SUPPORTS.



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260529 – HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS CONT.

1.5 QUALITY ASSURANCE

- A. COMPLY WITH NFPA 70.

PART 2 – PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. STEEL SLOTTED SUPPORT SYSTEMS: COMPLY WITH MFMA-4, FABRICATED COMPONENTS FOR FIELD ASSEMBLY.
1. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:
- a. COOPER B-LINE INC. A DIVISION OF COOPER INDUSTRIES.
 - b. UNI-STRUT; TYCO INTERNATIONAL LTD.
2. METALLIC COATINGS: NOT DIPPED GALVANIZED (ALL EXTERIOR APPLICATIONS) AFTER FABRICATION AND APPLIED ACCORDING TO MFMA-4.
3. PAINTED COATINGS: MANUFACTURER'S STANDARD PAINTED COATING (ALL INTERIOR APPLICATIONS) APPLIED ACCORDING TO MFMA-4.
- 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 OR 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. MECHANICAL EXPANSION ANCHORS: INSERT WEDGE-TYPE, STAINLESS STEEL, FOR USE IN HARDENED PORTLAND CEMENT CONCRETE WITH TENSION, SHEAR, AND PULLOUT CAPACITIES APPROPRIATE FOR SUPPORTED LOADS AND BUILDING MATERIALS IN WHICH USED. INSTALL PER MANUFACTURER'S WRITTEN INSTRUCTIONS. COORDINATE INSTALLATION REQUIREMENTS WITH STRUCTURAL ENGINEER AND AUTHORITY HAVING JURISDICTION.
- a. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:
- 1. HILTI INC. (KWIK BOLT T2)
 - 2. SIMPSON STRONG TIE (STRONG BOLT)
 - 3. POWERS (POWER STUD + SD2 ANCHOR)
2. CLAMPS FOR ATTACHMENT TO STEEL STRUCTURAL ELEMENTS: MSS SP-58; TYPE SUITABLE FOR ATTACHED STRUCTURAL ELEMENT.
3. THROUGH BOLTS: STRUCTURAL TYPE, HEX HEAD, AND HIGH STRENGTH. COMPLY WITH ASTM A 325.
4. TOGGLE BOLTS: ALL STEEL SPRINGHEAD TYPE.
5. 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. COORDINATE WITH STRUCTURAL ENGINEER.

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. MAXIMUM SUPPORT SPACING AND MINIMUM HANGER ROD SIZE FOR RACEWAY: SPACE SUPPORTS FOR EMT AND RMC AS REQUIRED BY NFPA 70. MINIMUM ROD SIZE SHALL BE 3/8-INCH IN DIAMETER.
- C. MULTIPLE RACEWAYS OR CABLES: INSTALL TRAPEZE-TYPE SUPPORTS FABRICATED WITH STEEL SLOTTED SUPPORT SYSTEM, SIZED SO CAPACITY CAN BE INCREASED BY AT LEAST 25 PERCENT IN THE FUTURE WITHOUT EXCEEDING SPECIFIED DESIGN LOAD LIMITS. SECURE RACEWAYS TO THESE SUPPORTS WITH TWO-BOLT CONDUIT CLAMPS.
- 3.2 SUPPORT INSTALLATION
- A. COMPLY WITH NECA 1 AND NECA 101 FOR INSTALLATION REQUIREMENTS EXCEPT AS SPECIFIED IN THIS ARTICLE.
- B. RACEWAY SUPPORT METHODS: RACEWAYS SHALL NOT BE SUPPORTED BY OPENINGS THROUGH STRUCTURAL MEMBERS.
- 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 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 MECHANICAL EXPANSION ANCHOR FASTENERS ON SOLID MASONRY UNITS.
 - 4. TO EXISTING CONCRETE: EXPANSION ANCHOR FASTENERS.
 - 5. TO STEEL: WELDED THREADED STUDS, BEAM CLAMPS, OR SPRING TENSION CLAMPS APPROVED BY STRUCTURAL ENGINEER AND AUTHORITY HAVING JURISDICTION.
 - 6. TO LIGHT STEEL: SHEET METAL SCREWS.
7. ITEMS MOUNTED ON HOLLOW WALLS AND NON-STRUCTURAL 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 PER MANUFACTURER'S WRITTEN INSTRUCTIONS AT LOCATIONS AND TO DEPTHS THAT AVOID REINFORCING BARS. COORDINATE WITH STRUCTURAL ENGINEER.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. CUT, FIT, AND PLACE MISC. METAL SUPPORTS ACCURATELY IN LOCATION, ALIGNMENT, AND ELEVATION TO SUPPORT AND ANCHOR ELECTRICAL MATERIALS AND EQUIPMENT.
- 3.4 CONCRETE BASES (COORDINATE WITH ARCHITECT AND STRUCTURAL ENGINEER)

- 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 WILL BE SPECIFIED BY THE ARCHITECT / STRUCTURAL ENGINEER.
- 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 PRODUCTS.
 - 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.
- 3.5 PAINTING
- A. TOUCH-UP: CLEAN FIELD WELDS AND ABRADED AREAS OF SHOP PAINT. PAINT EXPOSED AREAS IMMEDIATELY AFTER ERECTING HANGERS AND SUPPORTS. USE SAME MATERIALS AS USED FOR SHOP PAINTING. COMPLY WITH SSPC-PA 1 REQUIREMENTS FOR TOUCHING UP FIELD PAINTED SURFACES.
- B. GALVANIZED SURFACES: CLEAN WELDS, BOLTED CONNECTIONS, AND ABRADED AREAS AND APPLY GALVANIZING REPAIR PAINT TO COMPLY WITH ASTM A 780. DO NOT APPLY GALVANIZING REPAIR PAINT TO ITEMS INSTALLED UNDER A RAISED ACCESS FLOOR.

END OF SECTION 260529

260533 – RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 SUMMARY

- A. SECTION INCLUDES:
- 1. METAL CONDUITS, TUBING, AND FITTINGS.

- 2. METAL WIREWAYS AND AUXILIARY GUTTERS.
- 3. SURFACE RACEWAYS
- 4. BOXES, ENCLOSURES, AND CABINETS.

1.2 ACTION SUBMITTALS

- A. PRODUCT DATA: FOR SURFACE RACEWAYS, WIREWAYS, AND FITTINGS, FLOOR BOXES, HINGED COVER ENCLOSURES, AND CABINETS.
- B. SHOP DRAWINGS: FOR CUSTOM ENCLOSURES AND CABINETS. INCLUDE PLANS, ELEVATIONS, SECTIONS, AND ATTACHMENT DETAILS.

1.3 INFORMATIONAL SUBMITTALS

- A. COORDINATION DRAWINGS.

PART 2 – PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. LISTING AND LABELING: METAL CONDUITS, TUBING, AND FITTINGS SHALL BE LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.
- B. GRC: COMPLY WITH ANSI C80.1 AND UL 6.
- C. PVC COATED STEEL CONDUIT: PVC COATED RIGID STEEL CONDUIT SHALL COMPLY WITH NEMA RN 1 AND SHALL HAVE A MINIMUM COATING THICKNESS OF 0.040 INCH.
- D. EMT: COMPLY WITH ANSI C80.3 AND UL 797. FITTINGS SHALL BE STEEL AND SHALL BE OF COMPRESSION TYPE.
- E. LFMC: FLEXIBLE STEEL CONDUIT WITH PVC JACKET AND COMPLYING WITH UL 360.
- F. FITTINGS FOR METAL CONDUIT: COMPLY WITH NEMA FB 1 AND UL 514B.

- G. EXPANSION FITTINGS: PVC OR STEEL TO MATCH CONDUIT TYPE COMPLYING WITH UL 651, RATED FOR ENVIRONMENTAL CONDITIONS WHERE INSTALLED, AND INCLUDING FLEXIBLE EXTERNAL BONDING JUMPER.
- H. COATING FOR FITTINGS FOR PVC COATED CONDUIT: MINIMUM THICKNESS OF 0.040 INCH WITH OVERLAPPING SLEEVES PROTECTING THE THREADED JOINTS.

- I. JOINT COMPOUND FOR IMC, GRC: APPROVED AS DEFINED IN NFPA 70 BY AHJ FOR USE IN CONDUIT ASSEMBLIES AND COMPOUNDED FOR USE TO LUBRICATE AND PROTECT THREADED CONDUIT JOINTS FROM CORROSION AND TO ENHANCE THEIR CONDUCTIVITY.

2.2 METAL AND WIREWAYS AND AUXILIARY GUTTERS

- A. DESCRIPTION: SHEET METAL COMPLYING WITH UL 870 AND NEMA 250, TYPE 1 (INTERIOR), TYPE 3R (EXTERIOR) UNLESS OTHERWISE INDICATED AND SIZED ACCORDING TO NFPA 70.
- B. FITTINGS AND ACCESSORIES: INCLUDE COVERS, COUPLINGS, OFFSETS, ELBOWS, EXPANSION JOINTS, ADAPTERS, HOLD-DOWN STRAPS, END CAPS, AND OTHER FITTINGS AS NECESSARY TO MATCH AND MATE WITH WIREWAYS AS REQUIRED FOR A COMPLETE SYSTEM.

2.3 SURFACE RACEWAYS

- A. LISTING AND LABELING: SURFACE RACEWAYS AND TELE-POWER POLES SHALL BE LISTED AND LABELED AS DEFINED IN NFPA 70, BY A QUALIFIED TESTING AGENCY, AND MARKED FOR INTENDED LOCATION AND APPLICATION.
- B. SURFACE METAL RACEWAYS: GALVANIZED STEEL WITH SNAP-ON COVERS COMPLYING WITH UL 5.

2.4 BOXES, ENCLOSURES, AND CABINETS

- A. GENERAL REQUIREMENTS FOR BOXES, ENCLOSURES, AND CABINETS. ALL ITEMS INSTALLED IN WET LOCATIONS SHALL BE LISTED FOR USE IN WET LOCATIONS.
- B. SHEET METAL OUTLET AND DEVICE BOXES: COMPLY WITH NEMA OS 1 AND UL 514A.
- C. CAST METAL OUTLET AND DEVICE BOXES: COMPLY WITH NEMA FB 1, FERROUS-ALLOY, TYPE FD, WITH GASKETED COVER.
- D. METAL FLOOR BOXES: CAST METAL, FULL ADJUSTABLE, RECTANGULAR UNO AND SHALL BE LISTED AND LABELED FOR INTENDED LOCATION AND APPLICATION.
- E. LUMINAIRE OUTLET BOXES: NONADJUSTABLE, DESIGNED FOR ATTACHMENT OF LUMINAIRE SPECIFIED AND SHALL BE LISTED AND MARKED FOR THE MAXIMUM ALLOWABLE WEIGHT.
- F. CAST-METAL ACCESS, PULL, AND JUNCTION BOXES: COMPLY WITH NEMA FB 1 AND UL 1773, GALVANIZED, CAST IRON WITH GASKETED COVER.
- G. BOX EXTENSIONS USED TO ACCOMMODATE NEW BUILDING FINISHED SHALL BE OF SAME MATERIAL AS RECESSED BOX.
- H. DEVICE BOX DIMENSIONS: 4 INCHES SQUARE BY 2-1/8 INCHES DEEP OR 4 INCHES BY 2-1/8 INCHES DEEP.
- I. GANGABLE BOXES ARE PROHIBITED.
- J. HINGED COVER ENCLOSURE: COMPLY WITH UL 50 AND NEMA 250, TYPE 1 (INTERIOR), TYPE 3R (EXTERIOR) WITH CONTINUOUS HINGE COVER WITH FLUSH LATCH UNLESS OTHERWISE INDICATED.
- 1. METAL ENCLOSURES: STEEL, FINISHED INSIDE AND OUT WITH MANUFACTURER'S STANDARD ENAMEL.
 - 2. NONMETALLIC ENCLOSURES: PLASTIC.

PART 3 – EXECUTION

3.1 RACEWAY APPLICATION

- A. INDOORS: APPLY RACEWAY PRODUCTS AS SPECIFIED BELOW UNLESS OTHERWISE INDICATED.
- 1. EXPOSED, NOT SUBJECT TO PHYSICAL DAMAGE; EMT.
 - 2. EXPOSED, NOT SUBJECT TO SEVERE PHYSICAL DAMAGE: EMT
 - 3. EXPOSED AND SUBJECT TO SEVERE PHYSICAL DAMAGE: GRC. RACEWAY LOCATIONS INCLUDE THE FOLLOWING:
 - a. LOADING DOCK.
 - b. CORRIDORS USED FOR TRAFFIC OF MECHANIZED CARTS, FORKLIFTS, AND PALLET-HANDLING UNITS.
 - c. MECHANICAL ROOMS
4. CONCEALED IN CEILINGS AND INTERIOR WALLS AND PARTITIONS: EMT.
5. CONNECTION TO VIBRATING EQUIPMENT (INCLUDING TRANSFORMERS AND HYDRAULIC, PNEUMATIC, ELECTRIC SOLENOID, OR MOTOR-DRIVEN EQUIPMENT): FMC, EXCEPT USE LFMC IN DAMP OR WET LOCATIONS.
6. DAMP OR WET LOCATIONS: GRC.
7. BOXES AND ENCLOSURES: NEMA 250, TYPE 1, EXCEPT USE NEMA 250, TYPE 4 STAINLESS STEEL IN INSTITUTIONAL AND COMMERCIAL KITCHENS AND DAMP OR WET LOCATIONS.
- C. MINIMUM RACEWAY SIZE: 3/4-INCH (21-MM) TRADE SIZE.
- D. RACEWAY FITTINGS: COMPATIBLE WITH RACEWAYS AND SUITABLE FOR USE AND LOCATION.
- 1. RIGID AND INTERMEDIATE STEEL CONDUIT: USE THREADED RIGID STEEL CONDUIT FITTINGS UNLESS OTHERWISE INDICATED. COMPLY WITH NEMA FB 2.10.
 - 2. PVC EXTERNALLY COATED, RIGID STEEL CONDUITS: USE ONLY FITTINGS LISTED FOR USE WITH THIS TYPE OF CONDUIT. PATCH AND SEAL ALL JOINTS, NICKS, AND SCRAPES IN PVC COATING AFTER INSTALLING CONDUITS AND FITTINGS. USE SEALANT RECOMMENDED BY MANUFACTURER AND APPLY IN THICKNESS AND NUMBER OF COATS RECOMMENDED BY MANUFACTURER.
 - 3. EMT: USE COMPRESSION, STEEL FITTINGS. COMPLY WITH NEMA FB 2.10.
 - 4. FLEXIBLE CONDUIT: USE ONLY FITTINGS LISTED FOR USE WITH FLEXIBLE CONDUIT. COMPLY WITH NEMA FB 2.20. TRANSITIONS FROM FMC TO EMT SHALL BE COMPRESSION TYPE.

3.2 INSTALLATION

- A. COMPLY WITH NECA 1 AND NECA 101 FOR INSTALLATION REQUIREMENTS EXCEPT WHERE REQUIREMENTS ON DRAWINGS OR IN THIS ARTICLE ARE STRICTER. COMPLY WITH NFPA 70 LIMITATIONS FOR TYPES OF RACEWAYS ALLOWED IN SPECIFIC OCCUPANCIES AND NUMBER OF FLOORS.
- B. KEEP RACEWAYS AT LEAST 12 INCHES (150 MM) AWAY FROM PARALLEL RUNS OF FLUES AND STEAM OR HOT-WATER PIPES. INSTALL HORIZONTAL RACEWAY RUNS ABOVE WATER AND STEAM PIPING.
- C. INSTALL NO MORE THAN THE EQUIVALENT OF THREE 90-DEGREE BENDS IN ANY CONDUIT RUN EXCEPT FOR CONTROL WIRING CONDUITS, FOR WHICH FEWER BENDS ARE ALLOWED. SUPPORT WITHIN 12 INCHES (300 MM) OF CHANGES IN DIRECTION.

- D. CONCEAL CONDUIT AND EMT WITHIN FINISHED WALLS, CEILINGS, AND FLOORS UNLESS OTHERWISE INDICATED. INSTALL CONDUITS PARALLEL OR PERPENDICULAR TO BUILDING LINES.
- E. SUPPORT CONDUIT WITHIN 12 INCHES (300 MM)OF ENCLOSURES TO WHICH ATTACHED.
- F. STUB-UPS TO ABOVE RECESSED CEILINGS:
- 1. USE EMT RACEWAYS.
 - 2. USE A CONDUIT BUSHING OR INSULATED FITTING TO TERMINATE STUB-UPS NOT TERMINATED IN HUBS OR IN AN ENCLOSURE.
- G. RACEWAY TERMINATIONS AT LOCATIONS SUBJECT TO MOISTURE OR VIBRATION: USE INSULATING BUSHINGS TO PROTECT CONDUCTORS INCLUDING CONDUCTORS SMALLER THAN NO. 4 AWG.

- H. TERMINATE THREADED CONDUITS INTO THREADED HUBS OR WITH LOCKNUTS ON INSIDE AND OUTSIDE OF BOXES OR CABINETS: INSTALL BUSHINGS ON CONDUITS UP TO 1-1/4-INCH (35-MM) TRADE SIZE AND INSULATED THROAT METAL BUSHINGS ON 1-1/2-INCH (41-MM) TRADE SIZE AND LARGER CONDUITS TERMINATED WITH LOCKNUTS. INSTALL INSULATED THROAT METAL GROUNDING BUSHINGS ON SERVICE CONDUITS.

- I. INSTALL PULL WIRES IN EMPTY RACEWAYS. USE POLYPROPYLENE OR MONOFILAMENT PLASTIC LINE WITH NOT LESS THAN 200-LB (90-KG) TENSILE STRENGTH. LEAVE AT LEAST 12 INCHES (300 MM) OF SLACK AT EACH END OF PULL WIRE. CAP UNDERGROUND RACEWAYS DESIGNATED AS SPARE ABOVE GRADE ALONGSIDE RACEWAYS IN USE.

- J. INSTALL RACEWAY SEALING FITTINGS AT ACCESSIBLE LOCATIONS ACCORDING TO NFPA 70 AND FILL THEM WITH LISTED SEALING COMPOUND. FOR CONCEALED RACEWAYS, INSTALL EMT FITTING IN A FLUSH STEEL BOX WITH A BLANK COVER PLATE HAVING A FINISH SIMILAR TO THAT OF ADJACENT PLATES OR SURFACES.

- K. INSTALL DEVICES TO SEAL RACEWAY INTERIORS AT ACCESSIBLE LOCATIONS. LOCATE SEALS SO NO FITTINGS OR BOXES ARE BETWEEN THE SEAL AND THE FOLLOWING CHANGES OF ENVIRONMENTS. SEAL THE INTERIOR OF ALL RACEWAYS AT THE FOLLOWING POINTS:
- 1. WHERE CONDUITS PASS FROM WARM TO COLD LOCATIONS, SUCH AS BOUNDARIES OF REFRIGERATED SPACES.
 - 2. WHERE AN UNDERGROUND SERVICE RACEWAY ENTERS A BUILDING OR STRUCTURE.
 - 3. WHERE OTHERWISE REQUIRED BY NFPA 70.

- N. FLEXIBLE CONDUIT CONNECTIONS: COMPLY WITH NEMA RV 3. USE A MAXIMUM OF 72 INCHES (1830 MM) OF FLEXIBLE CONDUIT FOR RECESSED AND SEMIRECESSED LUMINAIRES, EQUIPMENT SUBJECT TO VIBRATION, NOISE TRANSMISSION, OR MOVEMENT; AND FOR TRANSFORMERS AND MOTORS.
- 1. USE LFMC IN DAMP OR WET LOCATIONS.

- O. MOUNT BOXES AT HEIGHTS INDICATED ON DRAWINGS. IF MOUNTING HEIGHTS OF BOXES ARE NOT INDIVIDUALLY INDICATED, GIVE PRIORITY TO ADA REQUIREMENTS. INSTALL BOXES WITH HEIGHT MEASURED TO CENTER OF BOX UNLESS OTHERWISE INDICATED.

- P. HORIZONTALLY SEPARATE BOXES MOUNTED ON OPPOSITE SIDES OF WALLS SO THEY ARE NOT IN THE SAME VERTICAL CHANNEL.

- Q. LOCATE BOXES SO THAT COVER OR PLATE WILL NOT SPAN DIFFERENT BUILDING FINISHES.

- R. SUPPORT BOXES OF THREE GANGS OR MORE FROM MORE THAN ONE SIDE BY SPANNING TWO FRAMING MEMBERS OR MOUNTING ON BRACKETS SPECIFICALLY DESIGNED FOR THE PURPOSE.

- S. FASTEN JUNCTION AND PULL BOXES TO OR SUPPORT FROM BUILDING STRUCTURE. DO NOT SUPPORT BOXES BY CONDUITS.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. INSTALL SLEEVES AND SLEEVE SEALS AT PENETRATIONS OF EXTERIOR FLOOR AND WALL ASSEMBLIES.

3.4 FIRESTOPPING

- A. INSTALL FIRESTOPPING AT PENETRATIONS OF FIRE-RATED FLOOR AND WALL ASSEMBLIES.

3.5 PROTECTION

- A. PROTECT COATINGS, FINISHES, AND CABINETS FROM DAMAGE AND DETERIORATION.
- 1. REPAIR DAMAGE TO GALVANIZED FINISHES WITH ZINC-RICH PAINT RECOMMENDED BY MANUFACTURER.
 - 2. REPAIR DAMAGE TO PVC COATINGS OR PAINT FINISHES WITH MATCHING TOUCHUP COATING RECOMMENDED BY MANUFACTURER.

END OF SECTION 260533

260553 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 – GENERAL

1.1 SUMMARY

- A. SECTION INCLUDES:
- 1. IDENTIFICATION FOR RACEWAYS.
 - 2. IDENTIFICATION OF POWER AND CONTROL CABLES.
 - 3. IDENTIFICATION FOR CONDUCTORS.
 - 4. WARNING LABELS AND SIGNS.
 - 5. INSTRUCTION SIGNS.
 - 6. EQUIPMENT IDENTIFICATION LABELS.
 - 7. MISCELLANEOUS IDENTIFICATION PRODUCTS.

1.2 ACTION SUBMITTALS

- A. PRODUCT DATA: FOR EACH ELECTRICAL IDENTIFICATION PRODUCT INDICATED.

1.3 QUALITY ASSURANCE

- A. COMPLY WITH ANSI A13.1.
- B. COMPLY WITH NFPA 70.
- C. COMPLY WITH 29 CFR 1910.144 AND 29 CFR 1910.145.
- D. COMPLY WITH ANSI Z535.4 FOR SAFETY SIGNS AND LABELS.
- E. ADHESIVE-ATTACHED LABELING MATERIALS, INCLUDING LABEL STOCKS, LAMINATING ADHESIVES, AND INKS USED BY LABEL PRINTERS, SHALL COMPLY WITH UL 969.

PART 2 – PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

- A. COLORS FOR RACEWAYS CARRYING CIRCUITS AT 600 V OR LESS:
- 1. BLACK LETTERS ON WHITE FIELD (UTILITY POWER)
 - 2. BLUE LETTERS ON WHITE FIELD (UPS POWER)
 - 3. RED LETTERS ON WHIT FIELD (EPO)
 - 4. WHITE LETTERS ON BLUE FIELD (BAS)
 - 5. WHITE LETTERS ON RED FIELD (FIRE ALARM)
 - 6. WHITE LETTERS ON BLACK FIELD (DC POWER)
- B. SELF-ADHESIVE VINYL LABELS FOR RACEWAYS CARRYING CIRCUITS AT 600 V OR LESS: PREPRINTED, FLEXIBLE LABEL LAMINATED WITH A CLEAR, WEATHER- AND CHEMICAL-RESISTANT COATING AND MATCHING WRAPAROUND ADHESIVE TAPE FOR SECURING ENDS OF LEGEND LABEL.

2.3 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. COMPLY WITH ANSI A13.1 FOR MINIMUM SIZE OF LETTERS FOR LEGEND AND FOR MINIMUM LENGTH OF COLOR FIELD FOR EACH RACEWAY AND CABLE SIZE.

- B. SELF-ADHESIVE VINYL LABELS: PREPRINTED, FLEXIBLE LABEL LAMINATED WITH A CLEAR, WEATHER- AND CHEMICAL-RESISTANT COATING AND MATCHING WRAPAROUND ADHESIVE TAPE FOR SECURING ENDS OF LEGEND LABEL.

2.4 CONDUCTOR IDENTIFICATION MATERIALS

- A. COLOR-CODING CONDUCTOR TAPE: COLORED, SELF-ADHESIVE VINYL TAPE NOT LESS THAN 3 MILS (0.08 MM) THICK BY 1 TO 2 INCHES (25 TO 50 MM) WIDE.

2.7 WARNING LABELS AND SIGNS

- A. COMPLY WITH NFPA 70 AND 29 CFR 1910.145.

- B. SELF-ADHESIVE WARNING LABELS: FACTORY-PRINTED, MULTICOLOR, PRESSURE-SENSITIVE ADHESIVE

- LABELS, CONFIGURED FOR DISPLAY ON FRONT COVER, DOOR, OR OTHER ACCESS TO EQUIPMENT UNLESS OTHERWISE INDICATED.

- C. WARNING LABEL AND SIGN SHALL INCLUDE, BUT ARE NOT LIMITED TO, THE FOLLOWING LEGENDS:
- 1. MULTIPLE POWER SOURCE WARNING: "DANGER – ELECTRICAL SHOCK HAZARD – EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. WORKSPACE CLEARANCE WARNING: "WARNING – OSHA REGULATION – AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES (915 MM)."

2.9 EQUIPMENT IDENTIFICATION LABELS

- A. SELF-ADHESIVE, ENGRAVED, LAMINATED ACRYLIC OR MELAMINE LABEL: ADHESIVE BACKED, WITH WHITE LETTERS ON A DARK-GRAY BACKGROUND. MINIMUM LETTER HEIGHT SHALL BE 3/8 INCH (10 MM).

PART 3 – EXECUTION


3.1 INSTALLATION

- A. LOCATION: INSTALL IDENTIFICATION MATERIALS AND DEVICES AT LOCATIONS FOR MOST CONVENIENT VIEWING WITHOUT INTERFERENCE WITH OPERATION AND MAINTENANCE OF EQUIPMENT.
- B. APPLY IDENTIFICATION DEVICES TO SURFACES THAT REQUIRE FINISH AFTER COMPLETING FINISH WORK.
- C. SELF-ADHESIVE IDENTIFICATION PRODUCTS: CLEAN SURFACES BEFORE APPLICATION, USING MATERIALS AND METHODS RECOMMENDED BY MANUFACTURER OF IDENTIFICATION DEVICE.
- D. ATTACH SIGNS AND PLASTIC LABELS THAT ARE NOT SELF-ADHESIVE TYPE WITH MECHANICAL FASTENERS APPROPRIATE TO THE LOCATION AND SUBSTRATE.
- E. SYSTEM IDENTIFICATION COLOR-CODING BANDS FOR RACEWAYS AND CABLES: EACH COLOR-CODING BAND SHALL COMPLETELY ENCIROLE CABLE OR CONDUIT. PLACE ADJACENT BANDS OF TWO-COLOR MARKINGS IN CONTACT, SIDE BY SIDE. LOCATE BANDS AT CHANGES IN DIRECTION, AT PENETRATIONS OF WALLS AND FLOORS, AT 50-FOOT (15-M) MAXIMUM INTERVALS IN STRAIGHT RUNS, AND AT 25-FOOT (7.6-M) MAXIMUM INTERVALS IN CONGESTED AREAS.

3.2 IDENTIFICATION SCHEDULE

- A. POWER-CIRCUIT CONDUCTOR IDENTIFICATION, 600 V OR LESS: FOR CONDUCTORS IN VAULTS, PULL AND JUNCTION BOXES, MANHOLES, AND HANDHOLES, USE COLOR-CODING CONDUCTOR TAPE TO IDENTIFY THE PHASE.
- 1. COLOR-CODING FOR PHASE AND VOLTAGE LEVEL IDENTIFICATION, 600 V OR LESS: USE COLORS LISTED BELOW FOR UNGROUNDED SERVICE, FEEDER, AND BRANCH-CIRCUIT] CONDUCTORS.
 - a. COLOR SHALL BE FACTORY APPLIED.
 - b. COLORS FOR 208/120-V CIRCUITS:
 - 1) PHASE A: BLACK.
 - 2) PHASE B: RED.
 - 3) PHASE C: BLUE.
 - c. COLORS FOR 480/277-V CIRCUITS:
 - 1) PHASE A: BROWN.
 - 2) PHASE B: ORANGE.
 - 3) PHASE C: YELLOW.
- B. INSTALL INSTRUCTIONAL SIGN INCLUDING THE COLOR-CODE FOR GROUNDED AND UNGROUNDED CONDUCTORS USING ADHESIVE-FILM-TYPE LABELS.
- C. AUXILIARY ELECTRICAL SYSTEMS CONDUCTOR IDENTIFICATION: IDENTIFY FIELD-INSTALLED ALARM, CONTROL, AND SIGNAL CONNECTIONS.
- 1. IDENTIFY CONDUCTORS, CABLES, AND TERMINALS IN ENCLOSURES AND AT JUNCTIONS, TERMINALS, AND PULL POINTS. IDENTIFY BY SYSTEM AND CIRCUIT DESIGNATION.
 - 2. USE SYSTEM OF MARKER TAPE DESIGNATIONS THAT IS UNIFORM AND CONSISTENT WITH SYSTEM USED BY MANUFACTURER FOR FACTORY-INSTALLED CONNECTIONS.
 - 3. COORDINATE IDENTIFICATION WITH PROJECT DRAWINGS, MANUFACTURER'S WIRING DIAGRAMS, AND THE OPERATION AND MAINTENANCE MANUAL.
- D. WARNING LABELS FOR INDOOR CABINETS, BOXES, AND ENCLOSURES FOR POWER AND LIGHTING: SELF-ADHESIVE WARNING LABELS.
- 1. COMPLY WITH 29 CFR 1910.145.
 - 2. IDENTIFY SYSTEM VOLTAGE WITH BLACK LETTERS ON AN ORANGE BACKGROUND.
 - 3. APPLY TO EXTERIOR OF DOOR, COVER, OR OTHER ACCESS.
 - 4. FOR EQUIPMENT WITH MULTIPLE POWER OR CONTROL SOURCES, APPLY TO DOOR OR COVER OF EQUIPMENT INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING:
 - a. POWER TRANSFER SWITCHES, SWITCHBOARDS, AND SWITCHGEAR.
 - b. CONTROLS WITH EXTERNAL CONTROL POWER CONNECTIONS.

- E. EQUIPMENT IDENTIFICATION LABELS: ON EACH UNIT OF EQUIPMENT, INSTALL UNIQUE DESIGNATION LABEL THAT IS CONSISTENT WITH WIRING DIAGRAMS, SCHEDULES, AND THE OPERATION AND MAINTENANCE MANUAL. APPLY LABELS TO DISCONNECT SWITCHES AND PROTECTION EQUIPMENT, CENTRAL OR MASTER UNITS, CONTROL PANELS, CONTROL STATIONS, TERMINAL CABINETS, AND RACKS OF EACH SYSTEM. SYSTEMS INCLUDE POWER, LIGHTING, CONTROL, COMMUNICATION, SIGNAL, MONITORING, AND ALARM SYSTEMS UNLESS EQUIPMENT IS PROVIDED WITH ITS OWN IDENTIFICATION.
1. LABELING INSTRUCTIONS:
- a. INDOOR EQUIPMENT: SELF-ADHESIVE, ENGRAVED, LAMINATED ACRYLIC OR MELAMINE LABEL. UNLESS OTHERWISE INDICATED, PROVIDE A SINGLE LINE OF TEXT WITH 1/2-INCH- (13-MM-) HIGH LETTERS ON 1-1/2-INCH- (38-MM-) HIGH LABEL; WHERE TWO LINES OF TEXT ARE REQUIRED, USE LABELS 2 INCHES (50 MM) HIGH.
 - b. ELEVATED COMPONENTS: INCREASE SIZES OF LABELS AND LETTERS TO THOSE APPROPRIATE FOR VIEWING FROM THE FLOOR.
 - c. UNLESS PROVIDED WITH SELF-ADHESIVE MEANS OF ATTACHMENT, FASTEN LABELS WITH APPROPRIATE MECHANICAL FASTENERS THAT DO NOT CHANGE THE NEMA OR NRTL RATING OF THE ENCLOSURE.




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ISG PROJECT #: 19-6423-0




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ISG PROJECT #: 19-6423-0

REVISIONS / AUTHORIZATIONS				
NO.	REVISIONS / AUTHORIZATIONS	DATE	BY	

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PROJECT TITLE: PIPE AND CHILLER REPLACEMENT

CORPORATE REAL ESTATE

00
202 EAST 3RD STREET
LEES SUMMIT (JACKSON COUNTY)
MISSOURI US
KSCYM041 123785.03.01 E05156

ELECTRICAL SPECIFICATIONS

SHEET TITLE:

AT&T PROJECT NUMBER:
A01KYNV

DATE: 01/21/20
DRAWN BY: SVL

SCALE: NONE
CHECKED BY: DJZ

AT&T AUTHORIZATION:
MATT LONG

SHEET: — OF: — SHEETS
AT&T DRAWING NO.:

SHEET NO.
E004

LOCATION: N:\project\19-6423-0 (ATT - LS CO Chiller Replacement)\CAD\26001 E003 ELECTRICAL SPECIFICATIONS.dwg
PLOT DATE: January 24, 2020
PLOTTED BY: SHANE

262416 – PANELBOARDS

PART 1 – GENERAL

- 1.1 SUMMARY
- A. SECTION INCLUDES DISTRIBUTION PANELBOARDS AND LIGHTING AND APPLIANCE BRANCH–CIRCUIT PANELBOARDS.
- 1.2 ACTION 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. DETAIL FEATURES, CHARACTERISTICS, RATINGS, AND FACTORY SETTINGS OF INDIVIDUAL OVERCURRENT PROTECTIVE DEVICES AND AUXILIARY COMPONENTS.
6. INCLUDE WIRING DIAGRAMS FOR POWER, SIGNAL, AND CONTROL WIRING.
7. INCLUDE TIME–CURRENT COORDINATION CURVES FOR EACH TYPE AND RATING OF OVERCURRENT PROTECTIVE DEVICE INCLUDED IN PANELBOARDS.
- 1.3 INFORMATIONAL SUBMITTALS
- A. FIELD QUALITY–CONTROL REPORTS.
- B. PANELBOARD SCHEDULES FOR INSTALLATION IN PANELBOARDS.
- 1.4 CLOSEOUT SUBMITTALS
- A. OPERATION AND MAINTENANCE DATA.
- 1.5 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.

PART 2 – PRODUCTS

- 2.1 GENERAL REQUIREMENTS FOR PANELBOARDS
- A. ENCLOSURES: FLUSH– AND SURFACE–MOUNTED CABINETS AS INDICATED ON CONSTRUCTION DRAWINGS.
- B.
1. RATED FOR ENVIRONMENTAL CONDITIONS AT INSTALLED LOCATION.
- a. INDOOR DRY AND CLEAN LOCATIONS: NEMA 250, TYPE 1.
- b. OUTDOOR LOCATIONS: NEMA 250, TYPE 3R.
- c. WASH–DOWN AREAS: NEMA 250, TYPE 4X, STAINLESS STEEL.
- d. OTHER WET OR DAMP INDOOR LOCATIONS: NEMA 250, TYPE 4.
- e. COORDINATE ABOVE REQUIREMENTS WITH CONSTRUCTION DRAWINGS. IF A DISCREPANCY IS FOUND BETWEEN THE SPECIFICATION AND CONSTRUCTION DRAWINGS, NOTIFY THE ENGINEER FOR DETERMINATION OF CORRECT ENCLOSURE.
2. FRONT: SECURED TO BOX WITH CONCEALED TRIM CLAMPS. FOR SURFACE–MOUNTED FRONTS, MATCH BOX DIMENSIONS; FOR FLUSH–MOUNTED FRONTS, OVERLAP BOX.
3. HINGED FRONT COVER: ENTIRE FRONT TRIM HINGED TO BOX AND WITH STANDARD DOOR WITHIN HINGED TRIM COVER.
4. DIRECTORY CARD: INSIDE PANELBOARD DOOR, MOUNTED IN TRANSPARENT CARD HOLDER.
- C. INCOMING MAINS LOCATION: TOP AND BOTTOM AS INDICATED ON CONSTRUCTION DRAWINGS. FIELD VERIFY WITH SITE CONDITIONS.
- D. PHASE, NEUTRAL, AND GROUND BUSES: **HARD–DRAWN COPPER, 98 PERCENT CONDUCTIVITY.**
- E. CONDUCTOR CONNECTORS: SUITABLE FOR USE WITH CONDUCTOR MATERIAL AND SIZES.
1. MATERIAL: **HARD–DRAWN COPPER, 98 PERCENT CONDUCTIVITY.**
2. MAIN AND NEUTRAL LUGS: **COMPRESSION TYPE.**
3. GROUND LUGS AND BUS CONFIGURED TERMINATORS: **COMPRESSION TYPE.**

- F. FUTURE DEVICES: MOUNTING BRACKETS, BUS CONNECTIONS, FILLER PLATES, AND NECESSARY APPURTENANCES REQUIRED FOR FUTURE INSTALLATION OF DEVICES.
- G. PANELBOARD SHORT–CIRCUIT CURRENT RATING: FULLY RATED TO INTERRUPT SYMMETRICAL SHORT–CIRCUIT CURRENT AVAILABLE AT TERMINALS.
- 2.2 PERFORMANCE REQUIREMENTS
- A. SURGE SUPPRESSION: FACTORY INSTALLED AS AN INTEGRAL PART OF INDICATED PANELBOARDS, COMPLYING WITH UL 1449 SPD TYPE 1.
- 2.3 DISTRIBUTION PANELBOARDS

- A. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:
1. **EATON ELECTRICAL INC.; CUTLER–HAMMER BUSINESS UNIT.**
2. **SIEMENS ENERGY & AUTOMATION, INC.**
3. **SQUARE D; A BRAND OF SCHNEIDER ELECTRIC.**
- B. PANELBOARDS: NEMA PB 1, POWER AND FEEDER DISTRIBUTION TYPE.
- C. DOORS: SECURED WITH VAULT–TYPE LATCH WITH TUMBLER LOCK; KEYED ALIKE.

- D. MAINS: CIRCUIT BREAKER OR LUGS ONLY AS INDICATED ON CONSTRUCTION DRAWINGS.
- E. BRANCH OVERCURRENT PROTECTIVE DEVICES: FOR CIRCUIT–BREAKER FRAME SIZES 125 A AND SMALLER: PLUG–IN CIRCUIT BREAKERS WHERE INDIVIDUAL POSITIVE–LOCKING DEVICE REQUIRES MECHANICAL RELEASE FOR REMOVAL.
- F. BRANCH OVERCURRENT PROTECTIVE DEVICES: FOR CIRCUIT–BREAKER FRAME SIZES LARGER THAN 125 A: PLUG–IN CIRCUIT BREAKERS WHERE INDIVIDUAL POSITIVE–LOCKING DEVICE REQUIRES MECHANICAL RELEASE FOR REMOVAL.
- 2.4 LIGHTING AND APPLIANCE BRANCH–CIRCUIT PANELBOARDS

- A. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:
1. **EATON ELECTRICAL INC.; CUTLER–HAMMER BUSINESS UNIT.**
2. **SIEMENS ENERGY & AUTOMATION, INC.**
3. **SQUARE D; A BRAND OF SCHNEIDER ELECTRIC.**
- B. PANELBOARDS: NEMA PB 1, LIGHTING AND APPLIANCE BRANCH–CIRCUIT TYPE.
- C. MAINS: CIRCUIT BREAKER OR LUGS ONLY AS INDICATED ON CONSTRUCTION DRAWINGS.

- D. BRANCH OVERCURRENT PROTECTIVE DEVICES: PLUG–IN OR BOLT–ON CIRCUIT BREAKERS, REPLACEABLE WITHOUT DISTURBING ADJACENT UNITS.
- E. DOORS: CONCEALED HINGES; SECURED WITH FLUSH LATCH WITH TUMBLER LOCK; KEYED ALIKE.
- 2.5 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:
1. **EATON ELECTRICAL INC.; CUTLER–HAMMER BUSINESS UNIT.**
2. **SIEMENS ENERGY & AUTOMATION, INC.**
3. **SQUARE D; A BRAND OF SCHNEIDER ELECTRIC.**
- B. MOLDED–CASE CIRCUIT BREAKER (MCCB): COMPLY WITH UL 489, WITH INTERRUPTING CAPACITY TO MEET AVAILABLE FAULT CURRENTS.
1. 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.
2. ADJUSTABLE INSTANTANEOUS–TRIP CIRCUIT BREAKERS: MAGNETIC TRIP ELEMENT WITH FRONT–MOUNTED, FIELD–ADJUSTABLE TRIP SETTING.
3. GFCI CIRCUIT BREAKERS: SINGLE– AND TWO–POLE CONFIGURATIONS WITH CLASS A GROUND–FAULT PROTECTION (6–MA TRIP).
4. GROUND–FAULT EQUIPMENT PROTECTION (GFEF) CIRCUIT BREAKERS: CLASS B GROUND–FAULT PROTECTION (30–MA TRIP).
5. ARC–FAULT CIRCUIT INTERRUPTER (AFCI) CIRCUIT BREAKERS: COMPLY WITH UL 1699; 120/240–V, SINGLE–POLE CONFIGURATION.
6. MOLDED–CASE CIRCUIT–BREAKER (MCCB) FEATURES AND ACCESSORIES:
- a. STANDARD FRAME SIZES, TRIP RATINGS, AND NUMBER OF POLES.
- b. LUGS: COMPRESSION STYLE, SUITABLE FOR NUMBER, SIZE, TRIP RATINGS, AND CONDUCTOR MATERIALS.
- c. APPLICATION LISTING: APPROPRIATE FOR APPLICATION; TYPE SMD FOR SWITCHING FLUORESCENT LIGHTING LOADS; TYPE HID FOR FEEDING FLUORESCENT AND HIGH–INTENSITY DISCHARGE (HID) LIGHTING CIRCUITS.
- d. HANDLE PADLOCKING DEVICE: FIXED ATTACHMENT, FOR LOCKING CIRCUIT–BREAKER HANDLE IN OFF POSITION.

PART 3 – EXECUTION

- 3.1 INSTALLATION
- A. RECEIVE, INSPECT, HANDLE, STORE AND INSTALL PANELBOARDS AND ACCESSORIES ACCORDING TO NECA 407.
- B. MOUNT TOP OF TRIM 90 INCHES (2286 MM) ABOVE FINISHED FLOOR UNLESS OTHERWISE INDICATED. CONTRACTOR TO VERIFY THE OPERATING HANDLE OF THE TOP–MOST SWITCH OR CIRCUIT BREAKER, IN THE ON POSITION IS NOT HIGHER THAN 79 INCHES ABOVE FINISHED FLOOR OR GRADE.
- C. 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.
- D. INSTALL OVERCURRENT PROTECTIVE DEVICES AND CONTROLLERS NOT ALREADY FACTORY INSTALLED.
1. SET FIELD–ADJUSTABLE, CIRCUIT–BREAKER TRIP RANGES.
- E. INSTALL FILLER PLATES IN UNUSED SPACES.
- F. ARRANGE CONDUCTORS IN GUTTERS INTO GROUPS AND BUNDLE AND WRAP WITH WIRE TIES.
- G. COMPLY WITH NECA 1.
- 3.2 IDENTIFICATION

- A. IDENTIFY FIELD–INSTALLED CONDUCTORS, INTERCONNECTING WIRING, AND COMPONENTS; PROVIDE WARNING SIGNS COMPLYING WITH SECTION 260553 "IDENTIFICATION FOR ELECTRICAL SYSTEMS" AND AS INDICATED ON CONSTRUCTION DRAWINGS.
- B. CREATE A DIRECTORY TO INDICATE INSTALLED CIRCUIT LOADS AND INCORPORATING OWNER'S FINAL ROOM DESIGNATIONS. OBTAIN APPROVAL BEFORE INSTALLING; USE A COMPUTER OR TYPEWRITER TO CREATE DIRECTORY; HANDWRITTEN DIRECTORIES ARE NOT ACCEPTABLE.
- C. PANELBOARD NAMEPLATES: LABEL EACH PANELBOARD WITH A NAMEPLATE COMPLYING WITH REQUIREMENTS FOR IDENTIFICATION SPECIFIED IN SECTION 260553 "IDENTIFICATION FOR ELECTRICAL SYSTEMS" AND AS INDICATED ON CONSTRUCTION DRAWINGS.
- D. DEVICE NAMEPLATES: LABEL EACH BRANCH CIRCUIT DEVICE IN DISTRIBUTION PANELBOARDS WITH A NAMEPLATE COMPLYING WITH REQUIREMENTS FOR IDENTIFICATION SPECIFIED IN SECTION 260553 "IDENTIFICATION FOR ELECTRICAL SYSTEMS" AND AS INDICATED ON CONSTRUCTION DRAWINGS.

- 3.3 FIELD QUALITY CONTROL
- A. PERFORM TESTS AND INSPECTIONS.
- B. ACCEPTANCE TESTING PREPARATION:
1. TEST INSULATION RESISTANCE FOR EACH PANELBOARD BUS, 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. PANELBOARDS WILL BE CONSIDERED DEFECTIVE IF THEY DO NOT PASS TESTS AND INSPECTIONS.
- E. 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.

END OF SECTION 262416

SECTION 262813 – FUSES

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. CARTRIDGE FUSES RATED 600–V AC AND LESS FOR USE IN CONTROL CIRCUITS ENCLOSED SWITCHES.
2. SPARE–FUSE CABINETS.
- 1.3 SUBMITTALS
- A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT INDICATED. INCLUDE CONSTRUCTION DETAILS, MATERIAL, DIMENSIONS, DESCRIPTIONS OF INDIVIDUAL COMPONENTS, AND FINISHES FOR SPARE–FUSE CABINETS. INCLUDE THE FOLLOWING FOR EACH FUSE TYPE INDICATED.
1. AMBIENT TEMPERATURE ADJUSTMENT INFORMATION: IF RATINGS OF FUSES HAVE BEEN ADJUSTED TO ACCOMMODATE AMBIENT TEMPERATURES, PROVIDE LIST OF FUSES WITH ADJUSTED RATINGS.

- a. FOR EACH FUSE HAVING ADJUSTED RATINGS, INCLUDE LOCATION OF FUSE, ORIGINAL FUSE RATING, LOCAL AMBIENT TEMPERATURE, AND ADJUSTED FUSE RATING.
- b. PROVIDE MANUFACTURER'S TECHNICAL DATA ON WHICH AMBIENT TEMPERATURE ADJUSTMENT CALCULATIONS ARE BASED.
2. DIMENSIONS AND MANUFACTURER'S TECHNICAL DATA ON FEATURES, PERFORMANCE, ELECTRICAL CHARACTERISTICS, AND RATINGS.
3. CURRENT–LIMITATION CURVES FOR FUSES WITH CURRENT–LIMITING CHARACTERISTICS.
4. TIME–CURRENT COORDINATION CURVES (AVERAGE MELT) AND CURRENT–LIMITATION CURVES (INSTANTANEOUS PEAK LET–THROUGH CURRENT) FOR EACH TYPE AND RATING OF FUSE.
5. COORDINATION CHARTS AND TABLES AND RELATED DATA.

- B. OPERATION AND MAINTENANCE DATA: FOR FUSES 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. AMBIENT TEMPERATURE ADJUSTMENT INFORMATION.
2. CURRENT–LIMITATION CURVES FOR FUSES WITH CURRENT–LIMITING CHARACTERISTICS.
- C. TIME–CURRENT COORDINATION CURVES (AVERAGE MELT) AND CURRENT–LIMITATION CURVES (INSTANTANEOUS PEAK LET–THROUGH CURRENT) FOR EACH TYPE AND RATING OF FUSE.
3. COORDINATION CHARTS AND TABLES AND RELATED DATA.
- 1.4 QUALITY ASSURANCE

- A. SOURCE LIMITATIONS: OBTAIN FUSES, FOR USE WITHIN A SPECIFIC PRODUCT OR CIRCUIT, FROM SINGLE SOURCE FROM SINGLE MANUFACTURER.
- 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. COMPLY WITH NEMA FU 1 FOR CARTRIDGE FUSES.
- D. COMPLY WITH NFPA 70.
- E. COMPLY WITH UL 248–11 FOR PLUG FUSES.
- 1.5 COORDINATION

- A. COORDINATE FUSE RATINGS WITH UTILIZATION EQUIPMENT NAMEPLATE LIMITATIONS OF MAXIMUM FUSE SIZE AND WITH SYSTEM SHORT–CIRCUIT CURRENT LEVELS.
- 1.6 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.
1. FUSES: EQUAL TO 10 PERCENT OF QUANTITY INSTALLED FOR EACH SIZE AND TYPE, BUT NO FEWER THAN TWO OF EACH SIZE AND TYPE.

PART 2 – PRODUCTS

- 2.1 MANUFACTURERS
- A. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS BY ONE OF THE FOLLOWING:
1. COOPER BUSSMANN, INC.
2. EDISON FUSE, INC.
3. FERRAZ SHIMMUT, INC.
- 2.2 CARTRIDGE FUSES

- A. CHARACTERISTICS: NEMA FU 1, NONRENEWABLE CARTRIDGE FUSES WITH VOLTAGE RATINGS CONSISTENT WITH CIRCUIT VOLTAGES.

PART 3 – EXECUTION

- 3.1 EXAMINATION
- A. CHARACTERISTICS: NEMA FU 1, NONRENEWABLE CARTRIDGE FUSES WITH VOLTAGE RATINGS CONSISTENT WITH CIRCUIT VOLTAGES.
- A. EXAMINE FUSES BEFORE INSTALLATION. REJECT FUSES THAT ARE MOISTURE DAMAGED OR PHYSICALLY DAMAGED.
- B. EXAMINE HOLDERS TO RECEIVE FUSES FOR COMPLIANCE WITH INSTALLATION TOLERANCES AND OTHER CONDITIONS AFFECTING PERFORMANCE, SUCH AS REJECTION FEATURES.
- C. EXAMINE UTILIZATION EQUIPMENT NAMEPLATES AND INSTALLATION INSTRUCTIONS. INSTALL FUSES OF SIZES AND WITH CHARACTERISTICS APPROPRIATE FOR EACH PIECE OF EQUIPMENT.
- D. EVALUATE AMBIENT TEMPERATURES TO DETERMINE IF FUSE RATING ADJUSTMENT FACTORS MUST BE APPLIED TO FUSE RATINGS.
- E. PROCEED WITH INSTALLATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.
- 3.2 FUSE APPLICATIONS
- A. CARTRIDGE FUSES:
1. FEEDERS: CLASS L, TIME DELAY, CLASS RK5, TIME DELAY.
2. MOTOR BRANCH CIRCUITS: CLASS RK5, TIME DELAY.
3. OTHER BRANCH CIRCUITS: CLASS RK5, TIME DELAY.
- 3.3 INSTALLATION
- A. INSTALL FUSES IN FUSIBLE DEVICES. ARRANGE FUSES SO RATING INFORMATION IS READABLE WITHOUT REMOVING FUSE.
- B. INSTALL SPARE–FUSE CABINET(S).
- 3.4 IDENTIFICATION

- A. INSTALL LABELS COMPLYING WITH REQUIREMENTS FOR IDENTIFICATION SPECIFIED IN DIVISION 26 SECTION "IDENTIFICATION FOR ELECTRICAL SYSTEMS" AND INDICATING FUSE REPLACEMENT INFORMATION ON INSIDE DOOR OF EACH FUSED SWITCH AND ADJACENT TO EACH FUSE BLOCK, SOCKET, AND HOLDER.

END OF SECTION 262813

SECTION 262726 – WIRING DEVICES

PART 1 – GENERAL

- 1.1 SUMMARY
- A. SECTION INCLUDES:
1. RECEPTACLES, RECEPTACLES WITH INTEGRAL GFCI, AND ASSOCIATED DEVICE PLATES.
2. WEATHER–RESISTANT RECEPTACLES.
3. SNAP SWITCHES AND WALL–BOX DIMMERS.
4. SOLID–STATE FAN SPEED CONTROLS.
5. WALL–SWITCH AND EXTERIOR OCCUPANCY SENSORS.
6. COMMUNICATIONS OUTLETS.
- 1.2 ADMINISTRATIVE REQUIREMENTS
- A. COORDINATION:
1. RECEPTACLES FOR OWNER–FURNISHED EQUIPMENT: MATCH PLUG CONFIGURATIONS.
- 1.3 ACTION SUBMITTALS
- A. PRODUCT DATA: FOR EACH TYPE OF PRODUCT.
- B. SHOP DRAWINGS: LIST OF LEGENDS AND DESCRIPTION OF MATERIALS AND PROCESS USED FOR PREMARKING WALL PLATES.

- 1.4 INFORMATIONAL SUBMITTALS
- A. FIELD QUALITY–CONTROL REPORTS.
- 1.5 CLOSEOUT SUBMITTALS
- A. OPERATION AND MAINTENANCE DATA.

PART 2 – PRODUCTS


- 2.1 MANUFACTURERS
- A. MANUFACTURERS' NAMES: SHORTENED VERSIONS (SHOWN IN PARENTHESES) OF THE FOLLOWING MANUFACTURERS' NAMES ARE USED IN OTHER PART 2 ARTICLES:
1. COOPER WIRING DEVICES: DIVISION OF COOPER INDUSTRIES, INC. (COOPER).
2. HUBBELL INCORPORATED: WIRING DEVICE–KELKEMS (HUBBELL).
3. LEVITON MFG. COMPANY, INC. (LEVITON).
4. PASS & SEYMOUR/LEGRAND (PASS & SEYMOUR)
- B. SOURCE LIMITATIONS: OBTAIN EACH TYPE OF WIRING DEVICE AND ASSOCIATED WALL PLATE FROM SINGLE SOURCE FROM SINGLE MANUFACTURER.
- 2.2 GENERAL WIRING–DEVICE REQUIREMENTS
- A. WIRING DEVICES, COMPONENTS, 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.
- C. DEVICES THAT ARE MANUFACTURED FOR USE WITH MODULAR PLUG–IN CONNECTORS MAY BE SUBSTITUTED UNDER THE FOLLOWING CONDITIONS:
1. CONNECTORS SHALL COMPLY WITH UL 2459 AND SHALL BE MADE WITH STRANDING BUILDING WIRE.
2. DEVICES SHALL COMPLY WITH THE REQUIREMENTS IN THIS SECTION.
- 2.3 STRAIGHT–BLADE RECEPTACLES
- A. CONVENIENCE RECEPTACLES, 125 V, 20 A: COMPLY WITH NEMA WD 1, NEMA WD 6 CONFIGURATION S–20R, UL 498, AND FS W–C–596.
1. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:
- a. COOPER: 5351 (SINGLE), CR5362 (DUPLEX).
- b. HUBBELL: HBL5351 (SINGLE), HBL5352 (DUPLEX).
- c. LEVITON: 5891 (SINGLE), 5352 (DUPLEX).
- d. PASS & SEYMOUR: 5361 (SINGLE), 5362 (DUPLEX).
- 2.4 GFCI RECEPTACLES
- A. GENERAL DESCRIPTION:
1. STRAIGHT BLADE, FEED–THROUGH TYPE.
2. COMPLY WITH NEMA WD 1, NEMA WD 6, UL 498, UL 943 CLASS A, AND FS W–C–596.
3. INCLUDE INDICATOR LIGHT THAT SHOWS WHEN THE GFCI HAS MALFUNCTIONED AND NO LONGER PROVIDES PROPER GFCI PROTECTION.
- B. DUPLEX GFCI CONVENIENCE RECEPTACLES, 125 V, 20 A:
1. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:
- a. COOPER: VGF20.
- b. HUBBELL: GFR5352L.
- c. PASS & SEYMOUR: 2095.
- d. LEVITON: 7590.
- 2.5 TOGGLE SWITCHES
- A. COMPLY WITH NEMA WD 1, UL 20, AND FS W–S–896.
- B. SWITCHES, 120/277 V, 20 A:
1. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:

- a. SINGLE POLE:
- a.a. COOPER: AH1221.
- a.b. HUBBELL: HBL1221.
- a.c. LEVITON: 1221–2.
- a.d. PASS & SEYMOUR: CSB20AC1.
- b. TWO POLE:
- b.a. COOPER: AH1222.
- b.b. HUBBELL: HBL1222.
- b.c. LEVITON: 1222–2.
- b.d. PASS & SEYMOUR: CSB20AC2.
- c. THREE WAY:
- c.a. COOPER: AH1223.
- c.b. HUBBELL: HBL1223.
- c.c. LEVITON: 1223–2.
- c.d. PASS & SEYMOUR: CSB20AC3.
- d. FOUR WAY:
- d.a. COOPER: AH1224.
- d.b. HUBBELL: HBL1224.
- d.c. LEVITON: 1224–2.
- d.d. PASS & SEYMOUR: CSB20AC4.
- C. PILOT–LIGHT SWITCHES, 20 A:
1. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:
- a. COOPER: AH1221PL FOR 120 AND 277 V.
- b. HUBBELL: HBL1201PL FOR 120 AND 277 V.
- c. LEVITON: 1221–1H1.
- d. PASS & SEYMOUR: PS20AC1RPL FOR 120 V, PS20AC1RPL7 FOR 277 V.
2. DESCRIPTION: SINGLE POLE, WITH NEON–LIGHTED HANDLE, ILLUMINATED WHEN SWITCH IS "OFF."
- D. KEY–OPERATED SWITCHES, 120/277 V, 20 A:
1. PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE ONE OF THE FOLLOWING:
- a. COOPER: AH1221L.
- b. HUBBELL: HBL1221L.
- c. LEVITON: 1221–2L.
- d. PASS & SEYMOUR: PS20AC1–L.
2. DESCRIPTION: SINGLE POLE, WITH FACTORY–SUPPLIED KEY IN LIEU OF SWITCH HANDLE.

- 2.6 WALL PLATES
- A. SINGLE AND COMBINATION TYPES SHALL MATCH CORRESPONDING WIRING DEVICES.
1. PLATE–SECURING SCREWS: METAL WITH HEAD COLOR TO MATCH PLATE FINISH.
2. MATERIAL FOR FINISHED SPACES: 0.035–INCH– (1–MM–) THICK, SATIN–FINISHED, TYPE 302 STAINLESS STEEL.
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 AND DAMP LOCATIONS.
- B. WET–LOCATION, WEATHERPROOF COVER PLATES: NEMA 250, COMPLYING WITH TYPE 3R, WEATHER–RESISTANT, DIE–CAST ALUMINUM WITH LOCKABLE COVER.
- 2.7 FINISHES
- A. DEVICE COLOR:
1. WIRING DEVICES CONNECTED TO NORMAL POWER SYSTEM: GRAY OR AS SELECTED BY ARCHITECT UNLESS OTHERWISE INDICATED OR REQUIRED BY NFPA 70 OR DEVICE LISTING.
2. WIRING DEVICES CONNECTED TO EMERGENCY POWER SYSTEM: ORANGE.
3. TVSS DEVICES: BLUE.
- B. WALL PLATE COLOR: FOR PLASTIC COVERS, MATCH DEVICE COLOR.

- PART 3 – EXECUTION**
- 3.1 INSTALLATION
- A. COMPLY WITH NECA 1, INCLUDING MOUNTING HEIGHTS LISTED IN THAT STANDARD, UNLESS OTHERWISE INDICATED.

- B. COORDINATION WITH OTHER TRADES:
1. PROTECT INSTALLED DEVICES AND THEIR BOXES. 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 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 RIGHT BEFORE THEY ARE SPICED 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.
4. EXISTING CONDUCTORS:
- a. CUT BACK AND PIGTAIL, OR REPLACE ALL DAMAGED CONDUCTORS.
- b. STRAIGHTEN CONDUCTORS THAT REMAIN AND REMOVE CORROSION AND FOREIGN MATTER.
- c. PIGTAILING EXISTING CONDUCTORS IS PERMITTED, PROVIDED THE OUTLET BOX IS LARGE ENOUGH.
- D. DEVICE INSTALLATION:
1. REPLACE DEVICES THAT HAVE BEEN IN TEMPORARY USE DURING CONSTRUCTION AND THAT 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 (152 MM) IN LENGTH.
5. WHEN THERE IS A CHANCE, USE SIDE WIRING WITH BINDING–HEAD SCREW TERMINALS. WRAP SOLID CONDUCTOR TIGHTLY CLOCKWISE, TWO–THIRDS TO THREE–FOURTHS OF THE WAY AROUND TERMINAL SCREW.
6. USE A TORQUE SCREWDRIVER WHEN A TORQUE IS RECOMMENDED OR REQUIRED BY 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.



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REVISIONS / AUTHORIZATIONS

NO.	REVISIONS / AUTHORIZATIONS	DATE	BY

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PROJECT TITLE: PIPE AND CHILLER REPLACEMENT			
00 202 EAST 3RD STREET LEES SUMMIT (JACKSON COUNTY) MISSOURI US			
KSCYM041		123785.03.01	E05156
SHEET TITLE: ELECTRICAL SPECIFICATIONS			
AT&T PROJECT NUMBER: A01KYNV	DATE: 01/21/20	SCALE: NONE	
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SECTION 262726 -- WIRING DEVICES CONT.

- E. RECEPTACLE ORIENTATION:
1. INSTALL GROUND PIN OF VERTICALLY MOUNTED RECEPTACLES UP, AND ON HORIZONTALLY MOUNTED RECEPTACLES TO THE RIGHT.
- F. DEVICE PLATES: 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.
- G. 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, MULTIGANG WALL PLATES.
- 3.2 GFCI RECEPTACLES
- A. INSTALL NON-FEED-THROUGH-TYPE GFCI RECEPTACLES WHERE PROTECTION OF DOWNSTREAM RECEPTACLES IS NOT REQUIRED.
- 3.3 FIELD QUALITY CONTROL
- A. PERFORM THE FOLLOWING TESTS AND INSPECTIONS:
1. TEST INSTRUMENTS: USE INSTRUMENTS THAT COMPLY WITH UL 1436.
 2. TEST INSTRUMENT FOR CONVENIENCE RECEPTACLES: DIGITAL WIRING ANALYZER WITH DIGITAL READOUT OR ILLUMINATED DIGITAL-DISPLAY INDICATORS OF MEASUREMENT.
- B. TESTS FOR CONVENIENCE RECEPTACLES:
1. LINE VOLTAGE: ACCEPTABLE RANGE IS 105 TO 132 V.
 2. PERCENT VOLTAGE DROP UNDER 15-A LOAD: A VALUE OF 6 PERCENT OR HIGHER IS UNACCEPTABLE.
 3. GROUND IMPEDANCE: VALUES OF UP TO 2 OHMS ARE ACCEPTABLE.
 4. GFCI TRIP: TEST FOR TRIPPING VALUES SPECIFIED IN UL 1436 AND UL 943.
 5. USING THE TEST PLUG, VERIFY THAT THE DEVICE AND ITS OUTLET BOX ARE SECURELY MOUNTED.
 6. TESTS SHALL BE DIAGNOSTIC, INDICATING DAMAGED CONDUCTORS, HIGH RESISTANCE AT THE CIRCUIT BREAKER, POOR CONNECTIONS, INADEQUATE FAULT CURRENT PATH, DEFECTIVE DEVICES, OR SIMILAR PROBLEMS. CORRECT CIRCUIT CONDITIONS, REMOVE MALFUNCTIONING UNITS AND REPLACE WITH NEW ONES, AND RETEST AS SPECIFIED ABOVE.
- C. WIRING DEVICE WILL BE CONSIDERED DEFECTIVE IF IT DOES NOT PASS TESTS AND INSPECTIONS.
- D. PREPARE TEST AND INSPECTION REPORTS.

END OF SECTION 262726

SECTION 262816 -- ENCLOSED SWITCHES AND CIRCUIT BREAKERS

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. SECTION INCLUDES:
1. FUSIBLE SWITCHES.
 2. NONFUSIBLE SWITCHES.
- 1.3 DEFINITIONS
- A. NC: NORMALLY CLOSED.
- B. NO: NORMALLY OPEN.
- C. SPDT: SINGLE POLE, DOUBLE THROW.
- 1.4 PERFORMANCE REQUIREMENTS
- A. SEISMIC PERFORMANCE: ENCLOSED SWITCHES AND CIRCUIT BREAKERS SHALL WITHSTAND THE EFFECTS OF EARTHQUAKE MOTIONS DETERMINED ACCORDING TO ASCE/SEI 7.
- 1.5 SUBMITTALS
- A. PRODUCT DATA: FOR EACH TYPE OF ENCLOSED SWITCH, CIRCUIT BREAKER, ACCESSORY, AND COMPONENT INDICATED. INCLUDE DIMENSIONED ELEVATIONS, SECTIONS, WEIGHTS, AND MANUFACTURERS' TECHNICAL DATA ON FEATURES, PERFORMANCE, ELECTRICAL CHARACTERISTICS, RATINGS, ACCESSORIES, AND FINISHES.
1. ENCLOSURE TYPES AND DETAILS FOR TYPES OTHER THAN NEMA 250, TYPE 1.
 2. CURRENT AND VOLTAGE RATINGS.
 3. SHORT-CIRCUIT CURRENT RATINGS (INTERRUPTING AND WITHSTAND, AS APPROPRIATE).
 4. DETAIL FEATURES, CHARACTERISTICS, RATINGS, AND FACTORY SETTINGS OF INDIVIDUAL OVERCURRENT PROTECTIVE DEVICES, ACCESSORIES, AND AUXILIARY COMPONENTS.
 5. INCLUDE TIME-CURRENT COORDINATION CURVES (AVERAGE MELT) FOR EACH TYPE AND RATING OF OVERCURRENT PROTECTIVE DEVICE; INCLUDE SELECTABLE RANGES FOR EACH TYPE OF OVERCURRENT PROTECTIVE DEVICE.
- 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. QUALIFICATION DATA: FOR QUALIFIED TESTING AGENCY.
- D. SEISMIC QUALIFICATION CERTIFICATES: FOR ENCLOSED SWITCHES AND CIRCUIT BREAKERS, 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.
 3. DETAILED DESCRIPTION OF EQUIPMENT ANCHORAGE DEVICES ON WHICH THE CERTIFICATION IS BASED AND THEIR INSTALLATION REQUIREMENTS.
- E. FIELD QUALITY-CONTROL REPORTS.
1. TEST PROCEDURES USED.
 2. TEST RESULTS THAT COMPLY WITH REQUIREMENTS.
 3. RESULTS OF FAILED TESTS AND CORRECTIVE ACTION TAKEN TO ACHIEVE TEST RESULTS THAT COMPLY WITH REQUIREMENTS.
- F. MANUFACTURER'S FIELD SERVICE REPORT.
- G. OPERATION AND MAINTENANCE DATA: FOR ENCLOSED SWITCHES AND CIRCUIT BREAKERS 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. MANUFACTURER'S WRITTEN INSTRUCTIONS FOR TESTING AND ADJUSTING ENCLOSED SWITCHES AND CIRCUIT BREAKERS.
 2. TIME-CURRENT COORDINATION CURVES (AVERAGE MELT) FOR EACH TYPE AND RATING OF OVERCURRENT PROTECTIVE DEVICE; INCLUDE SELECTABLE RANGES FOR EACH TYPE OF OVERCURRENT PROTECTIVE DEVICE.
- 1.6 QUALITY ASSURANCE
- A. TESTING AGENCY QUALIFICATIONS: MEMBER COMPANY OF NETA OR AN NRTL.
1. TESTING AGENCY'S FIELD SUPERVISOR: CURRENTLY CERTIFIED BY NETA TO SUPERVISE ON-SITE TESTING.
- B. SOURCE LIMITATIONS: OBTAIN ENCLOSED SWITCHES AND CIRCUIT BREAKERS, OVERCURRENT PROTECTIVE DEVICES, COMPONENTS, AND ACCESSORIES, WITHIN SAME PRODUCT CATEGORY, FROM SINGLE SOURCE FROM SINGLE MANUFACTURER.

- C. PRODUCT SELECTION FOR RESTRICTED SPACE: DRAWINGS INDICATE MAXIMUM DIMENSIONS FOR ENCLOSED SWITCHES AND CIRCUIT BREAKERS, INCLUDING CLEARANCES BETWEEN ENCLOSURES, AND ADJACENT SURFACES AND OTHER ITEMS. COMPLY WITH INDICATED MAXIMUM DIMENSIONS.
- 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.
- E. COMPLY WITH NFPA 70.
- 1.7 PROJECT CONDITIONS
- A. ENVIRONMENTAL LIMITATIONS: RATE EQUIPMENT FOR CONTINUOUS OPERATION UNDER THE FOLLOWING CONDITIONS UNLESS OTHERWISE INDICATED:
1. AMBIENT TEMPERATURE: NOT LESS THAN MINUS 22 DEG F AND NOT EXCEEDING 104 DEG F.
 2. ALTITUDE: NOT EXCEEDING 6600 FEET.
- B. INTERRUPTION OF EXISTING ELECTRIC SERVICE: DO NOT INTERRUPT ELECTRIC SERVICE TO FACILITIES OCCUPIED BY OWNER OR OTHERS UNLESS PERMITTED UNDER THE FOLLOWING CONDITIONS AND THEN ONLY AFTER ARRANGING TO PROVIDE TEMPORARY ELECTRIC SERVICE ACCORDING TO REQUIREMENTS INDICATED:
1. NOTIFY OWNER NO FEWER THAN 21 DAYS IN ADVANCE OF PROPOSED INTERRUPTION OF ELECTRIC SERVICE.
 2. INDICATE METHOD OF PROVIDING TEMPORARY ELECTRIC SERVICE.
 3. DO NOT PROCEED WITH INTERRUPTION OF ELECTRIC SERVICE WITHOUT OWNER'S WRITTEN PERMISSION.
 4. COMPLY WITH NFPA 70E.
- 1.8 COORDINATION
- A. COORDINATE LAYOUT AND INSTALLATION OF SWITCHES, CIRCUIT BREAKERS, AND COMPONENTS WITH EQUIPMENT SERVED AND ADJACENT SURFACES. MAINTAIN REQUIRED WORKSPACE CLEARANCES AND REQUIRED CLEARANCES FOR EQUIPMENT ACCESS DOORS AND PANELS.
- 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.
1. FUSES: EQUAL TO 10 PERCENT OF QUANTITY INSTALLED FOR EACH SIZE AND TYPE, BUT NO FEWER THAN THREE OF EACH SIZE AND TYPE.
 2. FUSE PULLERS: TWO FOR EACH SIZE AND TYPE.

PART 2 -- PRODUCTS

- 2.1 FUSIBLE SWITCHES
- A. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCT BY ONE OF THE FOLLOWING:
1. EATON ELECTRICAL INC.; CUTLER-HAMMER BUSINESS UNIT.
 2. SIEMENS ENERGY & AUTOMATION, INC.
 3. SQUARE D; A BRAND OF SCHNEIDER ELECTRIC.
- B. TYPE GD, GENERAL DUTY, SINGLE THROW, 240-V AC, 800 A AND SMALLER OR AS INDICATED ON DRAWINGS: UL 98 AND NEMA KS 1, HORSEPOWER RATED, WITH CARTRIDGE FUSE INTERIORS TO ACCOMMODATE SPECIFIED FUSES, LOCKABLE HANDLE WITH CAPABILITY TO ACCEPT TWO PADLOCKS, AND INTERLOCKED WITH COVER IN CLOSED POSITION.
- C. TYPE HD, HEAVY DUTY, SINGLE THROW, 240-600-V AC, 1200 A AND SMALLER OR AS INDICATED ON DRAWINGS: UL 98 AND NEMA KS 1, HORSEPOWER RATED, WITH CLIPS OR BOLT PADS TO ACCOMMODATE SPECIFIED FUSES, LOCKABLE HANDLE WITH CAPABILITY TO ACCEPT THREE PADLOCKS, AND INTERLOCKED WITH COVER IN CLOSED POSITION.
- D. 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. CLASS R FUSE KIT: PROVIDES REJECTION OF OTHER FUSE TYPES WHEN CLASS R FUSES ARE SPECIFIED.
 4. AUXILIARY CONTACT KIT: ONE NO/NC (FORM "C") AUXILIARY CONTACT(S), ARRANGED TO ACTIVATE BEFORE SWITCH BLADES OPEN.
 5. HOOKSTICK HANDLE: ALLOWS USE OF A HOOKSTICK TO OPERATE THE HANDLE.
 6. LUGS: MECHANICAL TYPE, SUITABLE FOR NUMBER, SIZE, AND CONDUCTOR MATERIAL.
 7. SERVICE-RATED SWITCHES: LABELED FOR USE AS SERVICE EQUIPMENT.
- 2.2 NONFUSIBLE SWITCHES
- A. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCT PRODUCT BY ONE OF THE FOLLOWING:
1. EATON ELECTRICAL INC.; CUTLER-HAMMER BUSINESS UNIT.
 2. SIEMENS ENERGY & AUTOMATION, INC.
 3. SQUARE D; A BRAND OF SCHNEIDER ELECTRIC.
- B. TYPE GD, GENERAL DUTY, SINGLE THROW, 600 A AND SMALLER OR AS INDICATED ON DRAWINGS: UL 98 AND NEMA KS 1, HORSEPOWER RATED, LOCKABLE HANDLE WITH CAPABILITY TO ACCEPT TWO PADLOCKS, AND INTERLOCKED WITH COVER IN CLOSED POSITION.
- C. TYPE HD, HEAVY DUTY, SINGLE THROW, 240-600-V AC, 1200 A AND SMALLER OR AS INDICATED ON DRAWINGS: UL 98 AND NEMA KS 1, HORSEPOWER RATED, LOCKABLE HANDLE WITH CAPABILITY TO ACCEPT THREE PADLOCKS, AND INTERLOCKED WITH COVER IN CLOSED POSITION.
- D. 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. ISOLATED GROUND KIT: INTERNALLY MOUNTED; INSULATED, CAPABLE OF BEING GROUNDED AND BONDED; LABELED FOR COPPER AND ALUMINUM NEUTRAL CONDUCTORS.
 4. AUXILIARY CONTACT KIT: TWO NO/NC (FORM "C") AUXILIARY CONTACT(S), ARRANGED TO ACTIVATE BEFORE SWITCH BLADES OPEN.
 5. HOOKSTICK HANDLE: ALLOWS USE OF A HOOKSTICK TO OPERATE THE HANDLE.
 6. LUGS: MECHANICAL TYPE, SUITABLE FOR NUMBER, SIZE, AND CONDUCTOR MATERIAL.

2.2 NONFUSIBLE SWITCHES

- A. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCT PRODUCT BY ONE OF THE FOLLOWING:
1. EATON ELECTRICAL INC.; CUTLER-HAMMER BUSINESS UNIT.
 2. SIEMENS ENERGY & AUTOMATION, INC.
 3. SQUARE D; A BRAND OF SCHNEIDER ELECTRIC.
- B. TYPE GD, GENERAL DUTY, SINGLE THROW, 600 A AND SMALLER OR AS INDICATED ON DRAWINGS: UL 98 AND NEMA KS 1, HORSEPOWER RATED, LOCKABLE HANDLE WITH CAPABILITY TO ACCEPT TWO PADLOCKS, AND INTERLOCKED WITH COVER IN CLOSED POSITION.
- C. TYPE HD, HEAVY DUTY, SINGLE THROW, 240-600-V AC, 1200 A AND SMALLER OR AS INDICATED ON DRAWINGS: UL 98 AND NEMA KS 1, HORSEPOWER RATED, LOCKABLE HANDLE WITH CAPABILITY TO ACCEPT THREE PADLOCKS, AND INTERLOCKED WITH COVER IN CLOSED POSITION.
- D. 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. ISOLATED GROUND KIT: INTERNALLY MOUNTED; INSULATED, CAPABLE OF BEING GROUNDED AND BONDED; LABELED FOR COPPER AND ALUMINUM NEUTRAL CONDUCTORS.
 4. AUXILIARY CONTACT KIT: TWO NO/NC (FORM "C") AUXILIARY CONTACT(S), ARRANGED TO ACTIVATE BEFORE SWITCH BLADES OPEN.
 5. HOOKSTICK HANDLE: ALLOWS USE OF A HOOKSTICK TO OPERATE THE HANDLE.
 6. LUGS: MECHANICAL TYPE, SUITABLE FOR NUMBER, SIZE, AND CONDUCTOR MATERIAL.
- 2.3 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. OTHER WET OR DAMP, INDOOR LOCATIONS: NEMA 250, TYPE 4.
 4. INDOOR LOCATIONS SUBJECT TO DUST, FALLING DIRT, AND DRIPPING NONCORROSIVE LIQUIDS: NEMA 250, TYPE 12.

PART 3 -- EXECUTION

- 3.1 EXAMINATION
- A. EXAMINE ELEMENTS AND SURFACES TO RECEIVE ENCLOSED SWITCHES AND CIRCUIT BREAKERS FOR COMPLIANCE WITH INSTALLATION TOLERANCES AND OTHER CONDITIONS AFFECTING PERFORMANCE OF THE WORK.
- B. PROCEED WITH INSTALLATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.

3.2 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.

3.3 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.

3.4 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 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.
 3. PERFORM THE FOLLOWING INFRARED SCAN TESTS AND INSPECTIONS AND PREPARE REPORTS:
 - a. INITIAL INFRARED SCANNING: AFTER SUBSTANTIAL COMPLETION, BUT NOT MORE THAN 60 DAYS AFTER FINAL ACCEPTANCE, PERFORM AN INFRARED SCAN OF EACH ENCLOSED SWITCH AND CIRCUIT BREAKER. REMOVE FRONT PANELS SO JOINTS AND CONNECTIONS ARE ACCESSIBLE TO PORTABLE SCANNER.
 - b. FOLLOW-UP INFRARED SCANNING: PERFORM AN ADDITIONAL FOLLOW-UP INFRARED SCAN OF EACH ENCLOSED SWITCH AND CIRCUIT BREAKER 11 MONTHS AFTER DATE OF SUBSTANTIAL COMPLETION.
 - c. INSTRUMENTS AND EQUIPMENT: USE AN INFRARED SCANNING DEVICE DESIGNED TO MEASURE TEMPERATURE OR TO DETECT SIGNIFICANT DEVIATIONS FROM NORMAL VALUES. PROVIDE CALIBRATION RECORD FOR DEVICE.
 4. TEST AND ADJUST CONTROLS, REMOTE MONITORING, AND SAFETIES. REPLACE DAMAGED AND MALFUNCTIONING CONTROLS AND EQUIPMENT.
- 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.
- 3.5 ADJUSTING
- A. ADJUST MOVING PARTS AND OPERABLE COMPONENTS TO FUNCTION SMOOTHLY, AND LUBRICATE AS RECOMMENDED BY MANUFACTURER.

END OF SECTION 262816

SECTION 262913 -- ENCLOSED CONTROLLERS

PART 1 -- GENERAL

- 1.1 RELATED DOCUMENTS
- 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 THE FOLLOWING ENCLOSED CONTROLLERS RATED 600 V AND LESS:
1. FULL-VOLTAGE MANUAL.
 2. FULL-VOLTAGE MAGNETIC.
- 1.3 DEFINITIONS
- CPT: CONTROL POWER TRANSFORMER.
- B. MCCB: MOLDED-CASE CIRCUIT BREAKER.
- C. MCP: MOTOR CIRCUIT PROTECTOR.
- D. N.C.: NORMALLY CLOSED.
- E. N.O.: NORMALLY OPEN.
- F. OCPD: OVERCURRENT PROTECTIVE DEVICE.
- G. SCR: SILICON-CONTROLLED RECTIFIER.
- 1.4 PERFORMANCE REQUIREMENTS
- SEISMIC PERFORMANCE: ENCLOSED CONTROLLERS SHALL WITHSTAND THE EFFECTS OF EARTHQUAKE MOTIONS DETERMINED ACCORDING TO ASCE/SEI 7.
- 1.5 SUBMITTALS
- PRODUCT DATA: FOR EACH TYPE OF ENCLOSED CONTROLLER. INCLUDE MANUFACTURER'S TECHNICAL DATA ON FEATURES, PERFORMANCE, ELECTRICAL CHARACTERISTICS, RATINGS, AND ENCLOSURE TYPES AND FINISHES.
- H. SHOP DRAWINGS: FOR EACH ENCLOSED CONTROLLER. INCLUDE DIMENSIONED PLANS, ELEVATIONS, SECTIONS, DETAILS, AND REQUIRED CLEARANCES AND SERVICE SPACES AROUND CONTROLLER ENCLOSURES.
1. SHOW TABULATIONS OF THE FOLLOWING:
 - a. EACH INSTALLED UNIT'S TYPE AND DETAILS.
 - b. FACTORY-INSTALLED DEVICES.
 - c. NAMEPLATE LEGENDS.
 - d. SHORT-CIRCUIT CURRENT RATING OF INTEGRATED UNIT.
 - e. LISTED AND LABELED FOR INTEGRATED SHORT-CIRCUIT CURRENT (WITHSTAND) RATING OF OCPDS IN COMBINATION CONTROLLERS BY AN NRTL ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION.
 - f. FEATURES, CHARACTERISTICS, RATINGS, AND FACTORY SETTINGS OF INDIVIDUAL OCPDS IN COMBINATION CONTROLLERS.
 2. WIRING DIAGRAMS: FOR POWER, SIGNAL, AND CONTROL WIRING.
- I. QUALIFICATION DATA: FOR QUALIFIED TESTING AGENCY.
- J. SEISMIC QUALIFICATION CERTIFICATES: FOR ENCLOSED CONTROLLERS, 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.
 3. DETAILED DESCRIPTION OF EQUIPMENT ANCHORAGE DEVICES ON WHICH THE CERTIFICATION IS BASED AND THEIR INSTALLATION REQUIREMENTS.
- E. FIELD QUALITY-CONTROL REPORTS.

- F. OPERATION AND MAINTENANCE DATA: FOR ENCLOSED CONTROLLERS 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. ROUTINE MAINTENANCE REQUIREMENTS FOR ENCLOSED CONTROLLERS AND INSTALLED COMPONENTS.
 2. MANUFACTURER'S WRITTEN INSTRUCTIONS FOR TESTING AND ADJUSTING CIRCUIT BREAKER AND MCP TRIP SETTINGS.
 3. MANUFACTURER'S WRITTEN INSTRUCTIONS FOR SETTING FIELD-ADJUSTABLE OVERLOAD RELAYS.
 4. MANUFACTURER'S WRITTEN INSTRUCTIONS FOR TESTING, ADJUSTING, AND REPROGRAMMING REDUCED-VOLTAGE SOLID-STATE CONTROLLERS.
 5. LOAD-CURRENT AND OVERLOAD-RELAY HEATER LIST: COMPILE AFTER MOTORS HAVE BEEN INSTALLED, AND ARRANGE TO DEMONSTRATE THAT SELECTION OF HEATERS SUITS ACTUAL MOTOR NAMEPLATE FULL-LOAD CURRENTS.
 6. LOAD-CURRENT AND LIST OF SETTINGS OF ADJUSTABLE OVERLOAD RELAYS: COMPILE AFTER MOTORS HAVE BEEN INSTALLED, AND ARRANGE TO DEMONSTRATE THAT SWITCH SETTINGS FOR MOTOR RUNNING OVERLOAD PROTECTION SUIT ACTUAL MOTORS TO BE PROTECTED.

1.6 QUALITY ASSURANCE

- A. TESTING AGENCY QUALIFICATIONS: MEMBER COMPANY OF NETA OR AN NRTL.
1. TESTING AGENCY'S FIELD SUPERVISOR: CURRENTLY CERTIFIED BY NETA TO SUPERVISE ON-SITE TESTING.
- 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. COMPLY WITH NFPA 70.
- D. IEEE COMPLIANCE: FABRICATE AND TEST ENCLOSED CONTROLLERS ACCORDING TO IEEE 344 TO WITHSTAND SEISMIC FORCES.
- 1.7 DELIVERY, STORAGE, AND HANDLING
- A. STORE ENCLOSED CONTROLLERS INDOORS IN CLEAN, DRY SPACE WITH UNIFORM TEMPERATURE TO PREVENT CONDENSATION. PROTECT ENCLOSED CONTROLLERS FROM EXPOSURE TO DIRT, FLUMES, WATER, CORROSIVE SUBSTANCES, AND PHYSICAL DAMAGE.
- B. IF STORED IN AREAS SUBJECT TO WEATHER, COVER ENCLOSED CONTROLLERS TO PROTECT THEM FROM WEATHER, DIRT, DUST, CORROSIVE SUBSTANCES, AND PHYSICAL DAMAGE. REMOVE LOOSE PACKING AND FLAMMABLE MATERIALS FROM INSIDE CONTROLLERS; INSTALL TEMPORARY ELECTRIC HEATING, WITH AT LEAST 250 W PER CONTROLLER.
- 1.8 PROJECT CONDITIONS
- A. ENVIRONMENTAL LIMITATIONS: RATE EQUIPMENT FOR CONTINUOUS OPERATION UNDER THE FOLLOWING CONDITIONS UNLESS OTHERWISE INDICATED:
1. AMBIENT TEMPERATURE: NOT LESS THAN MINUS 22 DEG F AND NOT EXCEEDING 104 DEG F.
 2. ALTITUDE: NOT EXCEEDING 6600 FEET.
- 1.9 COORDINATION
- B. COORDINATE LAYOUT AND INSTALLATION OF ENCLOSED CONTROLLERS WITH OTHER CONSTRUCTION INCLUDING CONDUIT, PIPING, EQUIPMENT, AND ADJACENT SURFACES. MAINTAIN REQUIRED WORKSPACE CLEARANCES AND REQUIRED CLEARANCES FOR EQUIPMENT ACCESS DOORS AND PANELS.
- C. COORDINATE SIZES AND LOCATIONS OF CONCRETE BASES WITH ACTUAL EQUIPMENT PROVIDED. CAST ANCHOR-BOLT INSERTS INTO BASES. CONCRETE, REINFORCEMENT, AND FORMWORK REQUIREMENTS ARE SPECIFIED IN DIVISION 03.
- D. COORDINATE INSTALLATION OF ROOF CURBS, EQUIPMENT SUPPORTS, AND ROOF PENETRATIONS.

1.10 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.
1. FUSES FOR FUSED SWITCHES: EQUAL TO 10 PERCENT OF QUANTITY INSTALLED FOR EACH SIZE AND TYPE, BUT NO FEWER THAN THREE OF EACH SIZE AND TYPE.
 2. CONTROL POWER FUSES: EQUAL TO 10 PERCENT OF QUANTITY INSTALLED FOR EACH SIZE AND TYPE, BUT NO FEWER THAN TWO OF EACH SIZE AND TYPE.
 3. INDICATING LIGHTS: TWO OF EACH TYPE AND COLOR INSTALLED.
 4. AUXILIARY CONTACTS: FURNISH ONE SPARE(S) FOR EACH SIZE AND TYPE OF MAGNETIC CONTROLLER INSTALLED.
 5. POWER CONTACTS: FURNISH THREE SPARES FOR EACH SIZE AND TYPE OF MAGNETIC CONTACTOR INSTALLED.

PART 2 -- PRODUCTS

- A. COMBINATION MAGNETIC CONTROLLER: FACTORY-ASSEMBLED COMBINATION OF MAGNETIC CONTROLLER, OCPD, AND DISCONNECTING MEANS.
1. MANUFACTURERS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCT BY ONE OF THE FOLLOWING:
 - a. EATON ELECTRICAL INC.; CUTLER-HAMMER BUSINESS UNIT.
 - b. SIEMENS ENERGY & AUTOMATION, INC.
 - c. SQUARE D; A BRAND OF SCHNEIDER ELECTRIC.
 2. FUSIBLE DISCONNECTING MEANS:
 - a. NEMA KS 1, HEAVY-DUTY, HORSEPOWER-RATED, FUSIBLE SWITCH WITH CLIPS OR BOLT PADS TO ACCOMMODATE CLASS R FUSES.
 - b. LOCKABLE HANDLE: ACCEPTS THREE PADLOCKS AND INTERLOCKS WITH COVER IN CLOSED POSITION.
 - c. AUXILIARY CONTACTS: N.O./N.C., ARRANGED TO ACTIVATE BEFORE SWITCH BLADES OPEN.
 3. NONFUSIBLE DISCONNECTING MEANS:
 - a. NEMA KS 1, HEAVY-DUTY, HORSEPOWER-RATED, NONFUSIBLE SWITCH.
 - b. LOCKABLE HANDLE: ACCEPTS THREE PADLOCKS AND INTERLOCKS WITH COVER IN CLOSED POSITION.
 - c. AUXILIARY CONTACTS: N.O./N.C., ARRANGED TO ACTIVATE BEFORE SWITCH BLADES OPEN.
- 2.2 ENCLOSURES
- A. ENCLOSED CONTROLLERS: NEMA ICS 6, TO COMPLY WITH ENVIRONMENTAL CONDITIONS AT INSTALLED LOCATION.
1. DRY AND CLEAN INDOOR LOCATIONS: TYPE 1.
 2. OUTDOOR LOCATIONS: TYPE 3R.
 3. OTHER WET OR DAMP INDOOR LOCATIONS: TYPE 4.
 4. INDOOR LOCATIONS SUBJECT TO DUST, FALLING DIRT, AND DRIPPING NONCORROSIVE LIQUIDS: TYPE 12.
- 2.3 ACCESSORIES
- A. GENERAL REQUIREMENTS FOR CONTROL CIRCUIT AND PILOT DEVICES: NEMA ICS 5; FACTORY INSTALLED IN CONTROLLER ENCLOSURE COVER UNLESS OTHERWISE INDICATED.
1. PUSH BUTTONS, PILOT LIGHTS, AND SELECTOR SWITCHES: HEAVY-DUTY, TYPE.
 - a. PUSH BUTTONS: RECESSED ,SHIELDED TYPES; MAINTAINED AS INDICATED.
 - b. PILOT LIGHTS: LED TYPES; COLORS AS INDICATED; PUSH TO TEST.
 - c. SELECTOR SWITCHES: ROTARY TYPE.
 2. ELAPSED TIME METERS: HEAVY DUTY WITH DIGITAL READOUT IN HOURS ; RESETTABLE.
 3. METERS: PANEL TYPE, 2-1/2-INCH MINIMUM SIZE WITH 90- OR 120-DEGREE SCALE AND PLUS OR MINUS TWO PERCENT ACCURACY. WHERE INDICATED, PROVIDE SELECTOR SWITCHES WITH AN OFF POSITION.
- B. REVERSIBLE N.C./N.O. AUXILIARY CONTACT(S).
- C. CONTROL RELAYS: AUXILIARY AND ADJUSTABLE SOLID-STATE TIME-DELAY RELAYS.
- D. PHASE-FAILURE, PHASE-REVERSAL, AND UNDERVOLTAGE AND OVERVOLTAGE RELAYS: SOLID-STATE SENSING CIRCUIT WITH ISOLATED OUTPUT CONTACTS FOR HARD-WIRED CONNECTIONS. PROVIDE ADJUSTABLE UNDERVOLTAGE, OVERVOLTAGE, AND TIME-DELAY SETTINGS.

PART 3 -- EXECUTION

- 3.1 EXAMINATION
- A. EXAMINE AREAS AND SURFACES TO RECEIVE ENCLOSED CONTROLLERS, WITH INSTALLER PRESENT, FOR COMPLIANCE WITH REQUIREMENTS AND OTHER CONDITIONS AFFECTING PERFORMANCE OF THE WORK.
- B. EXAMINE ENCLOSED CONTROLLERS BEFORE INSTALLATION. REJECT ENCLOSED CONTROLLERS THAT ARE WET, MOISTURE DAMAGED, OR MOLD DAMAGED.
- C. PROCEED WITH INSTALLATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.
- 3.2 INSTALLATION
- A. WALL-MOUNTED CONTROLLERS: INSTALL ENCLOSED CONTROLLERS ON WALLS WITH TOPS AT UNIFORM HEIGHT 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."

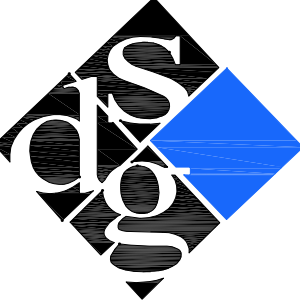
- B. INSTALL FUSES IN EACH FUSIBLE-SWITCH ENCLOSED CONTROLLER.
- C. INSTALL FUSES IN CONTROL CIRCUITS IF NOT FACTORY INSTALLED. COMPLY WITH REQUIREMENTS IN DIVISION 26 SECTION "FUSES."
- D. INSTALL HEATERS IN THERMAL OVERLOAD RELAYS. SELECT HEATERS BASED ON ACTUAL NAMEPLATE FULL-LOAD AMPERES AFTER MOTORS HAVE BEEN INSTALLED.
- E. INSTALL, CONNECT, AND FUSE THERMAL-PROTECTOR MONITORING RELAYS FURNISHED WITH MOTOR-DRIVEN EQUIPMENT.
- F. COMPLY WITH NECA 1.

3.3 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.

3.4 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 ENCLOSED CONTROLLER, COMPONENT, CONNECTING SUPPLY, FEEDER, AND CONTROL CIRCUIT.
 2. TEST CONTINUITY OF EACH CIRCUIT.



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PROJECT TITLE: **PIPE AND CHILLER REPLACEMENT**

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202 EAST 3RD STREET
LEES SUMMIT (JACKSON COUNTY)
MISSOURI US
KSCYM041 123785.03.01 E05156

SHEET TITLE:
**ELECTRICAL
SPECIFICATIONS**

AT&T PROJECT NUMBER:
A01KYNV

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CHECKED BY: DJZ
SHEET NO.
E006

SECTION 262913 - ENCLOSED CONTROLLERS CONT.

- 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 OWNER 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. PERFORM THE FOLLOWING INFRARED (THERMOGRAPHIC) SCAN TESTS AND INSPECTIONS AND PREPARE REPORTS:
 - a. INITIAL INFRARED SCANNING: AFTER SUBSTANTIAL COMPLETION, BUT NOT MORE THAN 60 DAYS AFTER FINAL ACCEPTANCE, PERFORM AN INFRARED SCAN OF EACH MULTI-POLE ENCLOSED CONTROLLER. REMOVE FRONT PANELS SO JOINTS AND CONNECTIONS ARE ACCESSIBLE TO PORTABLE SCANNER.
 - b. FOLLOW-UP INFRARED SCANNING: PERFORM AN ADDITIONAL FOLLOW-UP INFRARED SCAN OF EACH MULTI-POLE ENCLOSED CONTROLLER 11 MONTHS AFTER DATE OF SUBSTANTIAL COMPLETION.
 - c. INSTRUMENTS AND EQUIPMENT: USE AN INFRARED SCANNING DEVICE DESIGNED TO MEASURE TEMPERATURE OR TO DETECT SIGNIFICANT DEVIATIONS FROM NORMAL VALUES. PROVIDE CALIBRATION RECORD FOR DEVICE.
 9. 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 INCLUDING A CERTIFIED REPORT THAT IDENTIFIES ENCLOSED CONTROLLERS AND THAT DESCRIBES SCANNING RESULTS. INCLUDE NOTATION OF DEFICIENCIES DETECTED, REMEDIAL ACTION TAKEN, AND OBSERVATIONS AFTER REMEDIAL ACTION.

3.5 ADJUSTING

- A. SET FIELD-ADJUSTABLE SWITCHES, AUXILIARY RELAYS, TIME-DELAY RELAYS, TIMERS, AND OVERLOAD-RELAY PICKUP AND TRIP RANGES.
- B. ADJUST OVERLOAD-RELAY HEATERS OR SETTINGS IF POWER FACTOR CORRECTION CAPACITORS ARE CONNECTED TO THE LOAD SIDE OF THE OVERLOAD RELAYS.
- C. SET FIELD-ADJUSTABLE SWITCHES AND PROGRAM MICROPROCESSORS FOR REQUIRED START AND STOP SEQUENCES IN REDUCED-VOLTAGE SOLID-STATE CONTROLLERS.


3.6 PROTECTION

- A. TEMPORARY HEATING: APPLY TEMPORARY HEAT TO MAINTAIN TEMPERATURE ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS UNTIL ENCLOSED CONTROLLERS ARE READY TO BE ENERGIZED AND PLACED INTO SERVICE.
- B. REPLACE CONTROLLERS WHOSE INTERIORS HAVE BEEN EXPOSED TO WATER OR OTHER LIQUIDS PRIOR TO SUBSTANTIAL COMPLETION.

3.7 DEMONSTRATION

- A. TRAIN OWNER'S MAINTENANCE PERSONNEL TO ADJUST, OPERATE, AND MAINTAIN ENCLOSED CONTROLLERS.


END OF SECTION 262913




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DRAWINGS PREPARED FOR

PROJECT TITLE: PIPE AND CHILLER REPLACEMENT

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202 EAST 3RD STREET
LEES SUMMIT (JACKSON COUNTY)
MISSOURI US
KSCYM041 123785.03.01 E05156

SHEET TITLE:
**ELECTRICAL
SPECIFICATIONS**

AT&T PROJECT NUMBER:
A01KYNV

DATE: 01/21/20
SCALE: NONE

DRAWN BY: SVL
CHECKED BY: DJZ

AT&T AUTHORIZATION:
MATT LONG

SHEET: - OF: - SHEETS
AT&T DRAWING NO.:
E007

KEYED NOTES:

- 1 REMOVE EXISTING PANEL IN LOCATION INDICATED IN ITS ENTIRETY. REMOVE ALL ASSOCIATED CONDUIT AND CIRCUITRY BACK TO SOURCE OR NEAREST DEVICE SCHEDULED TO REMAIN. COORDINATE ALL WORK WITH CONSTRUCTION PHASING SEQUENCE AND OWNER AS TO MINIMIZE EQUIPMENT DOWNTIME. RE: ONE-LINE DIAGRAM FOR ADDITIONAL INFORMATION.
- 2 REMOVE EXISTING CONDUIT AND CIRCUITRY SERVING EXISTING CHILLER BACK TO SOURCE INDICATED. EXISTING CHILLER TO BE REMOVED BY MECHANICAL CONTRACTOR. REMOVE ALL ASSOCIATED POWER AND CONTROL WIRING BACK TO SOURCE OR NEAREST DEVICE SCHEDULED TO REMAIN. COORDINATE ALL WORK WITH CONSTRUCTION PHASING SEQUENCE AND OWNER AS TO MINIMIZE EQUIPMENT DOWNTIME. RE: ONE-LINE DIAGRAM FOR ADDITIONAL INFORMATION.
- 3 EXISTING EQUIPMENT TO BE REMOVED BY OTHERS. COORDINATE WORK WITH GENERAL CONTRACTOR.
- 4 REMOVE EXISTING CONDUIT AND CIRCUITRY SERVING EXISTING CHILLER BACK TO SOURCE INDICATED. EXISTING CHILLER TO BE RE-SERVED FROM NEW PANEL UNDER NEW WORK. COORDINATE ALL WORK WITH CONSTRUCTION PHASING SEQUENCE AND OWNER AS TO MINIMIZE EQUIPMENT DOWNTIME. RE: ONE-LINE DIAGRAM FOR ADDITIONAL INFORMATION.
- 5 REMOVE EXISTING VFD IN LOCATION INDICATED IN ITS ENTIRETY. REMOVE ALL ASSOCIATED CONDUIT AND CIRCUITRY BACK TO SOURCE AND TO PUMP BEING SERVED. EXISTING PUMP TO REMAIN. NEW VFD IS TO BE PROVIDED UNDER NEW WORK. COORDINATE ALL WORK WITH PHASING SEQUENCE AND OWNER AS TO MINIMIZE EQUIPMENT DOWNTIME. RE: ONE-LINE DIAGRAM FOR ADDITIONAL INFORMATION.
- 6 REMOVE EXISTING CONDUIT AND CIRCUITRY SERVING EXISTING PRIMARY CHILLED WATER PUMP BACK TO SOURCE INDICATED. EXISTING PUMP TO BE RE-SERVED FROM NEW PANEL UNDER NEW WORK. COORDINATE ALL WORK WITH CONSTRUCTION PHASING SEQUENCE AND OWNER AS TO MINIMIZE EQUIPMENT DOWNTIME. RE: ONE-LINE DIAGRAM FOR ADDITIONAL INFORMATION.
- 7 EXISTING ELECTRICAL EQUIPMENT TO REMAIN.
- 8 RELOCATE EXISTING FIRE SPRINKLER BOX IN GENERAL LOCATION INDICATED. REMOVE ABANDONED FIRE ALARM SYSTEM JUNCTION BOXES AND ABANDONED CAPPED PIPING AS REQUIRED TO INSTALL NEW MOTOR STARTER THAT IS TO BE PROVIDED UNDER NEW WORK. RE: SHEET EP100 FOR ADDITIONAL INFORMATION.
- 9 DISCONNECT EXISTING EPO SIGNAL FROM CHILLER THAT IS TO BE REMOVED AND RETAIN FOR RE-USE UNDER NEW WORK. EXISTING SIGNAL SHALL BE CONNECTED TO NEW CHILLER BEING PROVIDED UNDER NEW WORK.

- GENERAL NOTES:
- 1) RE: SHEET E001 FOR SYMBOLS AND ABBREVIATIONS.
 - 2) RE: SHEET E002 FOR ELECTRICAL GENERAL NOTES.
 - 3) COORDINATE SEQUENCE OF CONSTRUCTION AND APPROPRIATE WORK WINDOWS WITH OWNER AND ENGINEER.
 - 4) ALL CONDUIT THROUGH FLOOR SHALL BE FIRESTOPPED. RE: UNDERWRITER'S LABORATORIES SYSTEM #C-AJ-1291 / G-002.
 - 5) ALL CONDUCTORS INSTALLED IN VERTICAL RACEWAYS SHALL BE SUPPORTED PER THE NEC. PROVIDE JUNCTION BOX WITH INSULATED SUPPORTS SPACED AS INDICATED IN THE NEC. COORDINATE WITH OWNER AND ENGINEER.
 - 6) ITEMS MAY BE SHOWN OFFSET FOR CLARITY. COORDINATE EXACT LOCATION WITH ARCHITECTURAL, STRUCTURAL, MECHANICAL, AND BAS DRAWINGS AND FIELD CONDITIONS.

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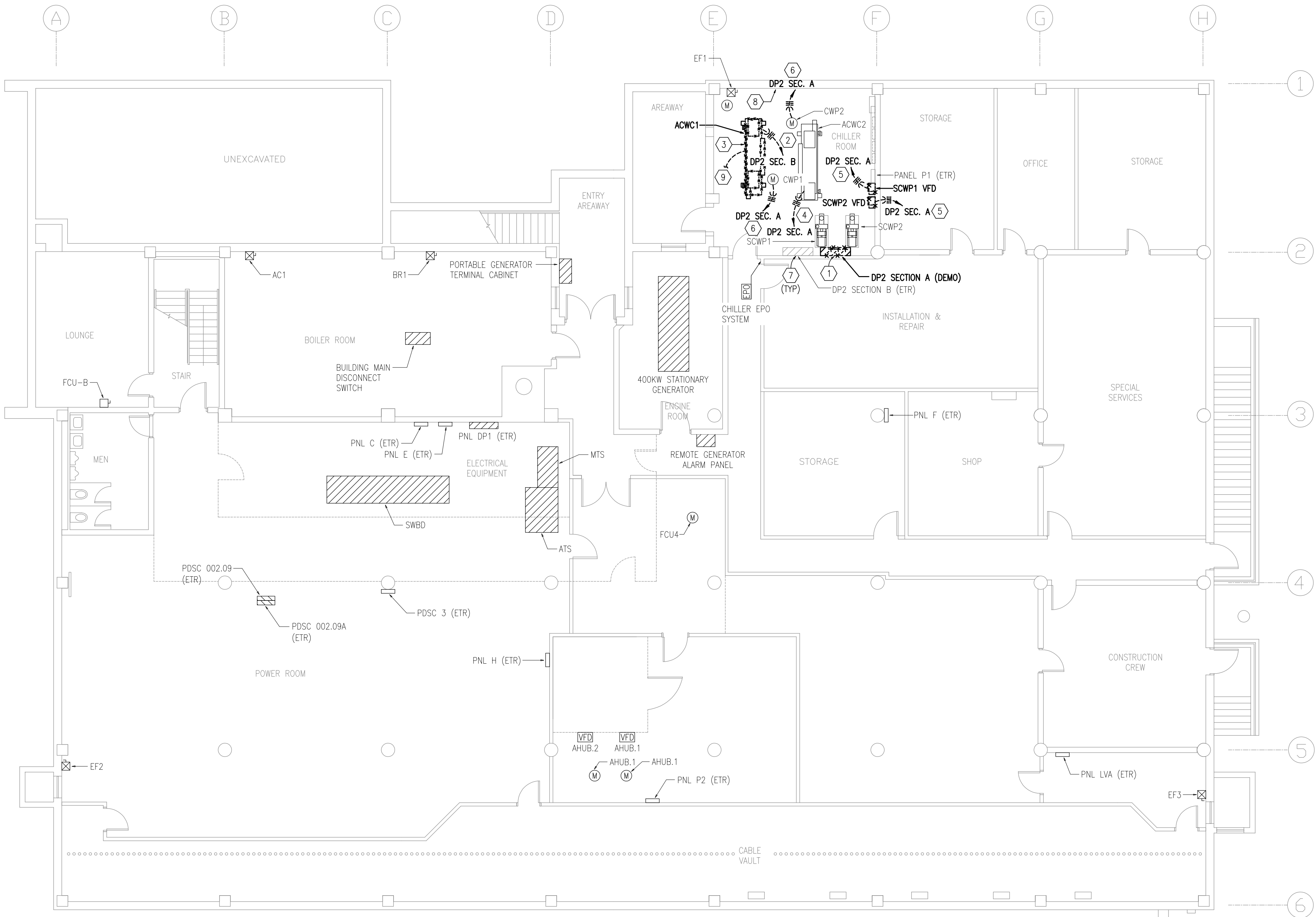
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PROJECT TITLE: PIPE AND CHILLER REPLACEMENT
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202 EAST 3RD STREET
LEES SUMMIT (JACKSON COUNTY)
MISSOURI US
KSCYM041 123785.03.01 E05156

SHEET TITLE: BASEMENT ELECTRICAL POWER DEMOLITION PLAN			
AT&T PROJECT NUMBER: A01KYNV	DATE: 01/21/20	SCALE: 1/8"=1'-0"	
AT&T AUTHORIZATION:	DRAWN BY: SVL	CHECKED BY: DJZ	SHEET NO.
MATT LONG	AT&T DRAWING NO.:	EPD100	



1 BASEMENT ELECTRICAL POWER DEMOLITION PLAN
SCALE: 1/8" = 1'-0"

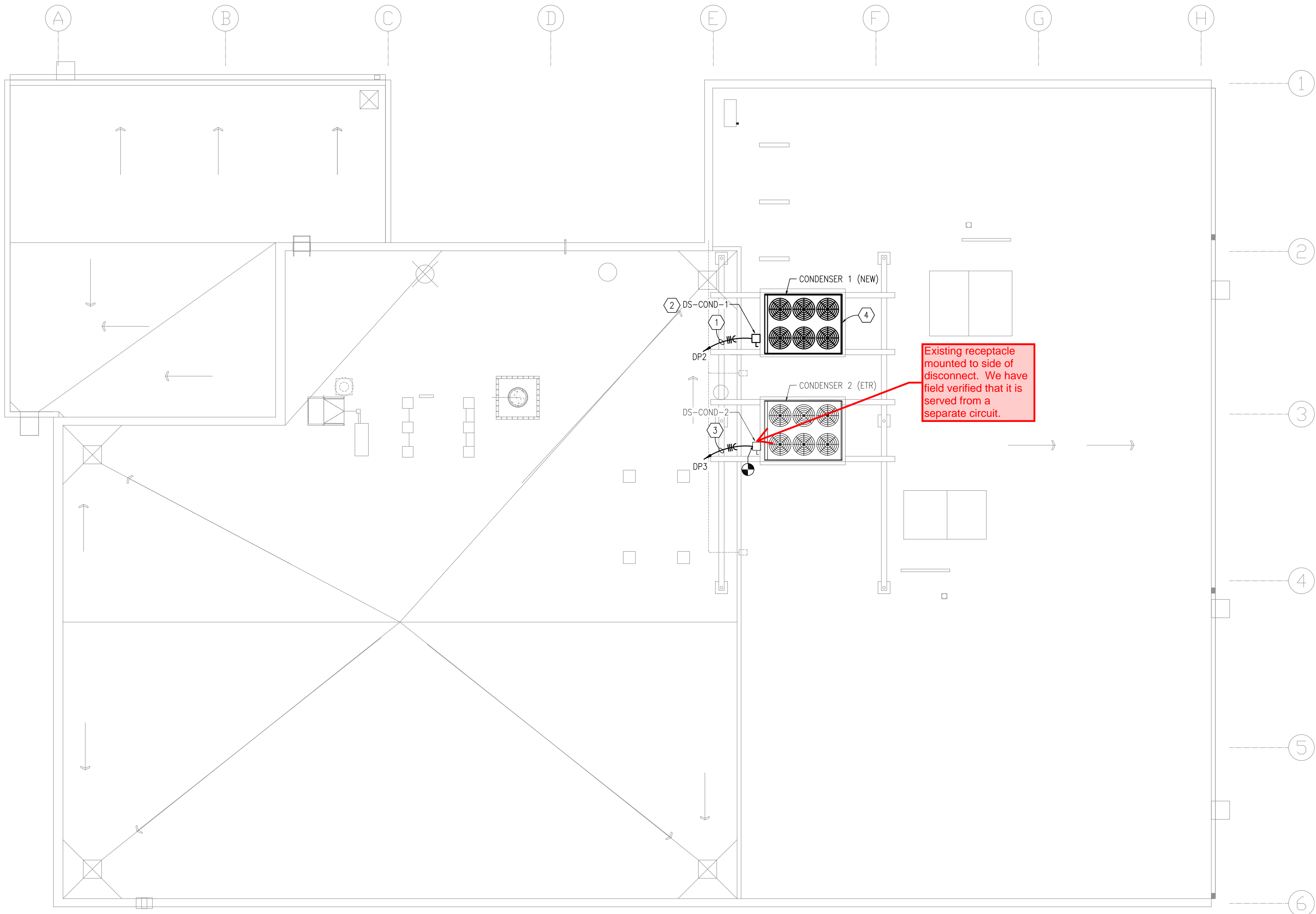


KEYED NOTES:

- ① ROUTE NEW POWER CONDUCTORS TO FUSED SWITCH IN EXISTING PANELBOARD DP2 LOCATED IN THE BASEMENT. TERMINATE CONDUCTORS TO NEW CONDENSING UNIT PER MANUFACTURER'S WRITTEN INSTRUCTIONS. COORDINATE ALL WORK WITH CONSTRUCTION PHASING SEQUENCE AND OWNER AS TO MINIMIZE EQUIPMENT DOWNTIME. RE: ONE-LINE DIAGRAM FOR CONDUCTOR SIZES.
- ② PROVIDE AND INSTALL NEW SAFETY SWITCH IN GENERAL LOCATION INDICATED. PROVIDE SUPPORTS AS REQUIRED. RE: SAFETY SWITCH SCHEDULE FOR ADDITIONAL INFORMATION.
- ③ ROUTE NEW POWER CONDUCTORS TO NEW CIRCUIT BREAKER IN NEW PANELBOARD DP3 LOCATED IN THE BASEMENT. TERMINATE CONDUCTORS TO NEW CONDENSING UNIT PER MANUFACTURER'S WRITTEN INSTRUCTIONS. COORDINATE ALL WORK WITH CONSTRUCTION PHASING SEQUENCE AND OWNER AS TO MINIMIZE EQUIPMENT DOWNTIME. RE: ONE-LINE DIAGRAM FOR CONDUCTOR SIZES.
- ④ NEW MECHANICAL EQUIPMENT TO BE PROVIDED AND INSTALLED BY OTHERS.

GENERAL NOTES:

- 1) RE: SHEET E001 FOR SYMBOLS AND ABBREVIATIONS.
- 2) RE: SHEET E002 FOR ELECTRICAL GENERAL NOTES.
- 3) COORDINATE SEQUENCE OF CONSTRUCTION AND APPROPRIATE WORK WINDOWS WITH OWNER AND ENGINEER.
- 4) ALL CONDUIT THROUGH FLOOR SHALL BE FIRESTOPPED. RE: UNDERWRITER'S LABORATORIES SYSTEM #G-AJ-1291 / G-002.
- 5) ALL CONDUCTORS INSTALLED IN VERTICAL RACEWAYS SHALL BE SUPPORTED PER THE NEC. PROVIDE JUNCTION BOX WITH INSULATED SUPPORTS SPACED AS INDICATED IN THE NEC. COORDINATE WITH OWNER AND ENGINEER.
- 6) ITEMS MAY BE SHOWN OFFSET FOR CLARITY. COORDINATE EXACT LOCATION WITH ARCHITECTURAL, STRUCTURAL, MECHANICAL, AND BAS DRAWINGS AND FIELD CONDITIONS.
- 7) ANY POWER AND COMMUNICATIONS DROPS LOCATED THROUGH FIRE RATED SLAB SHALL BE PROVIDED WITH FIRE RATED POKE THROUGH ASSEMBLY WITH MINIMUM CONDUIT SIZES INDICATED.



1 ROOF ELECTRICAL POWER DEMOLITION PLAN
SCALE: 1/8" = 1'-0"



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KSCYM041 123785.03.01 E05156

SHEET TITLE:
ROOF ELECTRICAL
POWER NEW WORK PLAN

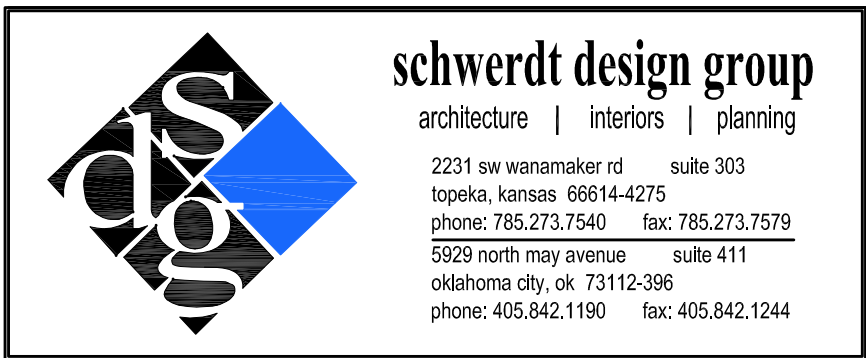
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AT&T AUTHORIZATION: MATT LONG	DRAWN BY: SVL CHECKED BY: DJZ	SHEET NO. EP102

KEYED NOTES:

- EXISTING CHILLER TO BE RE-POWERED FROM NEW SOURCE SHOWN. ROUTE NEW POWER CONDUCTORS TO NEW CIRCUIT BREAKER IN PANELBOARD DP3. TERMINATE CONDUCTORS TO EXISTING CHILLER PER MANUFACTURER'S WRITTEN INSTRUCTIONS. RE: ONE-LINE DIAGRAM FOR CONDUCTOR SIZES.
- NEW CHILLER PROVIDED AND INSTALLED BY OTHERS. ROUTE NEW POWER CONDUCTORS SHOWN TO FUSED SWITCH IN SWITCHBOARD DP2. TERMINATE CONDUCTORS TO NEW CHILLER PER MANUFACTURER'S WRITTEN INSTRUCTIONS. RE: ONE-LINE DIAGRAM FOR CONDUCTOR SIZES.
- PROVIDE AND INSTALL NEW PANELBOARD IN LOCATION INDICATED. COORDINATE ALL WORK WITH CONSTRUCTION PHASING SEQUENCE AND OWNER AS TO MINIMIZE EQUIPMENT DOWNTIME. RE: ONE-LINE DIAGRAM FOR ADDITIONAL INFORMATION.
- LOCATION OF EXISTING SWITCHBOARD DP2 SECTION B. PROVIDE PANEL WITH NEW LABEL AND RE-LABEL AS SWITCHBOARD DP2. RE: ONE-LINE DIAGRAM FOR ADDITIONAL INFORMATION.
- PROVIDE AND INSTALL VFD IN APPROXIMATE LOCATION SHOWN. CONNECT CIRCUITRY TO VFD PER MANUFACTURER'S REQUIREMENTS. PROVIDE SUPPORTS AS NECESSARY. EXTEND BAS CONTROL WIRING IN CONDUIT TO NEW VFD LOCATION. COORDINATE ALL WORK WITH CONSTRUCTION PHASING SEQUENCE AND OWNER AS TO MINIMIZE EQUIPMENT DOWNTIME. RE: ONE-LINE DIAGRAM FOR ADDITIONAL INFORMATION.
- PROVIDE NEW COMBINATION MOTOR STARTER IN GENERAL LOCATION INDICATED. PROVIDE NEW UNI-STRUT SUPPORTS AS NECESSARY. ROUTE NEW POWER CONDUCTORS TO SOURCE INDICATED. PROVIDE NEW CONDUIT AND CIRCUITRY FORM MOTOR STARTER TO EXISTING MOTOR. EXTEND BAS CONTROL WIRING IN CONDUIT TO NEW MOTOR STARTER LOCATION. COORDINATE ALL WORK WITH CONSTRUCTION PHASING SEQUENCE AND OWNER AS TO MINIMIZE EQUIPMENT DOWNTIME. RE: ONE-LINE DIAGRAM AND COMBINATION MOTOR STARTER SCHEDULE FOR ADDITIONAL INFORMATION.
- LOCATION OF EXISTING PANEL DP1. RE: ONE-LINE DIAGRAM FOR ADDITIONAL INFORMATION.
- EXISTING ELECTRICAL EQUIPMENT TO REMAIN.
- PROVIDE NEW GUTTER ON SIDE OF EXISTING PANELBOARD AS REQUIRED TO CONNECT NEW CONDUIT AND CIRCUITRY FROM NEW PANEL DP3. GUTTER SHALL BE SIZED TO MEET REQUIREMENTS OF NEC.
- CONNECT EXISTING EPO SIGNAL RETAINED DURING DEMOLITION TO NEW CHILLER. TERMINATE TO NEW CHILLERS CONTROL PANEL PER MANUFACTURER'S WRITTEN INSTRUCTIONS.

GENERAL NOTES:

- RE: SHEET E001 FOR GENERAL SYMBOLS AND ABBREVIATIONS.
- RE: SHEET E002 FOR ADDITIONAL GENERAL NOTES.
- COORDINATE SEQUENCE OF CONSTRUCTION AND APPROPRIATE WORK WINDOWS WITH OWNER AND ENGINEER.
- ALL CONDUIT THROUGH FLOOR SHALL BE FIRESTOPPED. RE: UNDERWRITER'S LABORATORIES SYSTEM #G-AJ-1291 / G-002.
- ALL CONDUCTORS INSTALLED IN VERTICAL RACEWAYS SHALL BE SUPPORTED PER THE NEC. PROVIDE JUNCTION BOX WITH INSULATED SUPPORTS SPACED AS INDICATED IN THE NEC. COORDINATE WITH OWNER AND ENGINEER.
- ITEMS MAY BE SHOWN OFFSET FOR CLARITY. COORDINATE EXACT LOCATION WITH ARCHITECTURAL, STRUCTURAL, MECHANICAL, AND BAS DRAWINGS AND FIELD CONDITIONS.
- ANY POWER AND COMMUNICATIONS DROPS LOCATED THROUGH FIRE RATED SLAB SHALL BE PROVIDED WITH FIRE RATED POKE THROUGH ASSEMBLY WITH MINIMUM CONDUIT SIZES INDICATED.



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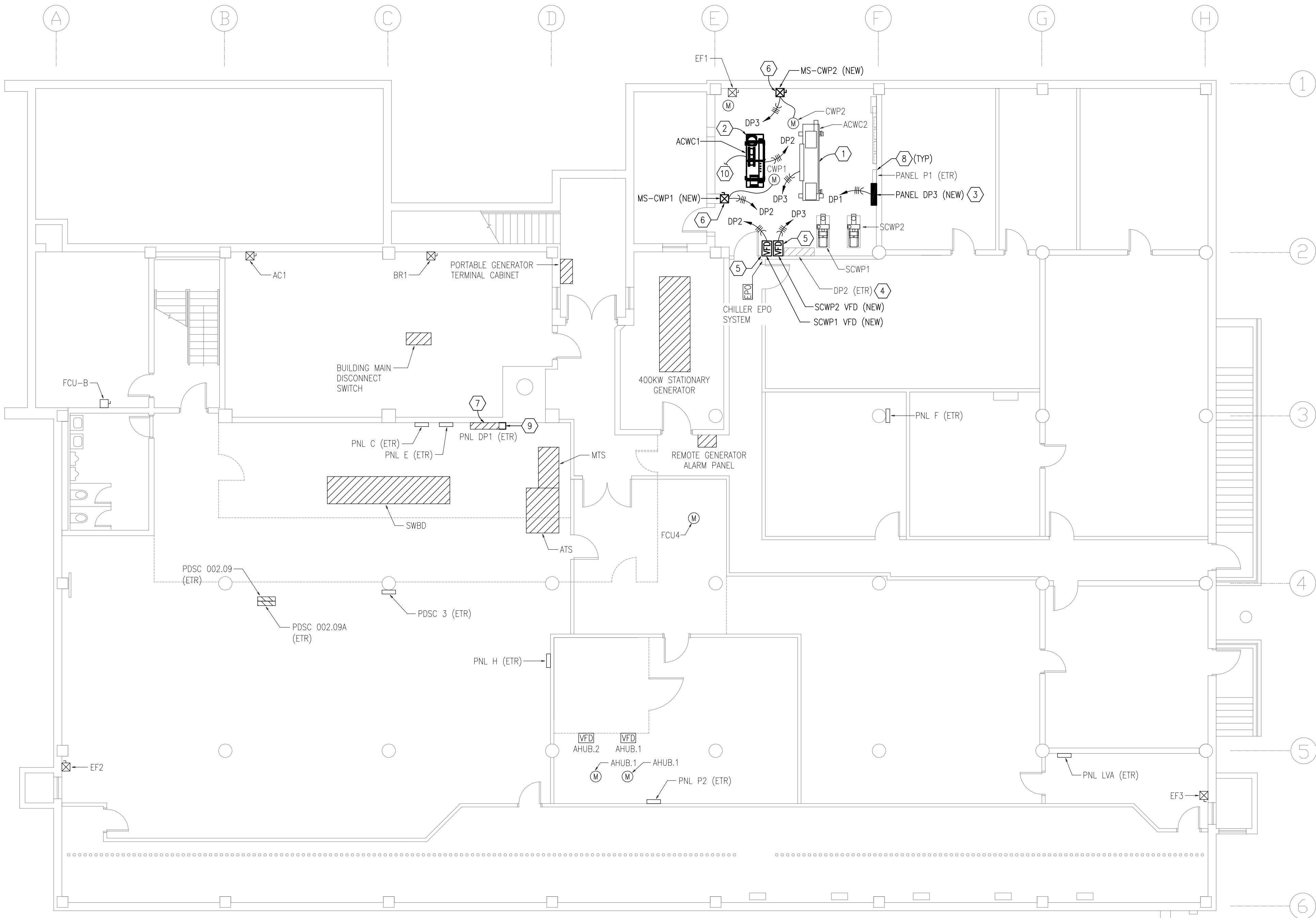
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SHEET TITLE:
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POWER NEW WORK PLAN

AT&T PROJECT NUMBER: A01KYNV	DATE: 01/21/20	SCALE: 1/8"=1'-0"
AT&T AUTHORIZATION: MATT LONG	DRAWN BY: SVL CHECKED BY: DJZ	SHEET NO. EP100



1 BASEMENT ELECTRICAL POWER NEW WORK PLAN
SCALE: 1/8" = 1'-0"

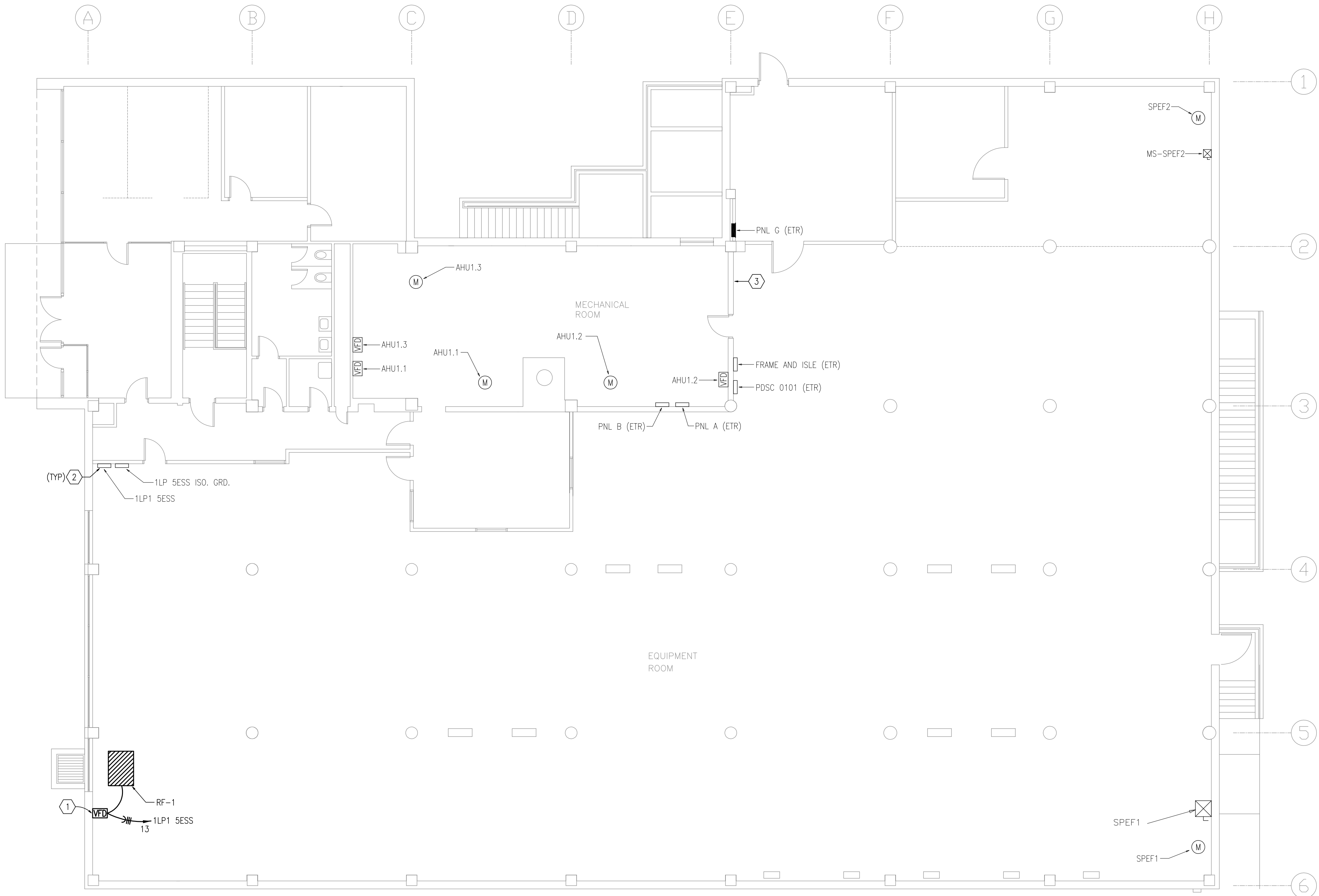


KEYED NOTES:

- 1) INSTALL VFD SUPPLIED BY OTHERS IN APPROXIMATE LOCATION SHOWN. CONNECT CIRCUITRY TO VFD PER MANUFACTURER'S REQUIREMENTS. ELECTRICAL CONTRACTOR IS RESPONSIBLE FOR PROVIDING AND INSTALLING ALL CONDUIT/CIRCUITRY FROM NEW VFD TO ASSOCIATED MOTOR(S). COORDINATE WORK WITH MECHANICAL CONTRACTOR. PROVIDE SUPPORTS AS NECESSARY.
- 2) EXISTING ELECTRICAL EQUIPMENT TO REMAIN.
- 3) PROVIDE NEW UNI-STRUT SUPPORTS FOR EXISTING VESDA PIPING ON RETURN GRILLE BEING REMOVED UNDER MECHANICAL SCOPE. RE: MECHANICAL DRAWINGS FOR ADDITIONAL INFORMATION.

GENERAL NOTES:

- 1) RE: SHEET E001 FOR GENERAL SYMBOLS AND ABBREVIATIONS.
- 2) RE: SHEET E002 FOR ADDITIONAL GENERAL NOTES.
- 3) COORDINATE SEQUENCE OF CONSTRUCTION AND APPROPRIATE WORK WINDOWS WITH OWNER AND ENGINEER.
- 4) ALL CONDUIT THROUGH FLOOR SHALL BE FIRESTOPPED. RE: UNDERWRITER'S LABORATORIES SYSTEM #G-AJ-1291 / G-002.
- 5) ALL CONDUCTORS INSTALLED IN VERTICAL RACEWAYS SHALL BE SUPPORTED PER THE NEC. PROVIDE JUNCTION BOX WITH INSULATED SUPPORTS SPACED AS INDICATED IN THE NEC. COORDINATE WITH OWNER AND ENGINEER.
- 6) ITEMS MAY BE SHOWN OFFSET FOR CLARITY. COORDINATE EXACT LOCATION WITH ARCHITECTURAL, STRUCTURAL, MECHANICAL, AND BAS DRAWINGS AND FIELD CONDITIONS.
- 7) ANY POWER AND COMMUNICATIONS DROPS LOCATED THROUGH FIRE RATED SLAB SHALL BE PROVIDED WITH FIRE RATED POKE THROUGH ASSEMBLY WITH MINIMUM CONDUIT SIZES INDICATED.



1 FIRST FLOOR ELECTRICAL POWER NEW WORK PLAN
SCALE: 1/8" = 1'-0"



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ISG PROJECT #: 19-6423-0

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PROJECT TITLE: PIPE AND CHILLER REPLACEMENT

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LEES SUMMIT (JACKSON COUNTY)
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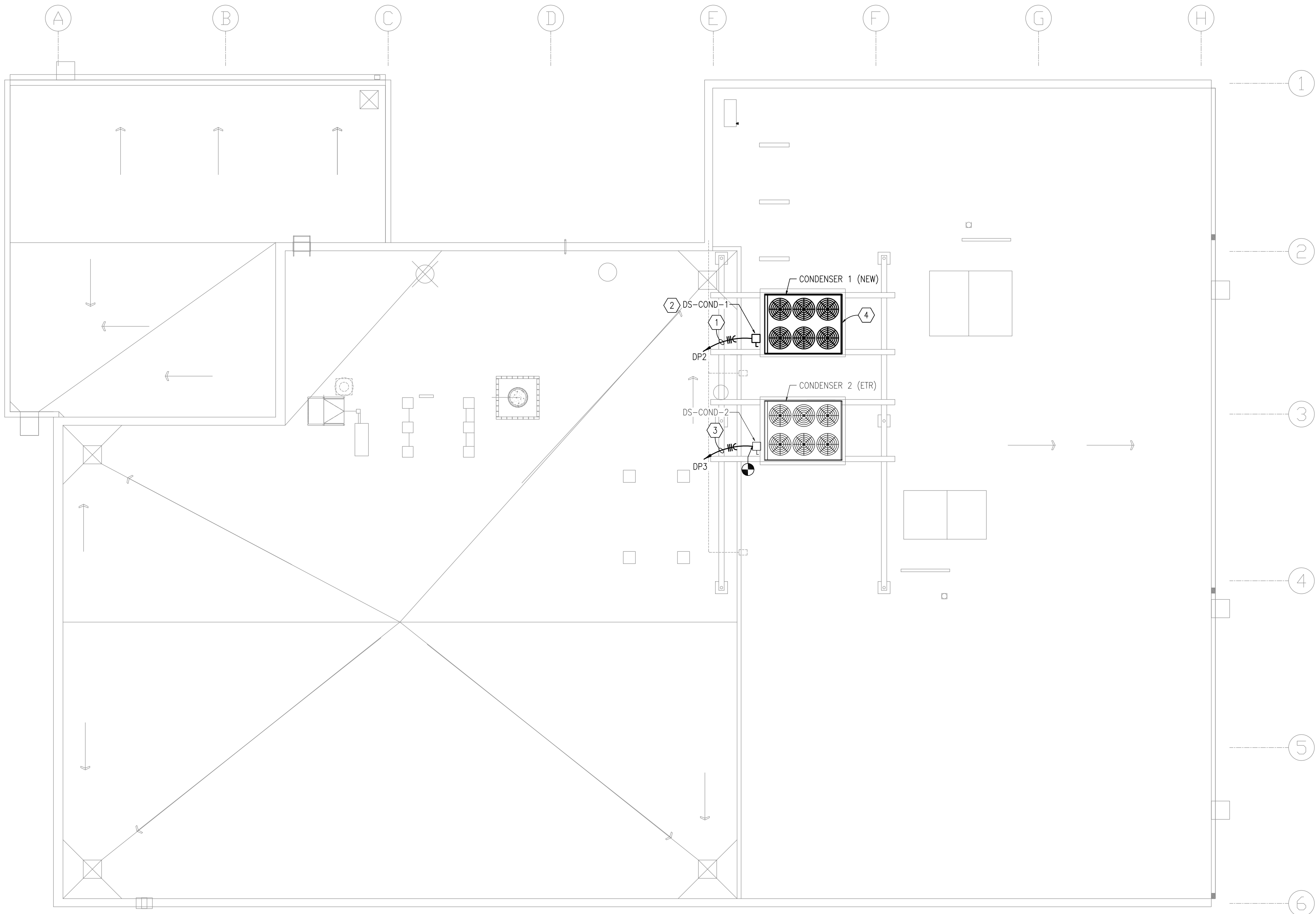
SHEET TITLE:
FIRST FLOOR ELECTRICAL
POWER NEW WORK PLAN

AT&T PROJECT NUMBER: A01KYNV	DATE: 01/21/20 DRAWN BY: SVL	SCALE: 1/8"=1'-0" CHECKED BY: DJZ
AT&T AUTHORIZATION: MATT LONG	SHEET: - OF: - SHEETS AT&T DRAWING NO.:	SHEET NO. EP101

KEYED NOTES:

- ① ROUTE NEW POWER CONDUCTORS TO FUSED SWITCH IN EXISTING PANELBOARD DP2 LOCATED IN THE BASEMENT. TERMINATE CONDUCTORS TO NEW CONDENSING UNIT PER MANUFACTURER'S WRITTEN INSTRUCTIONS. COORDINATE ALL WORK WITH CONSTRUCTION PHASING SEQUENCE AND OWNER AS TO MINIMIZE EQUIPMENT DOWNTIME. RE: ONE-LINE DIAGRAM FOR CONDUCTOR SIZES.
- ② PROVIDE AND INSTALL NEW SAFETY SWITCH IN GENERAL LOCATION INDICATED. PROVIDE SUPPORTS AS REQUIRED. RE: SAFETY SWITCH SCHEDULE FOR ADDITIONAL INFORMATION.
- ③ ROUTE NEW POWER CONDUCTORS TO NEW CIRCUIT BREAKER IN NEW PANELBOARD DP3 LOCATED IN THE BASEMENT. TERMINATE CONDUCTORS TO NEW CONDENSING UNIT PER MANUFACTURER'S WRITTEN INSTRUCTIONS. COORDINATE ALL WORK WITH CONSTRUCTION PHASING SEQUENCE AND OWNER AS TO MINIMIZE EQUIPMENT DOWNTIME. RE: ONE-LINE DIAGRAM FOR CONDUCTOR SIZES.
- ④ NEW MECHANICAL EQUIPMENT TO BE PROVIDED AND INSTALLED BY OTHERS.

- GENERAL NOTES:
- 1) RE: SHEET E001 FOR SYMBOLS AND ABBREVIATIONS.
- 2) RE: SHEET E002 FOR ELECTRICAL GENERAL NOTES.
- 3) COORDINATE SEQUENCE OF CONSTRUCTION AND APPROPRIATE WORK WINDOWS WITH OWNER AND ENGINEER.
- 4) ALL CONDUIT THROUGH FLOOR SHALL BE FIRESTOPPED. RE: UNDERWRITER'S LABORATORIES SYSTEM #G-AJ-1291 / G-002.
- 5) ALL CONDUCTORS INSTALLED IN VERTICAL RACEWAYS SHALL BE SUPPORTED PER THE NEC. PROVIDE JUNCTION BOX WITH INSULATED SUPPORTS SPACED AS INDICATED IN THE NEC. COORDINATE WITH OWNER AND ENGINEER.
- 6) ITEMS MAY BE SHOWN OFFSET FOR CLARITY. COORDINATE EXACT LOCATION WITH ARCHITECTURAL, STRUCTURAL, MECHANICAL, AND BAS DRAWINGS AND FIELD CONDITIONS.
- 7) ANY POWER AND COMMUNICATIONS DROPS LOCATED THROUGH FIRE RATED SLAB SHALL BE PROVIDED WITH FIRE RATED POKE THROUGH ASSEMBLY WITH MINIMUM CONDUIT SIZES INDICATED.



1 ROOF ELECTRICAL POWER DEMOLITION PLAN
SCALE: 1/8" = 1'-0"



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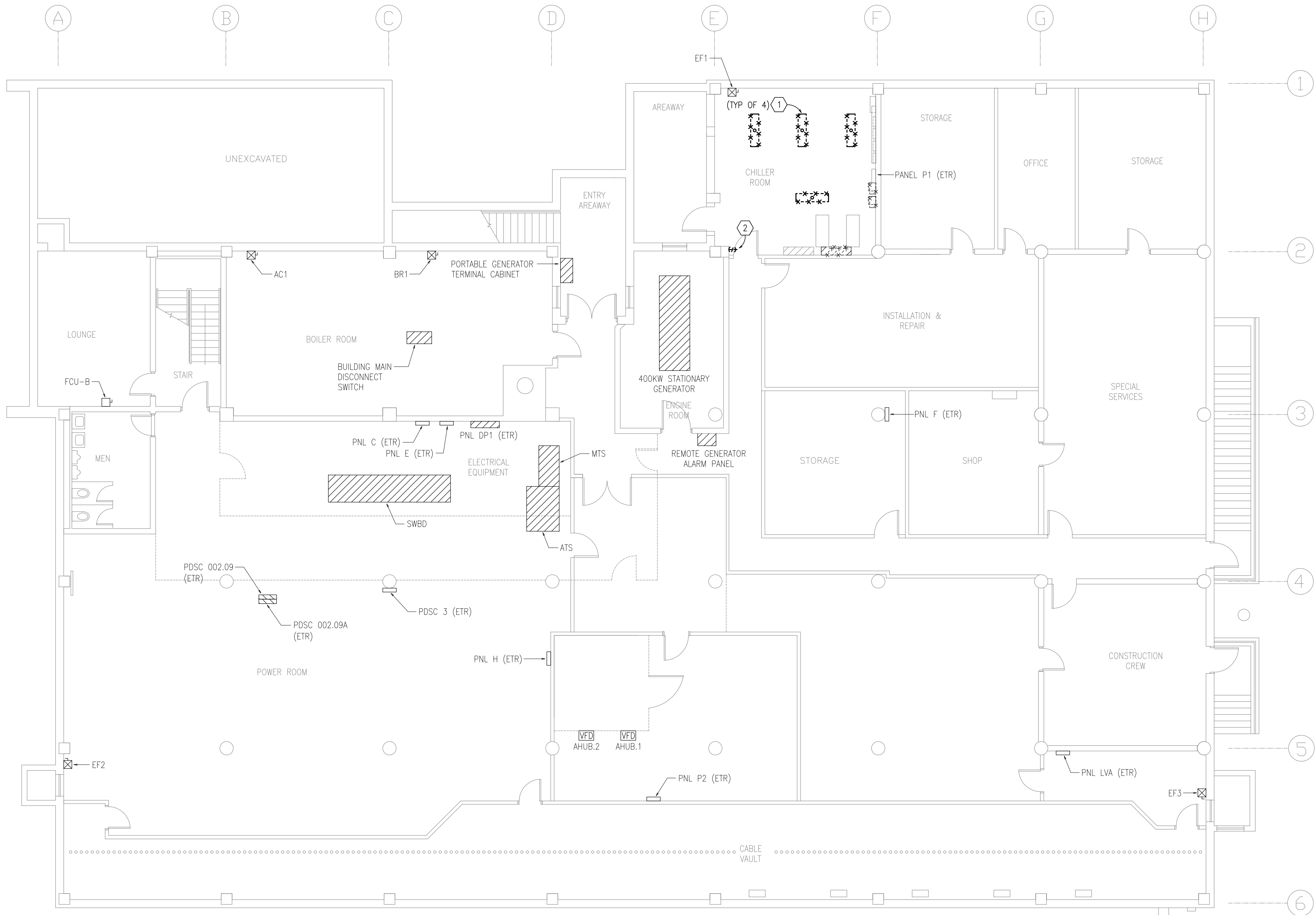
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ROOF ELECTRICAL POWER NEW WORK PLAN			
AT&T PROJECT NUMBER: A01KYNV	DATE: 01/21/20	SCALE: 1/8"=1'-0"	
AT&T AUTHORIZATION:	DRAWN BY: SVL	CHECKED BY: DJZ	SHEET NO.
MATT LONG	AT&T DRAWING NO.:		EP102

KEYED NOTES:

- ① REMOVE EXISTING LIGHT FIXTURE IN LOCATION INDICATED. ALL ASSOCIATED CONDUIT AND CIRCUITRY SHALL REMAIN IN PLACE FOR RE-USE UNDER NEW WORK.
- ② REMOVE EXISTING LIGHT SWITCH IN LOCATION INDICATED. ALL ASSOCIATED CONDUIT AND CIRCUITRY SHALL REMAIN IN PLACE FOR RE-USE UNDER NEW WORK.

GENERAL NOTES:

- 1) RE: SHEET E001 FOR SYMBOLS AND ABBREVIATIONS.
- 2) RE: SHEET E002 FOR ELECTRICAL GENERAL NOTES.
- 3) COORDINATE SEQUENCE OF CONSTRUCTION AND APPROPRIATE WORK WINDOWS WITH OWNER AND ENGINEER.
- 4) ALL CONDUIT THROUGH FLOOR SHALL BE FIRESTOPPED. RE: UNDERWRITER'S LABORATORIES SYSTEM #G-AJ-1291 / G-002.
- 5) ALL CONDUCTORS INSTALLED IN VERTICAL RACEWAYS SHALL BE SUPPORTED PER THE NEC. PROVIDE JUNCTION BOX WITH INSULATED SUPPORTS SPACED AS INDICATED IN THE NEC. COORDINATE WITH OWNER AND ENGINEER.
- 6) ITEMS MAY BE SHOWN OFFSET FOR CLARITY. COORDINATE EXACT LOCATION WITH ARCHITECTURAL, STRUCTURAL, MECHANICAL, AND BAS DRAWINGS AND FIELD CONDITIONS.
- 7) ANY POWER AND COMMUNICATIONS DROPS LOCATED THROUGH FIRE RATED SLAB SHALL BE PROVIDED WITH FIRE RATED POKE THROUGH ASSEMBLY WITH MINIMUM CONDUIT SIZES INDICATED.



1 BASEMENT ELECTRICAL LIGHTING DEMOLITION PLAN
SCALE: 1/8" = 1'-0"



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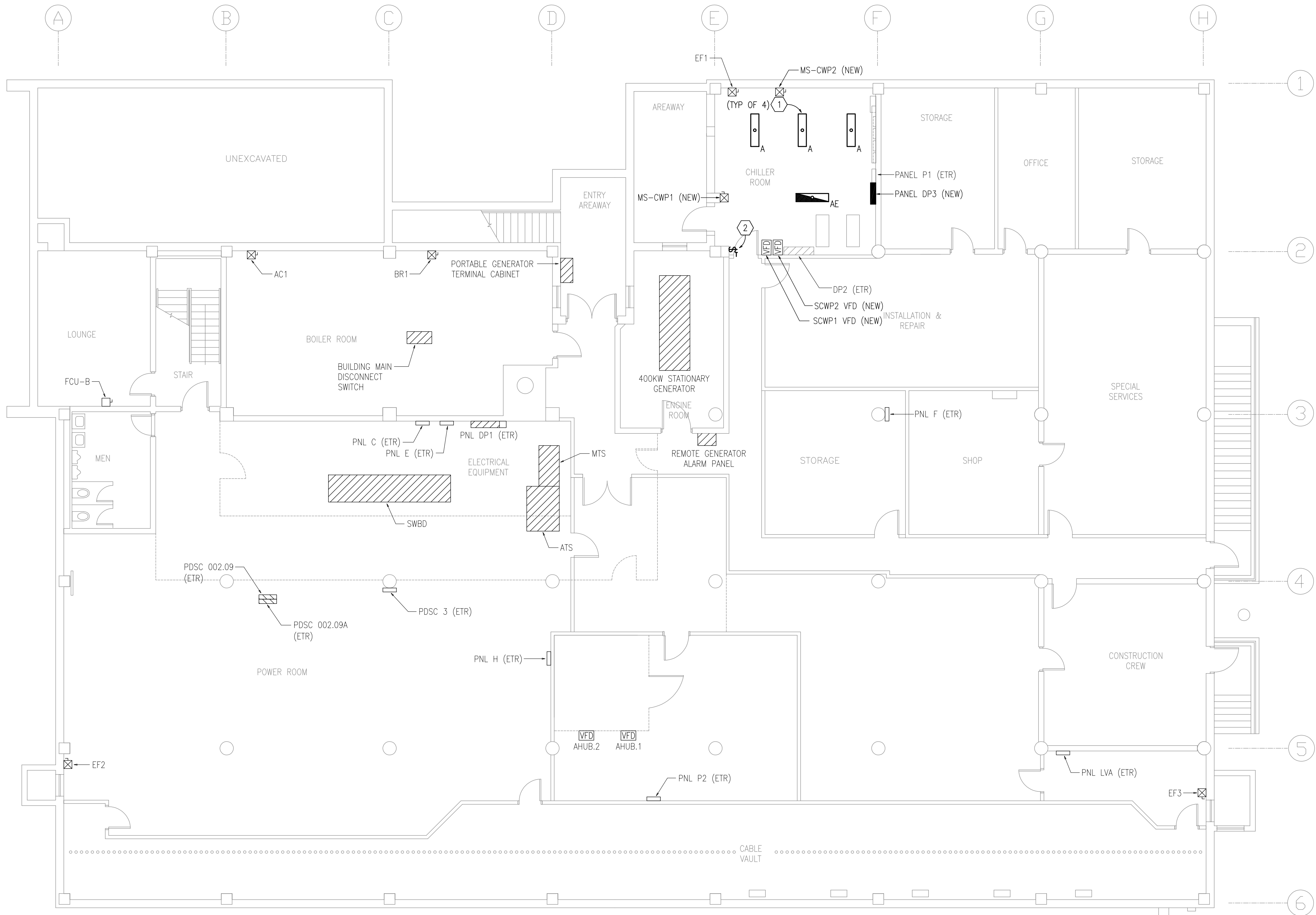
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KEYED NOTES:

- 1) PROVIDE AND INSTALL NEW LIGHT FIXTURE IN LOCATION INDICATED. CONNECT NEW LIGHT FIXTURE TO EXISTING LIGHTING CIRCUITRY RETAINED DURING DEMOLITION. RE: LIGHT FIXTURE SCHEDULE FOR ADDITIONAL INFORMATION.
- 2) PROVIDE AND INSTALL NEW TIMER SWITCH SENSORSWITCH MODEL #PTS 60 RATED FOR 800W OR PRIOR APPROVED EQUIVALENT. SWITCH SHALL BE PROVIDED WITH FLASH AND BEEP WARNINGS TO ALLOW TIME FOR OPERATOR TO RESET THE SWITCH PRIOR TO LIGHTING TURNING OFF. NO MINIMUM LOAD REQUIREMENT, UL LISTED, 5 YR WARRANTY, AND SHALL BE COMPATIBLE WITH ALL ELECTRONIC BALLASTS AND MOTOR LOADS.

GENERAL NOTES:

- 1) RE: SHEET E001 FOR SYMBOLS AND ABBREVIATIONS.
- 2) RE: SHEET E002 FOR ELECTRICAL GENERAL NOTES.
- 3) COORDINATE SEQUENCE OF CONSTRUCTION AND APPROPRIATE WORK WINDOWS WITH OWNER AND ENGINEER.
- 4) ALL CONDUIT THROUGH FLOOR SHALL BE FIRESTOPPED. RE: UNDERWRITER'S LABORATORIES SYSTEM #C-AJ-1291 / G-002.
- 5) ALL CONDUCTORS INSTALLED IN VERTICAL RACEWAYS SHALL BE SUPPORTED PER THE NEC. PROVIDE JUNCTION BOX WITH INSULATED SUPPORTS SPACED AS INDICATED IN THE NEC. COORDINATE WITH OWNER AND ENGINEER.
- 6) ITEMS MAY BE SHOWN OFFSET FOR CLARITY. COORDINATE EXACT LOCATION WITH ARCHITECTURAL, STRUCTURAL, MECHANICAL, AND BAS DRAWINGS AND FIELD CONDITIONS.
- 7) ANY POWER AND COMMUNICATIONS DROPS LOCATED THROUGH FIRE RATED SLAB SHALL BE PROVIDED WITH FIRE RATED POKE THROUGH ASSEMBLY WITH MINIMUM CONDUIT SIZES INDICATED.



1 BASEMENT ELECTRICAL LIGHTING NEW WORK PLAN
SCALE: 1/8" = 1'-0"



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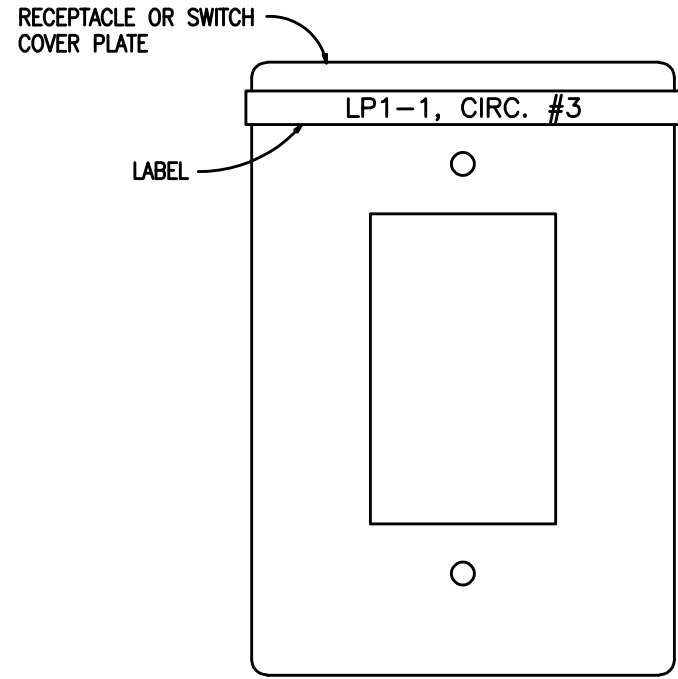
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PROVIDE LABELS AS NECESSARY TO INDICATE PANELBOARD AND CIRCUIT NUMBER SERVING RECEPTACLE AND LIGHT SWITCHES. PROVIDE ON ALL NEW AND EXISTING/MODIFIED RECEPTACLES AND LIGHT SWITCHES IN THE AREA OF WORK.

1 TYP. RECEPTACLE LABEL DETAIL

NO SCALE

XFMR-TX-DP-2A-1

75 KVA
HV: 480V, 3PH, 3W
LV: 208/120V, 3PH, 4W
FED BY: MSG-4A

DP-2A-1

225A, 208/120V, 3PH, 4W
FED BY: MSG-4A

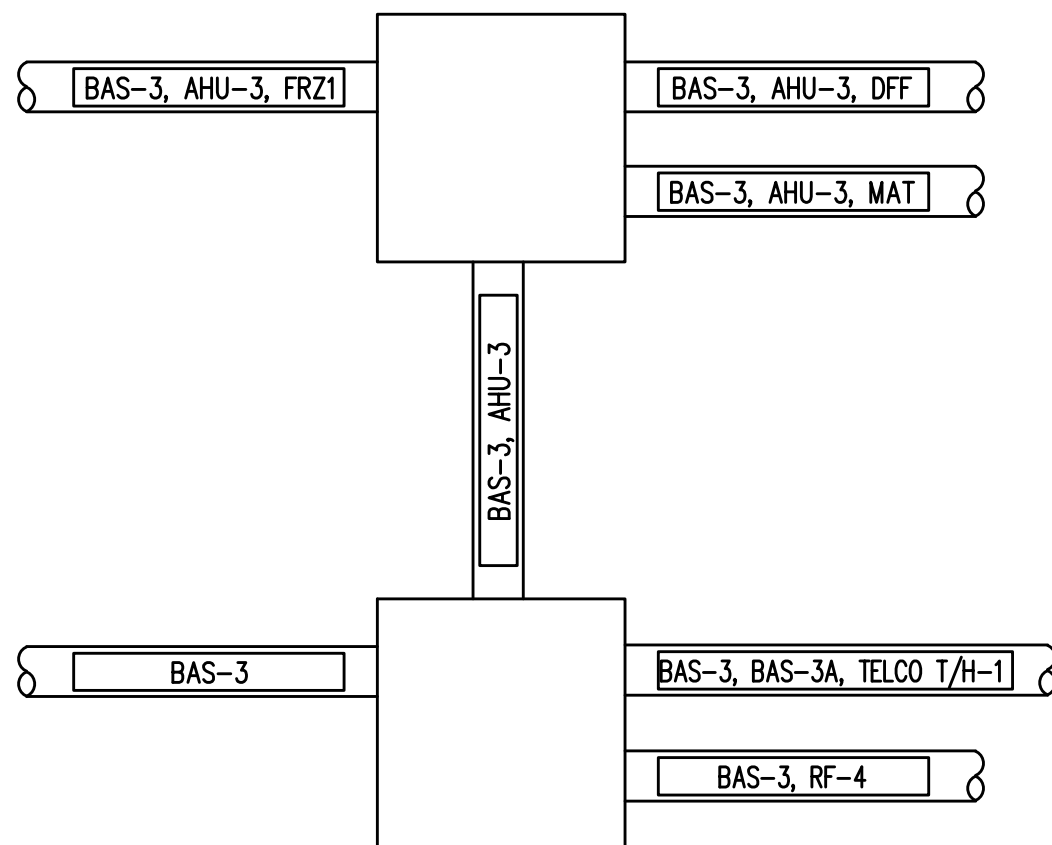
MDP-1

400A, 208/120V.3PH.4W
FED FROM
ATS-1

PROVIDE ENGRAVED NAMEPLATES ON ALL INDIVIDUAL BREAKERS AND SWITCHES IN MAIN PANELS.

3 TYPICAL EQUIPMENT TAG DETAIL

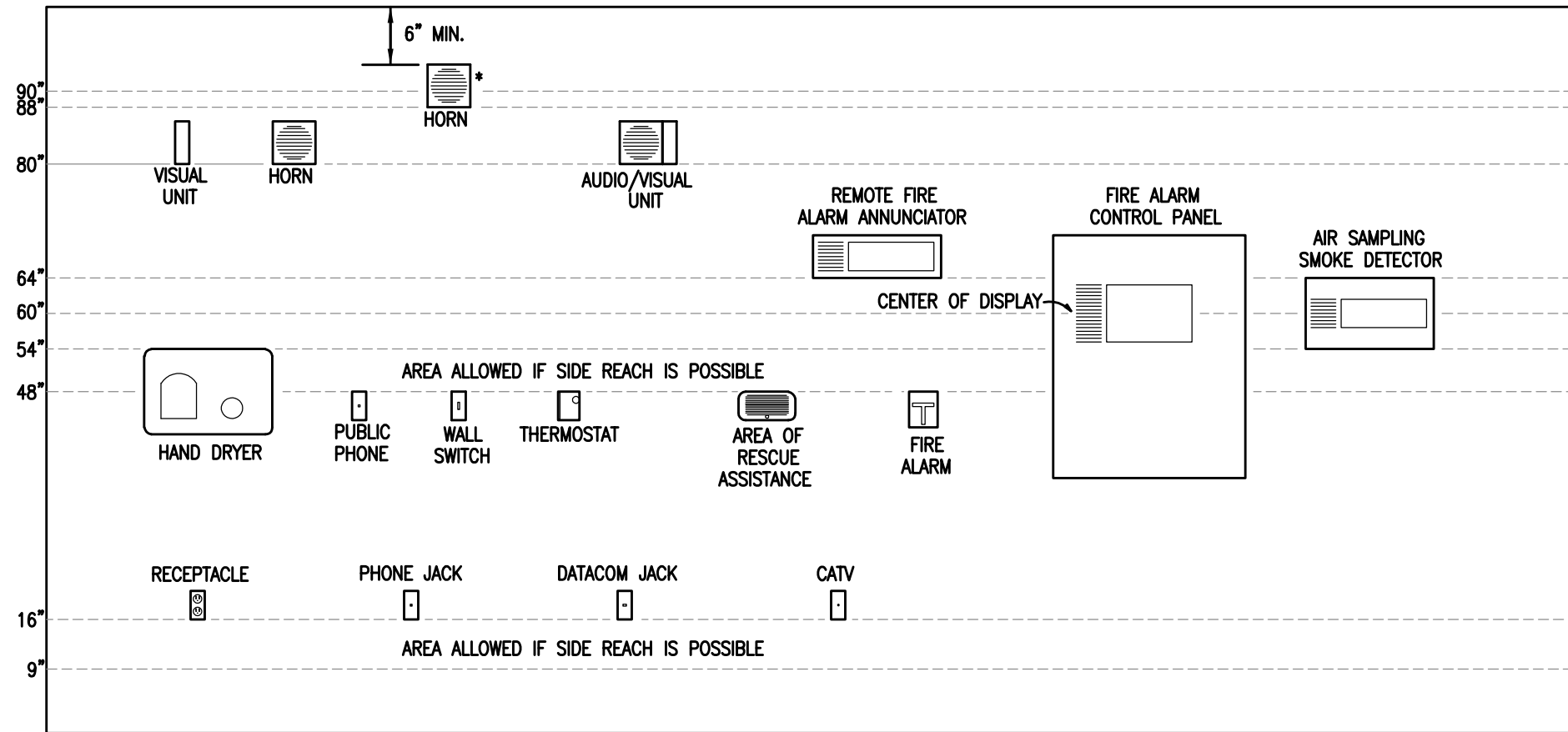
NO SCALE



ALL CONTROL WIRING SHALL BE INSTALLED IN CONDUIT. PROVIDE CONDUIT LABELING AT ALL LOCATIONS WHERE CONDUITS ENTER OR LEAVE JUNCTION BOXES, PULL BOXES, CONTROL PANELS, CONTROL DEVICES, WALLS, FLOORS, MECHANICAL EQUIPMENT, ETC., AND AT MAXIMUM 30' INTERVALS IN BETWEEN BOXES AND DEVICES. PROVIDE PANEL NAME, CONTROLLER NAME, AND POINT NAME CONTAINED WITHIN CONDUIT. WHERE MULTIPLE CONTROL POINTS ARE INSTALLED IN THE SAME CONDUIT IT IS ACCEPTABLE TO PROVIDE CONTROL PANEL NAME ONLY. LABELS SHALL BE BLUE WITH WHITE LETTERING, AND SHALL BE VISIBLE FROM FLOOR WHERE POSSIBLE.

4 TYPICAL CONDUIT LABELING DETAIL

NO SCALE

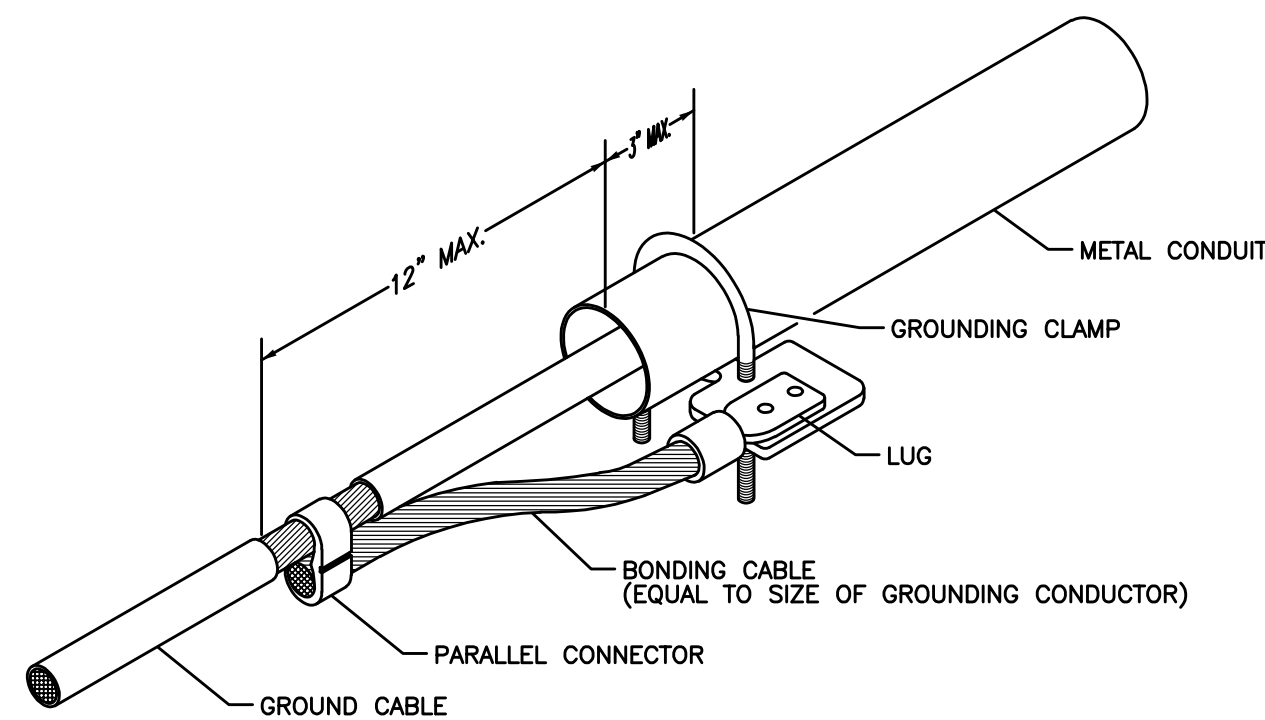


FIRE ALARM DEVICE MOUNTING NOTES:

- VISUAL UNIT**
DEVICE BOTTOM 80" ABOVE HIGHEST FLOOR LEVEL OR TOP 6" BELOW CEILING; WHICHEVER IS LOWER (ADA)
- AUDIO UNIT**
DEVICE BOTTOM 80" ABOVE HIGHEST FLOOR LEVEL OR TOP 6" BELOW CEILING; WHICHEVER IS LOWER (ADA)
* TOP OF UNIT NOT LESS THAN 90" ABOVE FLOOR AND NOT LESS THAN 6" BELOW CEILING (NFPA) (BOTTOM AT 88" WITH BLOCK COURSES). MOUNT AT NFPA HEIGHT ONLY IF REQUIRED BY LOCAL AHJ.
- AUDIO/VISUAL UNIT**
DEVICE BOTTOM 80" ABOVE HIGHEST FLOOR LEVEL OR TOP 6" BELOW CEILING; WHICHEVER IS LOWER (ADA)
- PULL STATION**
HIGHEST OPERABLE PART SHALL NOT BE MORE THAN 48" ABOVE THE FLOOR (FRONT APPROACH) (ADA) AND SHALL BE A MINIMUM OF 42" ABOVE THE FLOOR.

5 TYP. ELECTRICAL DEVICE MOUNTING HEIGHTS

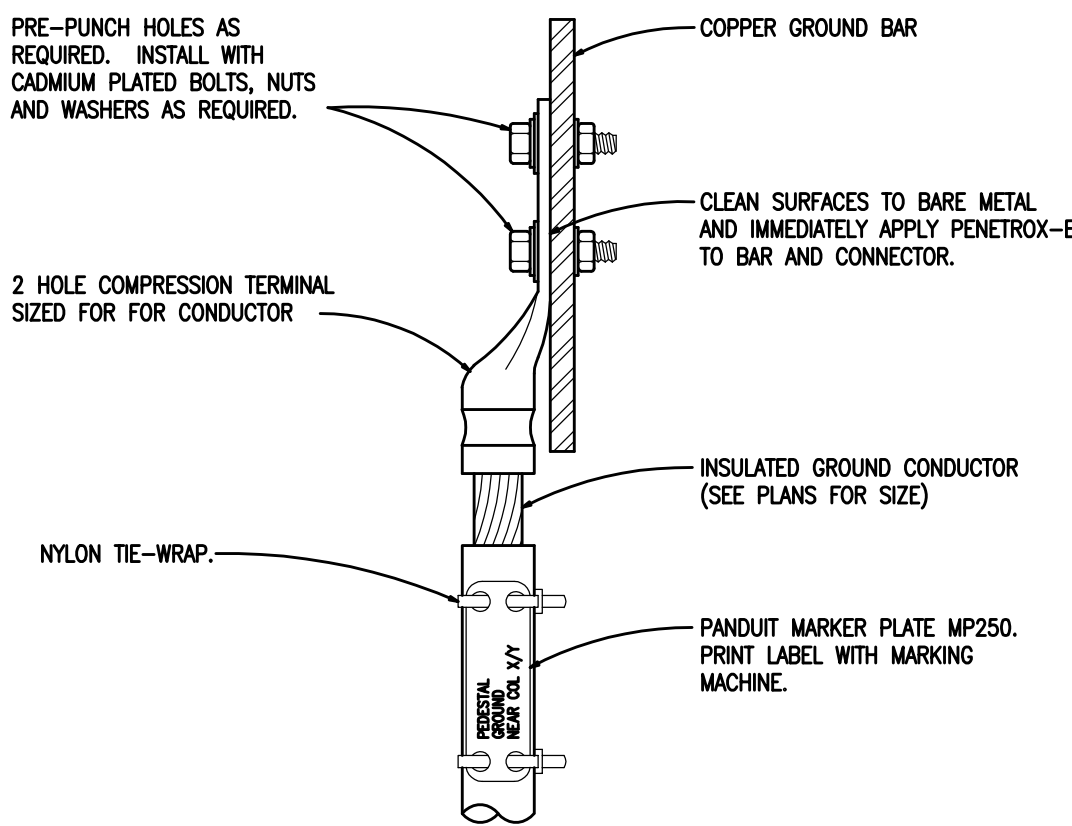
NOT TO SCALE



GENERAL NOTES:
1) ALL LUGS, PARALLEL CONNECTORS, AND GROUNDING CLAMPS SHALL BE UL LISTED AND BE INSTALLED USING UL LISTED CRIMPING TOOLS.

6 BONDING OF GROUNDING CONDUIT

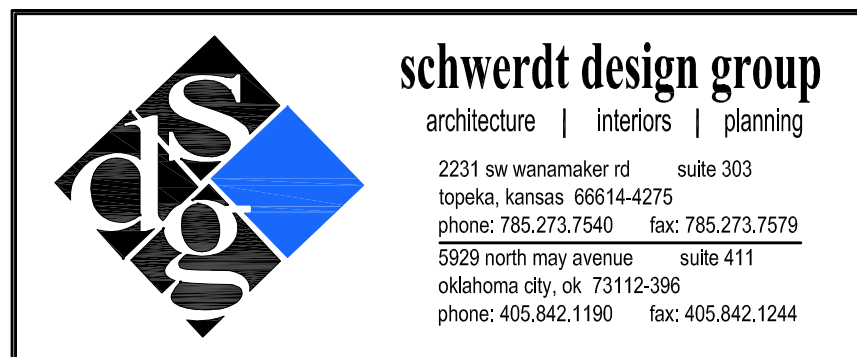
NO SCALE



DETAIL GENERAL NOTES:
1) ALL MULTIPLE CRIMP TWO HOLE LUGS TO BE INSTALLED USING UL LISTED TOOL AND HEXAGONAL DIE WITH PROPER NUMBER OF CRIMPS.

7 TYPICAL GROUND LUG COMPRESSION TERMINAL CONNECTION DETAIL

NOT TO SCALE



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SHEET TITLE:

ELECTRICAL DETAILS

AT&T PROJECT NUMBER: A01KYNV	DATE: 01/21/20	SCALE: NONE
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LIGHTING FIXTURE SCHEDULE

FIXTURE DESIGNATION	FIXTURE DESCRIPTION	LAMPS					FINISH	FIXTURE VOLTAGE	FIXTURE WATTAGE	No. & TYPE OF BALLAST	MANUFACTURER **	CATALOG NO.	NOTES
		QTY	INC.	FLUOR.	H.I.D.	CODE							
"A"	1'x4', SUSPENDED INDUSTRIAL SYLE LED FIXTURE.	—	—	—	—	LED	WHITE	120	52	—	WILLIAMS	80-4-L63/840-VBY-2-DRV-UNV	—
"Ae"	1'x4', SUSPENDED INDUSTRIAL SYLE LED FIXTURE WITH EMERGENCY DRIVER.	—	—	—	—	LED	WHITE	120	52	—	WILLIAMS	80-4-L63/840-EM/10W-VBY-2-DRV-UNV	—

- * ALL FIXTURES TO BE MOUNTED OUTSIDE SHALL BE RATED FOR DAMP LOCATIONS.
** ANY SUBSTITUTIONS SHALL BE SUBMITTED TO ENGINEER FOR APPROVAL PRIOR TO BIDDING.

NOTES:

- 1) PROVIDE FIXTURE WITH NUMBER OF FACES, DIRECTIONAL INDICATORS, AND MOUNTING HARDWARE AS NECESSARY TO INSTALL AS SHOWN ON PLANS.

COMBINATION MOTOR STARTER SCHEDULE

MARK	LOAD				SWITCH		MCP		STARTER				STARTED BY
	EQUIPMENT SERVED	VOLTS	HP	FLA	AMP	POLE	AMP	AIC	SIZE	TYPE	ENCLOSURE	ACCESSORIES	
CMS-CWP1	CWP1	208	2 HP	6.4	30	3	70	42,000	0	FVNR, MCP TYPE, SOLID STATE OVERLOAD	HD, NEMA 12	AC, GP, HOA, RP, CT	BAS
CMS-CWP2	CWP2	208	2 HP	6.4	30	3	70	42,000	0	FVNR, MCP TYPE, SOLID STATE OVERLOAD	HD, NEMA 12	AC, GP, HOA, RP, CT	BAS

ABBREVIATIONS:

- AC – AUXILIARY CONTACTS (1) NO, (1) NC
BAS – BUILDING AUTOMATION SYSTEM
CT – CONTROL VOLTAGE TRANSFORMER
FVNR – FULL-VOLTAGE NON-REVERSING
FVTS – FULL VOLTAGE TWO-SPEED
GD – GENERAL DUTY
GP – GREEN PILOT LAMP
HD – HEAVY DUTY
HOA – HAND-OFF-AUTO SELECTOR SWITCH
MCP – MOTOR CIRCUIT PROTECTOR (INSTANTANEOUS TRIP CIRCUIT BREAKER)
MCP – MELTING ALLOY THERMAL OVERLOADS
RP – RED PILOT LAMP
TDR – TIME DELAY RELAY (0-10 MIN., ADJUSTABLE BY SEC.)
TC – TEMPERATURE CONTROL
12 – 120V SEPARATE CONTROL POWER SOURCE COIL
24 – 24V SEPARATE CONTROL POWER SOURCE COIL
OF – ON/OFF SELECTOR SWITCH

* MANUFACTURER SHALL BE EATON, SIEMENS, SQUARE D, OR PRIOR APPROVED EQUIVALENT.

NOTES:

1. PROVIDE SUBMITTAL WITH PRODUCT DATA FOR EACH PRODUCT INDICATED.
2. PROVIDE SHOP DRAWING WITH PLANS, ELEVATIONS, SECTIONS, DIMENSIONS, WEIGHTS, ENCLOSURE TYPES, CURRENT / VOLTAGE RATINGS, SHORT CIRCUIT RATINGS, DETAIL FEATURES, CHARACTERISTICS, RATINGS, FACTORY SETTINGS, AND WIRING DIAGRAMS FOR EACH PRODUCT INDICATED.
3. PROVIDE CLOSEOUT SUBMITTAL WITH OPERATION AND MAINTENANCE DATA FOR EACH PRODUCT INDICATED.
4. ELECTRICAL COMPONENTS, DEVICES, AND ACCESSORIES SHALL BE LISTED AND LABELED AS DEFINED IN NFPA 70, ARTICLE 100, BY A TESTING AGENCY ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION, AND MARKED FOR INTENDED USE.
5. OBTAIN ENCLOSED SWITCHES AND CIRCUIT BREAKERS, OVERCURRENT PROTECTIVE DEVICES, COMPONENTS, AND ACCESSORIES, WITHIN SAME PRODUCT CATEGORY, FROM SINGLE SOURCE FROM SINGLE MANUFACTURER.
6. PRODUCT SELECTION FOR RESTRICTED SPACE: DRAWINGS INDICATE MAXIMUM DIMENSIONS FOR ENCLOSED SWITCHES AND CIRCUIT BREAKERS, INCLUDING CLEARANCES BETWEEN ENCLOSURES, AND ADJACENT SURFACES AND OTHER ITEMS. COMPLY WITH INDICATED MAXIMUM DIMENSIONS.
7. RATE EQUIPMENT FOR CONTINUOUS OPERATION WITH THE AMBIENT TEMPERATURE FROM MINUS 22 DEG F TO 104 DEG F WITH THE ALTITUDE NOT EXCEEDING 6600 FEET.
8. INSTALL TO MAINTAIN CODE REQUIRED AND MANUFACTURER RECOMMENDED AND REQUIRED CLEARANCES.
9. MANUFACTURER SHALL BE EATON, SIEMENS, SQUARE D, OR PRIOR APPROVED EQUIVALENT.
10. TYPE GD, GENERAL DUTY SWITCHES SHALL BE UL 98 AN NEMA KS 1, HORSEPOWER RATED, WITH CARTRIDGE FUSE INTERIORS TO ACCOMMODATE SPECIFIED FUSES, LOCKABLE HANDLE WITH CAPABILITY TO ACCEPT TWO PADLOCKS, AND INTERLOCKED WITH COVER IN CLOSED POSITION.
11. TYPE HD, HEAVY DUTY SWITCHES SHALL BE UL 98 AND NEMA KS 1, HORSEPOWER RATED, WITH CLIPS OR BOLT PADS TO ACCOMMODATE SPECIFIED FUSES, LOCKABLE HANDLE WITH CAPACITY TO ACCEPT THREE PADLOCKS, AND INTERLOCKED WITH COVER IN CLOSED POSITION.
12. INSTALL WALL MOUNTED CONTROLLERS ON WALLS WITH TOPS AT UNIFORM HEIGHT, AND WITH DISCONNECT OPERATING HANDLES NOT HIGHER THAN 70 INCHES ABOVE FINISHED FLOOR. BOLT UNIT TO WALL OR UGHWIGHT STRUCTURAL STEEL CHANNELS BOLTED TO THE WALL.
13. FOR CONTROLLERS NOT AT WALLS, PROVIDE FREE-STANDING SUPPORT RACK.
14. FLOOR MOUNTED CONTROLLERS SHALL BE PROVIDED WITH 4-INCH THICK CONCRETE BASE. COORDINATION WITH OTHER TRADES.
15. INSTALL HEATERS IN THERMAL OVERLOAD RELAYS. SELECT HEATERS BASED ON ACTUAL NAMEPLATE FULL-LOAD AMPS AFTER MOTORS HAVE BEEN INSTALLED.
16. INSTALL WIRING BETWEEN CONTROLLER AND REMOTE DEVICES. COORDINATE WITH MANUFACTURER'S WIRING DIAGRAM. BUNDLE, TRIM, AND SUPPORT WIRING IN ENCLOSURES.
17. EXAMINE ELEMENTS AND SURFACES FOR COMPLIANCE WITH INSTALLATION TOLERANCES AND OTHER CONDITIONS AFFECTING PERFORMANCE OF THE WORK.
18. INSTALL FUSES IN FUSIBLE DEVICES.
19. COMPLY WITH NECA 1.
20. SET FIELD-ADJUSTABLE SWITCHES, CIRCUIT BREAKERS, OVERLOAD-RELAY PICKUP, AND TRIP RANGES.
21. TEST INSULATION RESISTANCE FOR EACH ENCLOSED SWITCH AND CIRCUIT BREAKER, COMPONENT, CONNECTING SUPPLY, FEEDER, AND CONTROL CIRCUIT.
22. TEST CONTINUITY OF EACH CIRCUIT.
23. PERFORM EACH VISUAL AND MECHANICAL INSPECTION AND ELECTRICAL TEST STATED IN NETA ACCEPTANCE TESTING SPECIFICATION. CORRECT MALFUNCTIONING UNITS ON-SITE IF POSSIBLE AND RE-TEST TO DEMONSTRATE COMPLIANCE; OTHERWISE REPLACE WITH NEW UNITS.
24. TEST AND ADJUST CONTROLS, REMOTE MONITORING, AND SAFETIES. REPLACE DAMAGED AND MALFUNCTIONING CONTROLS AND EQUIPMENT.

VARIABLE FREQUENCY DRIVE SCHEDULE

TAG NO.	MANUFACTURER *	MODEL	LOCATION / SERVICE	SERVES	HP	VOLTS/PHASE/HERTZ	DIMENSIONS	NOTES
VFD-SCWP1	ASEA BROWN BOVERI	ACH-580	CHILLER ROOM	SCWP1	7.5	208/3/60	5.39"W X 10.77"D X 44.10"H	1-10
VFD-SCWP2	ASEA BROWN BOVERI	ACH-580	CHILLER ROOM	SCWP2	7.5	208/3/60	5.39"W X 10.77"D X 44.10"H	1-10

NOTES:

1. VARIABLE FREQUENCY DRIVE TO BE PROVIDED BY MECHANICAL CONTRACTOR AND INSTALLED BY ELECTRICAL CONTRACTOR. PROVIDE WITH OPTION PACK AND MANUAL BYPASS.
2. PROVIDE WITH LOCAL DISCONNECT. THE LOCAL DISCONNECT SWITCH SHALL BE CAPABLE OF BEING LOCKED IN THE OPEN POSITION, THE PROVISION FOR LOCKING OR ADDING A LOCK TO THE CONTROLLER DISCONNECT SHALL BE INSTALLED ON OR AT THE SWITCH AND SHALL REMAIN IN PLACE WITH OR WITHOUT THE LOCK INSTALLED.
3. PROVIDE WITH CONTROLS INTERFACE BOARD FOR SINGLE TERMINATION BY CONTROLS CONTRACTOR FOR START/STOP, PROOF, SPEED OUTPUT, AND SPEED INPUT. COORDINATE WITH CONTROLS CONTRACTOR.
4. PROVIDE WITH HUMAN INTERFACE OPERATOR CONTROL PANEL.
5. PROVIDE WITH (W) PROGRAMMABLE ANALOG INPUTS, A ZERO (TWO) TO TEN VOLT, 250 KOHM SINGLE ENDED VOLTAGE REFERENCE, A ZERO (FOUR) TO TWENTY MILLI-AMP, 100 OHM, SINGLE ENDED CURRENT REFERENCE, AND A TEN VOLTS DC, TEN MILLI-AMP POTENTIOMETER.
6. PROVIDE WITH TWO PROGRAMMABLE CURRENT OUTPUTS WITH A ZERO (FOUR) TO TWENTY MILLI-AMP SIGNAL LEVEL AT PLUS/MINUS 1%.
7. PROVIDE WITH (6) PROGRAMMABLE DIGITAL INPUTS AT 24 VDC.
8. PROVIDE WITH THREE PROGRAMMABLE RELAY (FORM C) OUTPUTS WITH A SWITCHING CAPACITY OF 8A AT 24 VDC OR 250 VAC AND .4A AT 120 VDC WITH SILVER CADMIUM OXIDE CONTACT MATERIAL.
9. PROVIDE WITH THE FOLLOWING PROTECTIONS: SINGLE PHASE, OVERCURRENT, OVERVOLTAGE, UNDERVOLTAGE, OVERTEMPERATURE (+239°F), AUXILIARY VOLTAGE (SHORT CIRCUIT PROTECTED), GROUND FAULT, SHORT CIRCUIT, MICROPROCESSOR FAULT, MOTOR STALL PROTECTION, MOTOR OVERTEMPERATURE PROTECTION, INPUT POWER LOSS OF PHASE, LOSS OF REFERENCE, 100,000 RMS SYMMETRICAL AMPS, INPUT LINE IMPEDENCE (%EQUIVALENT INPUT IMPEDANCE WITH INTERNAL REACTORS).

SAFETY SWITCH / ENCLOSED BREAKER SCHEDULE

MARK	LOAD		SWITCH			FUSE		CIRCUIT BREAKER			ENCLOSURE	ACCESSORIES	NOTES
	EQUIPMENT SERVED	VOLTS	TYPE/DUTY	AMP	POLE	AMP	TYPE	AMP	TYPE	AIC			
DS-COND-1	CONDENSER 1	208	HD	30	3	30	FRN-R	N/A	N/A	N/A	NEMA 3R	AC	—

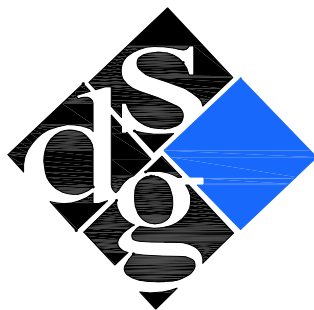
SPECIFICATIONS:

1. PROVIDE SUBMITTAL WITH PRODUCT DATA FOR EACH PRODUCT INDICATED.
2. PROVIDE SHOP DRAWING WITH PLANS, ELEVATIONS, SECTIONS, DIMENSIONS, WEIGHTS, ENCLOSURE TYPES, CURRENT / VOLTAGE RATINGS, SHORT CIRCUIT RATINGS, DETAIL FEATURES, CHARACTERISTICS, RATINGS, FACTORY SETTINGS, AND WIRING DIAGRAMS FOR EACH PRODUCT INDICATED.
3. PROVIDE CLOSEOUT SUBMITTAL WITH OPERATION AND MAINTENANCE DATA FOR EACH PRODUCT INDICATED.
4. ELECTRICAL COMPONENTS, DEVICES, AND ACCESSORIES SHALL BE LISTED AND LABELED AS DEFINED IN NFPA 70, ARTICLE 100, BY A TESTING AGENCY ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION, AND MARKED FOR INTENDED USE.
5. OBTAIN ENCLOSED SWITCHES AND CIRCUIT BREAKERS, OVERCURRENT PROTECTIVE DEVICES, COMPONENTS, AND ACCESSORIES, WITHIN SAME PRODUCT CATEGORY, FROM SINGLE SOURCE FROM SINGLE MANUFACTURER.
6. PRODUCT SELECTION FOR RESTRICTED SPACE: DRAWINGS INDICATE MAXIMUM DIMENSIONS FOR ENCLOSED SWITCHES AND CIRCUIT BREAKERS, INCLUDING CLEARANCES BETWEEN ENCLOSURES, AND ADJACENT SURFACES AND OTHER ITEMS. COMPLY WITH INDICATED MAXIMUM DIMENSIONS.
7. RATE EQUIPMENT FOR CONTINUOUS OPERATION WITH THE AMBIENT TEMPERATURE FROM MINUS 22 DEG F TO 104 DEG F WITH THE ALTITUDE NOT EXCEEDING 6600 FEET.
8. INSTALL TO MAINTAIN CODE REQUIRED AND MANUFACTURER RECOMMENDED AND REQUIRED CLEARANCES.
9. MANUFACTURER SHALL BE EATON, SIEMENS, SQUARE D, OR PRIOR APPROVED EQUIVALENT.
10. TYPE GD, GENERAL DUTY SWITCHES SHALL BE UL 98 AN NEMA KS 1, HORSEPOWER RATED, WITH CARTRIDGE FUSE INTERIORS TO ACCOMMODATE SPECIFIED FUSES, LOCKABLE HANDLE WITH CAPABILITY TO ACCEPT TWO PADLOCKS, AND INTERLOCKED WITH COVER IN CLOSED POSITION.
11. TYPE HD, HEAVY DUTY SWITCHES SHALL BE UL 98 AND NEMA KS 1, HORSEPOWER RATED, WITH CLIPS OR BOLT PADS TO ACCOMMODATE SPECIFIED FUSES, LOCKABLE HANDLE WITH CAPACITY TO ACCEPT THREE PADLOCKS, AND INTERLOCKED WITH COVER IN CLOSED POSITION.
12. ACCESSORIES IF SPECIFIED ABOVE:
 - 12.1. EQUIPMENT GROUND KIT: INTERNALLY MOUNTED AND LABELED FOR COPPER AND ALUMINUM CONDUCTORS.
 - 12.2. NEUTRAL KIT: INTERNALLY MOUNTED, INSULATED, CAPABLE OF BEING GROUNDED AND BONDED. LABELED FOR COPPER AND ALUMINUM CONDUCTORS.
 - 12.3. ISOLATED GROUND KIT: INTERNALLY MOUNTED; INSULATED, CAPABLE OF BEING GROUNDED AND BONDED, LABELED FOR COPPER AND ALUMINUM CONDUCTORS.
 - 12.4. CLASS R FUSE KIT: PROVIDES REJECTION OF OTHER FUSE TYPES WHEN CLASS R FUSES ARE SPECIFIED.
 - 12.5. AUXILIARY CONTACT KIT: ONE NO / ONE NC (FORM "C") AUXILIARY CONTACTS, ARRANGED TO ACTIVATE BEFORE SWITCH BLADES OPEN.
 - 12.6. HOOKSTICK HANDLE: ALLOWS USE OF A HOOKSTICK TO OPERATE THE HANDLE.
 - 12.7. LUGS: MECHANICAL TYPE, SUITABLE FOR NUMBER, SIZE, AND CONDUCTOR MATERIAL SPECIFIED.
 - 12.8. SERVICE RATED SWITCHES: LABELED FOR USE AS SERVICE EQUIPMENT.
13. EXAMINE ELEMENTS AND SURFACES TO RECEIVE ENCLOSED SWITCHES AND CIRCUIT BREAKERS FOR COMPLIANCE WITH INSTALLATION TOLERANCES AND OTHER CONDITIONS AFFECTING PERFORMANCE OF THE WORK.
14. INSTALL INDIVIDUAL WALL-MOUNTED SWITCHES AND CIRCUIT BREAKERS WITH TOPS AT UNIFORM HEIGHT UNLESS OTHERWISE INDICATED.
15. INSTALL FUSES IN FUSIBLE DEVICES.
16. COMPLY WITH NECA 1.
17. TEST INSULATION RESISTANCE FOR EACH ENCLOSED SWITCH AND CIRCUIT BREAKER, COMPONENT, CONNECTING SUPPLY, FEEDER, AND CONTROL CIRCUIT.
18. TEST CONTINUITY OF EACH CIRCUIT.
19. PERFORM EACH VISUAL AND MECHANICAL INSPECTION AND ELECTRICAL TEST STATED IN NETA ACCEPTANCE TESTING SPECIFICATION. CORRECT MALFUNCTIONING UNITS ON-SITE IF POSSIBLE AND RE-TEST TO DEMONSTRATE COMPLIANCE; OTHERWISE REPLACE WITH NEW UNITS.
20. TEST AND ADJUST CONTROLS, REMOTE MONITORING, AND SAFETIES. REPLACE DAMAGED AND MALFUNCTIONING CONTROLS AND EQUIPMENT.

ABBREVIATIONS:

- ECB – ENCLOSED CIRCUIT BREAKER
SB – SWITCHBOARD TYPE CONSTRUCTION
GDSS – GENERAL DUTY SAFETY SWITCH
HDSS – HEAVY DUTY SAFETY SWITCH
GD – GENERAL DUTY
HD – HEAVY DUTY
AC – AUXILIARY CONTACTS (1) NO, (1) NC
NF – NON-FUSED

* MANUFACTURER SHALL BE EATON, SIEMENS, SQUARE D, OR PRIOR APPROVED EQUIVALENT



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SCHWERDT DESIGN GROUP PROJECT # 190102

CONSULTANT STAMP



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ISG PROJECT #: 19-6423-0

REVISIONS / AUTHORIZATIONS

NO.	REVISIONS / AUTHORIZATIONS	DATE	BY

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**AT&T**
CORPORATE
REAL ESTATE

PROJECT TITLE: PIPE AND CHILLER REPLACEMENT
00
202 EAST 3RD STREET
LEES SUMMIT (JACKSON COUNTY)
MISSOURI US
KSCYM041 123785.03.01 E05156

SHEET TITLE:
**ELECTRICAL
SCHEDULES**

AT&T PROJECT NUMBER: A01KYNV	DATE: 01/21/20	SCALE: NONE
AT&T AUTHORIZATION: MATT LONG	DRAWN BY: SVL SHEET: — OF: — AT&T DRAWING NO.:	CHECKED BY: DJZ SHEET NO. E601

PANELBOARD SCHEDULE: DP3 (NEW)										PANEL LOCATION:		
1-LINE PANELBOARD TYPE				MAIN FUSE (OMB)		FEEDER ENTRANCE:		PANEL LOCATION:				
120/208	VOLTAGE	3	PHASE	4	WIRE	X	600A	MAIN BREAKER (1-LINE)	X	TOP	CHILLER ROOM	
600	AMP MAIN BUS							MAIN LUGS		BOTTOM	FEEDER CABLE:	
1	NEMA ENCLOSURE							SUB-FEED LUGS			RE: ONE-LINE DIAGRAM	
65,000	RMS SYMMETRICAL AMPS @	208	VOLTS					SUB-FEED BREAKER	X	SURFACE	SOURCE:	
1/23/20	DATE	X	COPPER BUSSING			X		SOLID NEUTRAL		FLUSH	PANEL DP1	
SERVICE		VA LOAD			LOAD TYPE	C.B.		C.B.	LOAD TYPE	VA LOAD		
		A	B	C		TRIP	POLE	TRIP	POLE	A	B	C
ACWC2	27860				LM	300	3	50	3	M	2642	
		27860			LM					M		2642
			27860		LM					M		
					M					M	770	
CONDENSER 2	2954				M	30	3	15	3	M	770	
		2954			M					M		770
			2954		M					M		
												770
SPACE												
		30814	30814	30814						3412	3412	3412
CONNECTED VA/PH (LESS FEED THRU & SUB FEED)		A -		34226	B -		34226	C -		34226		
CONNECTED VA/PH FROM FEED THRU AND SUB FEED		A -			B -			C -				
TOTAL CONNECTED VA/PH		A -		34226	B -		34226	C -		34226		
LOAD TYPE	CODE DEMAND REQUIREMENTS				CONNECTED VA		DEMAND VA		MIN. CODE VA (1.25 x CONT.) (NEC 210.19 & 215.2)			
					THIS PANEL	SUB PNLS	TOTAL					
LIGHTING (NEC 220.42)	100K				0	0	0	0	0	0		
RECEPTALS (NEC 220.44)	181 10,000VA + 1/2 x REMAINING				0	0	0	0	0	0		
LARGEST MOTOR (NEC 430.24)	1.25 x LARGEST FLA	83580			83580	83580	104475	104475	104475	104475		
REMAINING MOTORS (NEC 430.24)	100% REMAINING MOTORS	19098			19098	19098	19098	19098	19098	19098		
HEATING (NEC 220.51)	100%	0			0	0	0	0	0	0		
KITCHEN EQUIPMENT (NEC 220.56)	VARIES (SEE CODE SECTION)	0			0	0	0	0	0	0		
WATER HEATER (NEC 210.19 & 215.2)	100%	0			0	0	0	0	0	0		
MISC. (NEC 210.19 & 215.2)	100%	0			0	0	0	0	0	0		
SPARE	0 x CODE MIN.VA									0		
TOTAL LOADS		102678	0	102678	123573		123573		123573			
SIZING LOAD				343 AMPS								
NOTES:												
* PANEL SHALL HAVE LOCKABLE HINGED DOOR.												
** CIRCUIT BREAKERS USED FOR PROTECTION OF HVAC EQUIPMENT SHALL BE HACR TYPE BREAKERS.												

PANELBOARD SCHEDULE: 1LP1 5ESS (EXISTING)

AF

PANELBOARD TYPE

120/208

VOLTAGE

3

PHASE

4

WIRE

MAIN BREAKER

100

AMP MAIN BUS

200% RATED NEUTRAL

X

MAIN LUGS

SUB-FEED LUGS

SUB-FEED BREAKER

1

NEMA ENCLOSURE

10,000

RMS SYMMETRICAL AMPS @

208

VOLTS

COPPER BUSSING

X

SOLID NEUTRAL

1/23/20

DATE

FLUSH

FEEDER ENTRANCE:

TOP

X

BOTTOM

MOUNT:

X

SURFACE

FLUSH

PANEL LOCATION:

TELEPHONE EQUIP. RM.

FEEDER CABLE:

RE: ONE-LINE DIAGRAM

SOURCE:

PANEL DP1

POLE #	SERVICE	VA LOAD			LOAD TYPE	C.B. TRIP	POLE	C.B. TRIP	POLE	LOAD TYPE	VA LOAD			SERVICE	POLE #
		A	B	C							A	B	C		
1	TRANSFORMER	1920			MI	20	1	20	1	MI	500			LOW INTENSITY	2
3	AISLE LIGHTING		1000		L	20	1	20	1				OFF	4	
5	OFF					20	1	20	1				OFF	6	
7	REC. BUILDING LOBBY	500			R	20	1	20	1				OFF	8	
9	FIRE ALARM PANEL		500			20	1	20	1				OFF	10	
11	OFF				LM	20	1	20	1				OFF	12	
13		937											SPACE	14	
15	RF-1		937		LM	15	3						SPACE	16	
17				937	LM								SPACE	18	
19	SPACE												SPACE	20	
21	SPACE												SPACE	22	
23	SPACE												SPACE	24	
		3357	2437	937							500	0	0		
CONNECTED VA/PH (LESS FEED THRU & SUB FEED)		A - 3857		B - 2437		C - 937									
CONNECTED VA/PH FROM FEED THRU & SUB FEED		A -		B -		C -									
TOTAL CONNECTED VA/PH		A - 3857		B - 2437		C - 937									

LOAD TYPE	CODE	DEMAND	REQUIREMENTS			CONNECTED VA			DEMAND VA	MIN. CODE VA (1.25 x CONT.) (NEC 210.19 & 215.2)
			THIS PANEL	SUB PNL'S	TOTAL	THIS PANEL	SUB PNL'S	TOTAL		
LIGHTING (NEC 220.42)	100%					1000		1000	1000	1250
RECEPTACLES (NEC 220.44)	1st 10,000VA + 1/2 x REMAINING					500		500	500	500
LARGEST MOTOR (NEC 430.24)	1.25 x LARGEST FLA					2811		2811	3514	3514
REMAINING MOTORS (NEC 430.24)	100% REMAINING MOTORS					0		0	0	0
HEATING (NEC 220.51)	100%					0		0	0	0
KITCHEN EQUIPMENT (NEC 220.56)	VARIES (SEE CODE SECTION)					0		0	0	0
WATER HEATER (NEC 210.19 & 215.2)	100%					0		0	0	0
MISC. (NEC 210.19 & 215.2)	100%					2920		2920	2920	2920
SPARE	0 x CODE MIN.VA									0
TOTAL LOADS						7231	0	7231	7934	8184
		SIZING LOAD				2.3 AMPS				

NOTES:

* PANEL SHALL HAVE LOCKABLE HINGED DOOR.



** CIRCUIT BREAKERS USED FOR PROTECTION OF HVAC EQUIPMENT SHALL BE HACR TYPE BREAKERS.




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SCHWERDT DESIGN GROUP PROJECT # 190102

	<p align="center">CONSULTANT STAMP</p>	
<p align="center">InSite Group</p>		
<p align="center">DEDICATION, DESIRE, INTEGRITY. 3540 NE RALPH POWELL RD., STE. B LEE'S SUMMIT, MO 64064 PHONE: (816) 228-3700 MO. CEN. 2003016693 Curtis L. Brungardt, P.E. 2003016693 ISG PROJECT #: 19-6423-0</p>		

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CORPORATE REAL ESTATE

DRAWINGS PREPARED FOR

PROJECT TITLE:

PIPE AND CHILLER REPLACEMENT

00

202 EAST 3RD STREET

LEES SUMMIT (JACKSON COUNTY)

MISSOURI US

KSCYMO41

123785.03.01

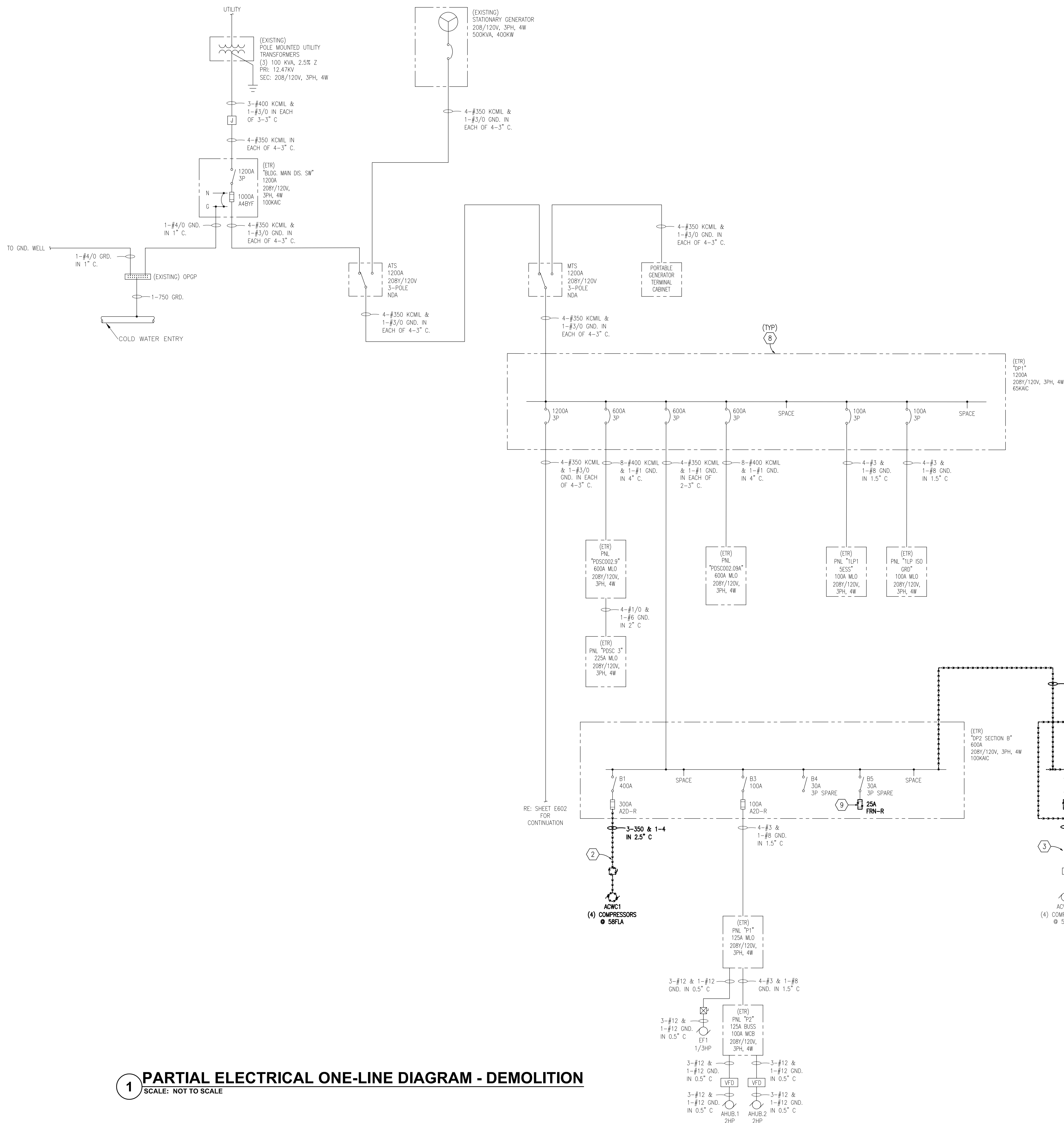
E0513

ELECTRICAL

PANEL SCHEDULES

<p>&T PROJECT NUMBER:</p> <p style="font-size: 1.2em; font-weight: bold;">A01KYNV</p>	<p>DATE: 01/21/20</p> <p>DRAWN BY: SVL</p>	<p>SCALE: NONE</p> <p>CHECKED BY: DJZ</p>				
<p>&T AUTHORIZATION:</p> <p style="margin-top: 20px; font-weight: bold;">MATT LONG</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;"> <p>SHEET: — OF: — SHEETS</p> </td> <td style="width: 50%;"> <p>SHEET N</p> </td> </tr> <tr> <td colspan="2"> <p>AT&T DRAWING NO.:</p> </td> </tr> </table>		<p>SHEET: — OF: — SHEETS</p>	<p>SHEET N</p>	<p>AT&T DRAWING NO.:</p>	
<p>SHEET: — OF: — SHEETS</p>	<p>SHEET N</p>					
<p>AT&T DRAWING NO.:</p>						

E60




KEYED NOTES:

- ① REMOVE EXISTING SWITCHBOARD IN LOCATION INDICATED IN ITS ENTIRETY. REMOVE ALL ASSOCIATED CONDUIT AND CIRCUITRY BACK TO SWITCHBOARD DP2 SECTION B AS INDICATED. COORDINATE ALL WORK WITH CONSTRUCTION PHASING SEQUENCE AND OWNER AS TO MINIMIZE EQUIPMENT DOWNTIME.
- ② REMOVE EXISTING CONDUIT AND CIRCUITRY SERVING EXISTING CHILLER BACK TO SOURCE INDICATED. EXISTING CHILLER TO BE REMOVED BY MECHANICAL CONTRACTOR. REMOVE ALL ASSOCIATED POWER AND CONTROL WIRING BACK TO SOURCE OR NEAREST DEVICE SCHEDULED TO REMAIN. COORDINATE ALL WORK WITH CONSTRUCTION PHASING SEQUENCE AND OWNER AS TO MINIMIZE EQUIPMENT DOWNTIME.
- ③ REMOVE EXISTING CONDUIT AND CIRCUITRY SERVING EXISTING CHILLER BACK TO SOURCE INDICATED. EXISTING CHILLER TO BE RE-SERVED FROM NEW PANEL UNDER NEW WORK. COORDINATE ALL WORK WITH CONSTRUCTION PHASING SEQUENCE AND OWNER AS TO MINIMIZE EQUIPMENT DOWNTIME.
- ④ REMOVE EXISTING VFD SERVING EXISTING SECONDARY CHILLED WATER PUMP IN ITS ENTIRETY. REMOVE ALL ASSOCIATED CONDUIT AND CIRCUITRY BACK TO SOURCE AND TO PUMP BEING SERVED. EXISTING PUMP TO REMAIN. NEW VFD IS TO BE PROVIDED UNDER NEW WORK. COORDINATE ALL WORK WITH PHASING SEQUENCE AND OWNER AS TO MINIMIZE EQUIPMENT DOWNTIME.
- ⑤ REMOVE EXISTING CONDUIT AND CIRCUITRY SERVING EXISTING PRIMARY CHILLED WATER PUMP BACK TO SOURCE INDICATED. EXISTING PUMP TO BE RE-SERVED FROM NEW PANEL UNDER NEW WORK. COORDINATE ALL WORK WITH CONSTRUCTION PHASING SEQUENCE AND OWNER AS TO MINIMIZE EQUIPMENT DOWNTIME.
- ⑥ REMOVE EXISTING CONDUIT AND CIRCUITRY SERVING EXISTING CONDENSING UNIT BACK TO SOURCE INDICATED. EXISTING CONDENSING UNIT TO BE REMOVED BY MECHANICAL CONTRACTOR. REMOVE ALL ASSOCIATED POWER AND CONTROL WIRING BACK TO SOURCE OR NEAREST DEVICE SCHEDULED TO REMAIN. COORDINATE ALL WORK WITH CONSTRUCTION PHASING SEQUENCE AND OWNER AS TO MINIMIZE EQUIPMENT DOWNTIME.
- ⑦ REMOVE EXISTING CONDUIT AND CIRCUITRY SERVING EXISTING CONDENSING UNIT BACK TO SOURCE INDICATED. EXISTING CONDENSING UNIT TO BE RE-SERVED FROM NEW PANEL UNDER NEW WORK. COORDINATE ALL WORK WITH CONSTRUCTION PHASING SEQUENCE AND OWNER AS TO MINIMIZE EQUIPMENT DOWNTIME.
- ⑧ EXISTING ELECTRICAL EQUIPMENT TO REMAIN.
- ⑨ REMOVE EXISTING FUSES IN SWITCH INDICATED.

GENERAL NOTES:

- 1) RE: SHEET E001 FOR SYMBOLS AND ABBREVIATIONS.
- 2) RE: SHEET E002 FOR ELECTRICAL GENERAL NOTES.
- 3) COORDINATE SEQUENCE OF CONSTRUCTION AND APPROPRIATE WORK WINDOWS WITH OWNER AND ENGINEER.
- 4) ALL CONDUIT THROUGH FLOOR SHALL BE FIRESTOPPED. RE: UNDERWRITERS LABORATORIES SYSTEM #C-AJ-1291 / G-002.
- 5) ALL CONDUCTORS INSTALLED IN VERTICAL RACEWAYS SHALL BE SUPPORTED PER THE NEC. PROVIDE JUNCTION BOX WITH INSULATED SUPPORTS SPACED AS INDICATED IN THE NEC. COORDINATE WITH OWNER AND ENGINEER.
- 6) ITEMS MAY BE SHOWN OFFSET FOR CLARITY. COORDINATE EXACT LOCATION WITH ARCHITECTURAL, STRUCTURAL, MECHANICAL, AND BAS DRAWINGS AND FIELD CONDITIONS.
- 7) ANY POWER AND COMMUNICATIONS DROPS LOCATED THROUGH FIRE RATED SLAB SHALL BE PROVIDED WITH FIRE RATED POKE THROUGH ASSEMBLY WITH MINIMUM CONDUIT SIZES INDICATED.



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SCHWERDT DESIGN GROUP PROJECT # 190102

CONSULTANT STAMP



STATE OF MISSOURI
PROFESSIONAL ENGINEER
1-21-20
NUMBER
PE-200031016693



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ISO PROJECT # 19-64-23-0

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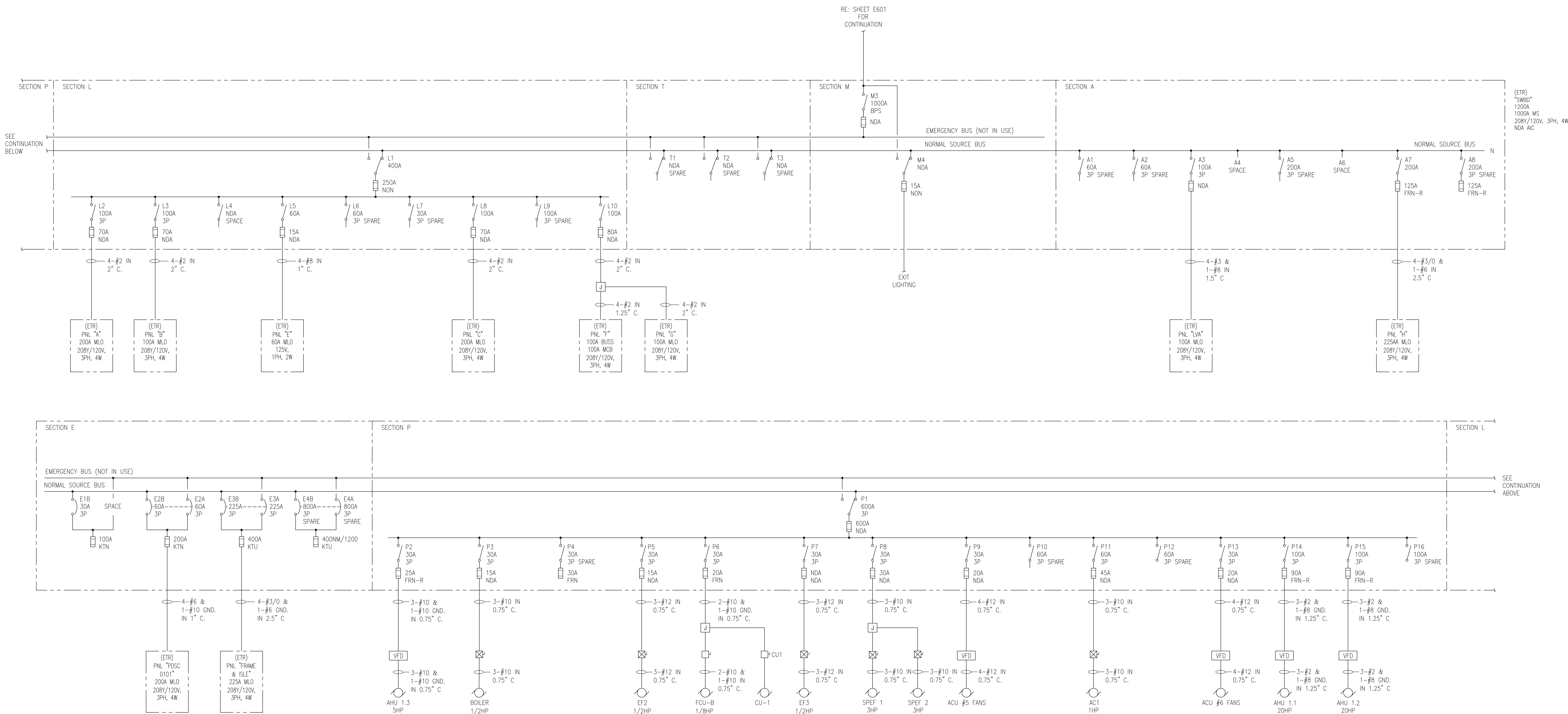

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DRAWINGS PREPARED FOR
 CORPORATE
 REAL ESTATE

PROJECT TITLE: PIPE AND CHILLER REPLACEMENT
00
202 EAST 3RD STREET
LEES SUMMIT (JACKSON COUNTY)
MISSOURI US
KSCYM041 123785.03.01 E05156

HEET TITLE: ELECTRICAL ONE-LINE
DIAGRAM - DEMOLITION

AT&T PROJECT NUMBER: A01KYNV	DATE: 01/21/20	SCALE: N.T.S.
AT&T AUTHORIZATION:	DRAWN BY: SVL	CHECKED BY: DJZ
MATT LONG	SHEET: — OF: — SHEETS AT&T DRAWING NO.:	SHEET NO. ED701



1 PARTIAL ELECTRICAL ONE-LINE DIAGRAM - (REFERENCE ONLY)
SCALE: NOT TO SCALE

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SCHWERDT DESIGN GROUP PROJECT # 190102

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ISG PROJECT #: 19-6423-0

REVISIONS / AUTHORIZATIONS

NO.	REVISIONS / AUTHORIZATIONS	DATE	BY

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DRAWINGS PREPARED FOR

AT&T CORPORATE
REAL ESTATE

PROJECT TITLE: PIPE AND CHILLER REPLACEMENT

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202 EAST 3RD STREET
LEES SUMMIT (JACKSON COUNTY)
MISSOURI US
KSCYM041 123785.03.01 E05156


SHEET TITLE:
**ELECTRICAL ONE-LINE
DIAGRAM - (REFERENCE)**

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- ① EXISTING CHILLER TO BE RE-POWERED FROM NEW SOURCE SHOWN. ROUTE NEW POWER CONDUCTORS TO NEW CIRCUIT BREAKER IN PANELBOARD DP3. TERMINATE CONDUCTORS TO EXISTING CHILLER PER MANUFACTURER'S WRITTEN INSTRUCTIONS.
- ② NEW CHILLER PROVIDED AND INSTALLED BY OTHERS. ROUTE NEW POWER CONDUCTORS SHOWN TO EXISTING FUSED SWITCH IN PANELBOARD DP2. TERMINATE CONDUCTORS TO NEW CHILLER PER MANUFACTURER'S WRITTEN INSTRUCTIONS. RE: ONE-LINE DIAGRAM FOR CONDUCTOR SIZES.
- ③ TERMINATE NEW CONDUCTORS TO NEW CHILLER TERMINAL BLOCKS RATED AT 100,000KAIC.
- ④ PROVIDE AND INSTALL NEW PANELBOARD INDICATED. COORDINATE ALL WORK WITH CONSTRUCTION PHASING SEQUENCE AND OWNER AS TO MINIMIZE EQUIPMENT DOWNTIME.
- ⑤ RE-LABEL EXISTING PANELBOARD (DP2 SECTION A) AS PANELBOARD DP2. RE: ELECTRICAL DETAILS FOR ADDITIONAL INFORMATION.
- ⑥ PROVIDE AND INSTALL NEW VFD TO SERVE EXISTING SECONDARY CHILLED WATER PUMP. CONNECT CIRCUITRY FROM VFD PER MANUFACTURER'S REQUIREMENTS AND PROVIDE NEW CONDUIT AND CIRCUITRY BETWEEN VFD AND EXISTING PUMP. PROVIDE SUPPORTS AS NECESSARY. COORDINATE ALL WORK WITH CONSTRUCTION PHASING SEQUENCE AND OWNER AS TO MINIMIZE EQUIPMENT DOWNTIME.
- ⑦ PROVIDE NEW COMBINATION MOTOR STARTER TO SERVE EXISTING PRIMARY CHILLED WATER PUMP. PROVIDE NEW UNI-STRUT SUPPORTS AS NECESSARY. ROUTE NEW POWER CONDUCTORS TO SOURCE INDICATED. PROVIDE NEW CONDUIT AND CIRCUITRY FROM MOTOR STARTER TO EXISTING PUMP. COORDINATE ALL WORK WITH CONSTRUCTION PHASING SEQUENCE AND OWNER AS TO MINIMIZE EQUIPMENT DOWNTIME. RE: COMBINATION MOTOR STARTER SCHEDULE FOR ADDITIONAL INFORMATION.
- ⑧ NEW CONDENSING UNIT PROVIDED AND INSTALLED BY OTHERS. ROUTE NEW POWER CONDUCTORS SHOWN TO NEW FUSED SWITCH IN PANELBOARD DP2. TERMINATE CONDUCTORS TO NEW UNIT PER MANUFACTURER'S WRITTEN INSTRUCTIONS.
- ⑨ EXISTING CONDENSING UNIT TO BE RE-POWERED FROM NEW SOURCE SHOWN. ROUTE NEW POWER CONDUCTORS TO NEW CIRCUIT BREAKER IN PANELBOARD DP3. TERMINATE CONDUCTORS TO EXISTING UNIT PER MANUFACTURER'S WRITTEN INSTRUCTIONS.
- ⑩ PROVIDE AND INSTALL NEW 600A CIRCUIT BREAKER IN EXISTING PANELBOARD INDICATED. NEW CIRCUIT BREAKER SHALL BE GE SPECTRUM RMS SERIES CATALOG #SGH36A0600.
- ⑪ PROVIDE NEW CONDUIT AND CIRCUITRY AS INDICATED.
- ⑫ PROVIDE NEW FUSES AS INDICATED.
- ⑬ PROVIDE AND INSTALL NEW 100A FUSED SWITCH IN EXISTING SWITCHBOARD INDICATED. NEW FUSED SWITCH SHALL MATCH MAKE, MODEL AND AIC RATING OF EXISTING SWITCHES INSTALLED WITHIN SWITCHBOARD.

- 1) RE: SHEET E001 FOR SYMBOLS AND ABBREVIATIONS.
- 2) RE: SHEET E002 FOR ELECTRICAL GENERAL NOTES.
- 3) COORDINATE SEQUENCE OF CONSTRUCTION AND APPROPRIATE WORK WINDOWS WITH OWNER AND ENGINEER.
- 4) ALL CONDUIT THROUGH FLOOR SHALL BE FIRESTOPPED. RE: UNDERWRITER'S LABORATORIES SYSTEM #C-AJ-1291 / G-002.
- 5) ALL CONDUCTORS INSTALLED IN VERTICAL RAISEWAYS SHALL BE SUPPORTED PER THE NEC. PROVIDE JUNCTION BOX WITH INSULATED SUPPORTS SPACED AS INDICATED IN THE NEC. COORDINATE WITH OWNER AND ENGINEER.
- 6) ITEMS MAY BE SHOWN OFFSET FOR CLARITY. COORDINATE EXACT LOCATION WITH ARCHITECTURAL, STRUCTURAL, MECHANICAL, AND BAS DRAWINGS AND FIELD CONDITIONS.
- 7) ANY POWER AND COMMUNICATIONS DROPS LOCATED THROUGH FIRE RATED SLAB SHALL BE PROVIDED WITH FIRE RATED POKE THROUGH ASSEMBLY WITH MINIMUM CONDUIT SIZES INDICATED.



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AT&T

PROJECT TITLE: **PIPE AND CHILLER REPLACEMENT**

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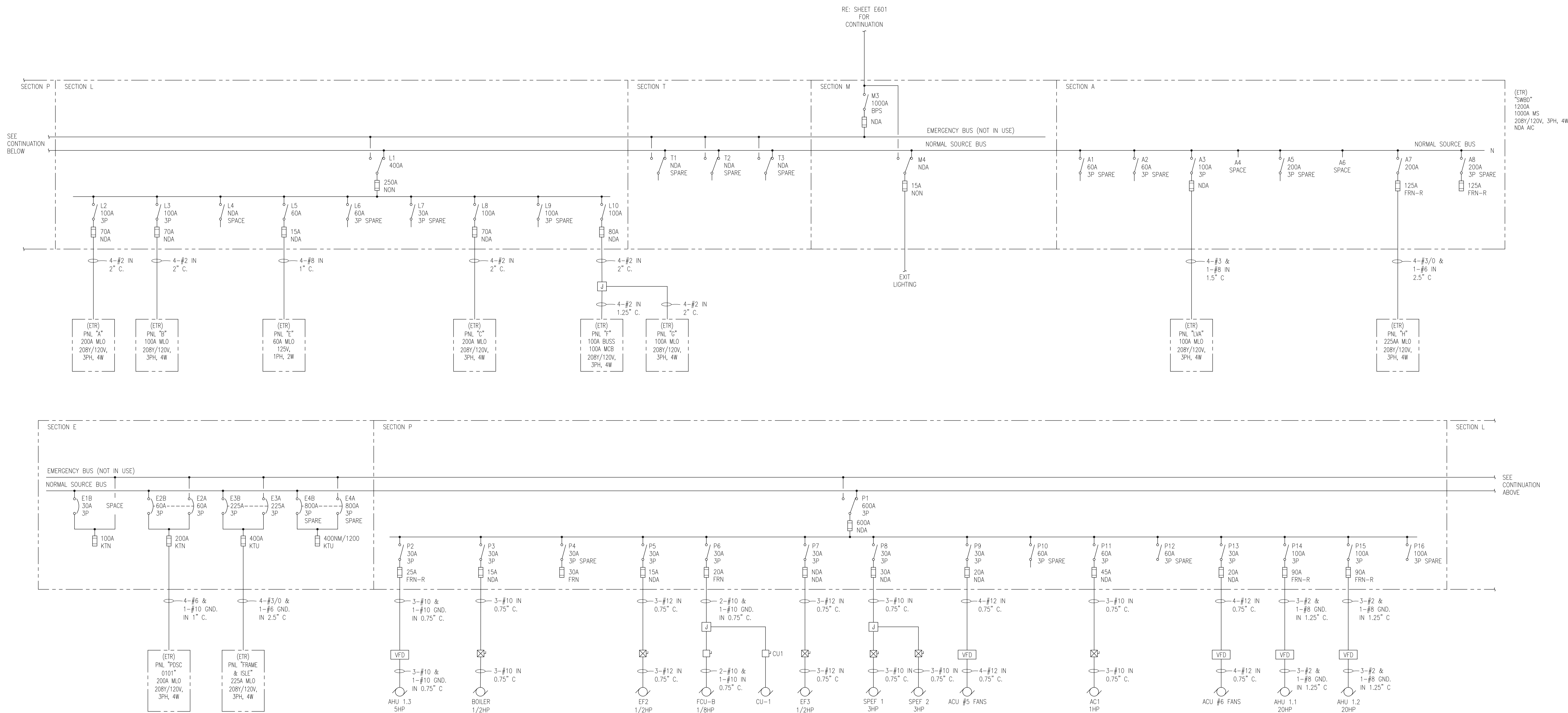
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XSCYM041 123785.03.01 E051

PROJECT NUMBER: A01KYNV	DATE: 01/21/20	SCALE: N.T.S.
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SCHWERDT DESIGN GROUP PROJECT # 190102

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<p style="margin: 0;">PROJECT TITLE: PIPE AND CHILLER REPLACEMENT</p>		
<p style="margin: 0;">00</p> <p style="margin: 0;">202 EAST 3RD STREET</p> <p style="margin: 0;">LEES SUMMIT (JACKSON COUNTY)</p> <p style="margin: 0;">MISSOURI US</p>		
KSCYM041	123785.03.01	E05156
<p style="margin: 0;">SHEET TITLE:</p> <h2 style="margin: 0; text-align: center;">ELECTRICAL ONE-LINE DIAGRAM — (REFERENCE)</h2>		
AT&T PROJECT NUMBER:	DATE: 01/21/20	SCALE: N.T.S.
A01KYNV	DRAWN BY: SVL	CHECKED BY: DJZ
AT&T AUTHORIZATION:	SHEET: — OF: — SHEETS	SHEET NO.
MATT LONG	AT&T DRAWING NO.:	E702