Codes Administration Plan Review– Comment Responses

For: The NW Quadrant T-Hangar Development – Phase 1 at
LEE'S SUMMIT MUNICIPAL AIRPORT
LEE'S SUMMIT, MO

Prepared By:

CRAWFORD, MURPHY, & TILLY, INC.
ENGINEERS & CONSULTANTS
211 NW Executive Way, Suite H
Lee's Summit, MO 64063

March 14, 2018

CMT Responses to Codes Administration Plan Review Comments

On March 1 the Codes Administration and Fire Department completed reviews of the building permit application. The comments can be found in Appendix A1. Some of the comments will or are being addressed by the project contractor – B. Dean Construction. CMT's responses to this comments provided are as follows:

Licensed Contactors:

1. Lee's Summit Code of Ordinance, Section7-130.4 - Business License. (excerpt)
   No person, other than a licensed contractor or employees of a licensed contractor, shall engage in electrical, plumbing or mechanical business, construction, installation or maintenance unless duly licensed in accordance with this section.

   Action required: MEP subcontractors are required to be listed on permit. Provide company names of licensed Plumbing Contractor.

   Response: B. Dean construction has identified Mission Plumbing & Heating as MEP subcontractor.
   Address: 5729 Nieman Rd, Shawnee, KS 66203
   LS Business License Number: 20171047

Building Plan Review

1. This report represents both new buildings, hangars W & X. All comments apply to both buildings.

   Action required: Comment is for informational purposes.

   Response: No action required

2. The building permit for this project can not be issued until the Codes Administration Department has received the approved Final Development Plan from the Planning and Development Department.

   Action required: Comment is for informational purposes.

   Response: Responses to comments are in this document.

3. A License Tax application completed by the contractor must be submitted to the City of Lee's Summit, Codes Administration Department, and any applicable License Tax paid prior to issuing a building permit.

   Action required: Comment is for informational purposes.

   Response: B Dean has addressed, License Tax Bill from City of Lee's Summit is attached as Appendix A2.

4. 2012 IBC 1704.2 Special inspections. Where application is made for construction as described in this section, the owner or the registered design professional in responsible charge acting as the owner's agent shall employ one or more approved agencies to perform inspections during construction on the types of work listed under Section 1705. These inspections are in addition to the inspections identified in Lee's Summit Code of Ordinances Chapter 7. (see code section for exceptions)

Action required: Provide statement of special inspections / letter of responsibility from company contracted to perform special inspections.

Response: B. Dean Construction has provided a statement of special inspections from testing firm PSI. This is attached as Appendix A3.

5. All plans submitted for review on or after January 1, 2014 shall be designed to the requirements of the 2012 International Building Code, 2012 International Mechanical Code, 2012 International Plumbing Code, 2012 International Fuel Gas Code, 2012 International Fire Code, 2011 National Electric Code and the ANSI A117.1-2009 as amended and adopted by the City of Lee's Summit.

   Action required: Update all code references to those currently adopted. (2009 IBC is referenced in multiple locations)

   Response: Where not already uniform, code references have adapted to reflect those listed above.

6. A code analysis shall be provided which includes but is not limited to occupancy type, occupant load, construction type, actual area, height and floors, allowable area, height and floors, and the codes to which the project is designed.

   Action required: Provide complete code analysis as noted.

   Response: Code analysis is provided on the cover sheet of T-Hangar Building Plans designed by Fulfab. B. Dean will provide updated building plans with codes updated to reflect 2012 IBC.

7. 2012 IBC 1803.1 General. Geotechnical investigations shall be conducted in accordance with Section 1803.2 and reported in accordance with Section 1803.6. Where required by the building official or where geotechnical investigations involve in-situ testing, laboratory testing or engineering calculations, such investigations shall be conducted by a registered design professional.

   Action required: Provide soils report to justify design assumption of soil bearing capacity greater than 2,000psf.

   Response: A geotechnical investigation was conducted by Kruger Technologies Inc. (KTI) and the report is included to this report in Appendix A4. Soils along the foundation footprint to be overexcavated and replace with engineered fill in the form of crushed aggregate with fines to provide stable soil bearing capacity for foundation footings. In addition to this the upper 18 inches of subgrade beneath slab-on-grade to be overexcavated and replaced with engineered fill in the form of crushed aggregate with fines.

8. 2012 IBC 703.2 Fire-resistance ratings. The fire-resistance rating of building elements, components or assemblies shall be determined in accordance with the test procedures set forth in ASTM E 119 or UL 263 or in accordance with Section 703.3. Where materials, systems or devices that have not been tested as part of a fire-resistance-rated assembly are incorporated into the building element, component or assembly, sufficient data shall be made available to the building official to show that the required fire-resistance rating is not reduced. Materials and methods of construction used to protect joints and penetrations in fire resistance-rated building elements, components or assemblies shall not reduce the required fire-resistance rating.

   Action required: Provide UL# and complete details for construction of fire rated assembly.

   Response: Details of these components should be provided through B. Dean from hangar manufacturer: Fulfab

9. 2012 IBC 1609.1 Applications. Buildings, structures and parts thereof shall be designed to withstand the minimum wind loads pre-scribed herein. Decreases in wind loads shall not be made for the effect of shielding by other structures.

   Action required: Update referenced wind loads to 115mph per IBC Figure 1609A.

   Response: B. Dean will be providing revised plans reflecting 115mph wind load.

Fire Plan Review

1. Emergency lighting

   ACTION REQUIRED: Provide emergency lighting for all hangers and storage spaces.[B] 1006.1 Illumination required. The means of egress, including the exit discharge, shall be illuminated at all times the building space served by the means of egress is occupied. Exceptions:
   1. Occupancies in Group U.
   2. Aisle accessways in Group A.
   3. Dwelling units and sleeping units in Groups R-1, R-2 and R-3
   4. Sleeping units of Group I occupancies.

   [B] 1006.2 Illumination level. The means of egress illumination level shall not be less than 1 footcandle (11 lux) at the walking surface.

   Response: T-hangar bay wiring plan revised to identify each light fixture closest to the pedestrian doorway (means of egress) as an emergency light fixture. Emergency light fixtures to be rated at 12 lux and include emergency battery pack option. Emergency lights to specifically be Lithonia model: IBG 12000LM SEF AFL WD 120 OZ10 40K 80CRI BPK PS30250 CS93WL15 LAOZU DWH USPOM.

   Sheet 23 of 28 and Sheet 25 of 28 in the engineering plans has been revised to reflect this. This revised sheet and the material data sheet are attached as Appendix A5.

2. 2012 IFC 505.1- Address numbers. New and existing buildings shall have approved address numbers, building numbers or approved building identification placed in a position that is plainly legible and visible from the street or road fronting the property. These numbers shall contrast with their background. In Multi-tenant commercial building where tenants have multiple entrances located on different sides of the building , each door shall be addressed. Address numbers shall be Arabic numerals or alphabet letters. Numbers shall be a minimum of 4 inches (102 mm) high with a minimum stroke width of 0.5 inch (12.7 mm).

   ACTION REQUIRED:(verified at inspection)
   Provide addressing for each hagar building, hangar space and storage space. Address shall be readable from the roadway.

   Response: Addressing of the buildings is included in the specifications for this project meeting the requirements listed above. A sheet metal sign indicating the Letter prescribed to each Hangar (“W” and “X”) with a 5 ¼” tall font size will be affixed to the southern face of each hangar building in a location plainly visible to the taxilanes. For each individual hangar unit or storage unit it is a requirement that the individual hangar or storage number is affixed as a 5 ¼” tall designator on the pedestrian door.

3. 2012 IFC 906.2- General requirements. Portable fire extinguishers shall be selected, installed and maintained in accordance with this section and NFPA 10.

   ACTION REQUIRED:(verified at inspection)

Provide one 2A-10BC fire extinguisher for each hangar and storage space. Extinguishers to be mounted on a wall close to an exit.

Response: Per the project specifications, one 2A-10BC fire extinguisher will be provided for each hangar space and storage bay. Brackets will be installed by contractor and fire extinguishers will be provided by the Owner prior to giving hangar access to tenants. The fire extinguisher locations can be seen in Sheet 21 of 28 of the engineering drawings which is attached for reference as Appendix A6.

APPENDIX A1 – Codes Administration Plan Review Comments

LEE'S SUMMIT
MISSOURI

CODES ADMINISTRATION

PLAN REVIEW CONDITIONS

March 01, 2018

CMT CRAWFORD, MILLY & TILLY
211 NW EXECUTIVE WAY STE H
LEE'S SUMMIT, MO 64063

Permit No:	PRCOM20180430
Project Title:	LEES SUMMIT 2018 T-HANGAR PROJECT - HANGAR W
Project Address:	2751 NE DOUGLAS ST, Unit:W, LEES SUMMIT, MO 64064
Parcel Number:	
Location / Legal Description:	SEC 19 TWP 48 RNG 31 BEG NE COR OF SEC TH W 960' TH S 1600' TH W 360' TH S 1043' TH E 1320' TH N 2640' TO POB & N 1/2 VAC LEINWEBER RD LY S & ADJ
Type of Work:	NEW COMMERCIAL
Occupancy Group:	
Description:	NEW 14 BAY AIRPLANE HANGAR

Revisions Required

One or more departments have not approved the permit and the following is a list of requirements from the City of Lee's Summit that have not been satisfactorily addressed in the plans and specifications. Please address the comments as requested and provide three (3) copies of any revised sheets and/or additional information. Please contact the appropriate department regarding clarification of comments.

Development Services Department (816) 969-1200 Fire Department (816) 969-1300

Licensed Contractors **Reviewed By: Joe Frogge** **Rejected**

1. Lee's Summit Code of Ordinance, Section7-130.4 - Business License. (excerpt)
No person, other than a licensed contractor or employees of a licensed contractor, shall engage in electrical, plumbing or mechanical business, construction, installation or maintenance unless duly licensed in accordance with this section.

Action required: MEP subcontractors are required to be listed on permit. Provide company names of licensed Plumbing Contractor.

Building Plan Review **Reviewed By: Joe Frogge** **Rejected**

1. T**his report represents both new buildings, hangars W & X. All comments apply to both buildings.**

Action required: Comment is for informational purposes.

2. The building permit for this project can not be issued until the Codes Administration Department has received the approved Final Development Plan from the Planning and Development Department.

Action required: Comment is for informational purposes.

3. A License Tax application completed by the contractor must be submitted to the City of Lee's Summit, Codes Administration Department, and any applicable License Tax paid prior to issuing a building permit.

Action required: Comment is for informational purposes.

4. 2012 IBC 1704.2 Special inspections. Where application is made for construction as described in this section, the owner or the registered design professional in responsible charge acting as the owner's agent shall employ one or more approved agencies to perform inspections during construction on the types of work listed under Section 1705. These inspections are in addition to the inspections identified in Lee's Summit Code of Ordinances Chapter 7. (see code section for exceptions)

Action required: Provide statement of special inspections / letter of responsibility from company contracted to perform special inspections.

5. All plans submitted for review on or after January 1, 2014 shall be designed to the requirements of the 2012 International Building Code, 2012 International Mechanical Code, 2012 International Plumbing Code, 2012 International Fuel Gas Code, 2012 International Fire Code, 2011 National Electric Code and the ANSI A117.1-2009 as amended and adopted by the City of Lee's Summit.

Action required: Update all code references to those currently adopted. (2009 IBC is referenced in multiple locations)

6. A code analysis shall be provided which includes but is not limited to occupancy type, occupant load, construction type, actual area, height and floors, allowable area, height and floors, and the codes to which the project is designed.

Action required: Provide complete code analysis as noted.

7. 2012 IBC 1803.1 General. Geotechnical investigations shall be conducted in accordance with Section 1803.2 and reported in accordance with Section 1803.6. Where required by the building official or where geotechnical investigations involve in-situ testing, laboratory testing or engineering calculations, such investigations shall be conducted by a registered design professional.

Action required: Provide soils report to justify design assumption of soil bearing capacity greater than 2,000psf.

8. 2012 IBC 703.2 Fire-resistance ratings. The fire-resistance rating of building elements, components or assemblies shall be determined in accordance with the test procedures set forth in ASTM E 119 or UL 263 or in accordance with Section 703.3. Where materials, systems or devices that have not been tested as part of a fire-resistance-rated assembly are incorporated into the building element, component or assembly, sufficient data shall be made available to the building official to show that the required fire-resistance rating is not reduced. Materials and methods of construction used to protect joints and penetrations in fire resistance-rated building elements, components or assemblies shall not reduce the required fire-resistance rating.

Action required: Provide UL# and complete details for construction of fire rated assembly.

9. 2012 IBC 1609.1 Applications. Buildings, structures and parts thereof shall be designed to withstand the minimum wind loads pre-scribed herein. Decreases in wind loads shall not be made for the effect of shielding by other structures.

Action required: Update referenced wind loads to 115mph per IBC Figure 1609A.

Fire Plan Review **Reviewed By: Joe Dir** **Rejected**

1. Emergency lighting
ACTION REQUIRED:
Provide emergency lighting for all hangers and storage spaces.
[B] 1006.1 Illumination required. The means of egress, including the exit discharge, shall be illuminated at all times the building space served by the means of egress is occupied.
Exceptions:
1. Occupancies in Group U.
2. Aisle accessways in Group A.
3. Dwelling units and sleeping units in Groups R-1, R-2 and R-3.
4. Sleeping units of Group I occupancies.
[B] 1006.2 Illumination level. The means of egress illumination level shall not be less than 1 footcandle (11 lux) at the walking surface.

2. 2012 IFC 505.1- Address numbers. New and existing buildings shall have approved address numbers, building numbers or approved building identification placed in a position that is plainly legible and visible from the street or road fronting the property. These numbers shall contrast with their background. In Multi-tenant commercial building where tenants have multiple entrances located on different sides of the building , each door shall be addressed. Address numbers shall be Arabic numerals or alphabet letters. Numbers shall be a minimum of 4 inches (102 mm) high with a minimum stroke width of 0.5 inch (12.7 mm).
ACTION REQUIRED:(verified at inspection)
Provide addressing for each hagar building, hangar space and storage space. Address shall be readable from the roadway.

3. 2012 IFC 906.2- General requirements. Portable fire extinguishers shall be selected, installed and maintained in accordance with this section and NFPA 10.
ACTION REQUIRED:(verified at inspection)
Provide one 2A-10BC fire extinguisher for each hangar and storage space. Extinguishers to be mounted on a wall close to an exit.

The review conducted by the City of Lee's Summit Codes Administration Department shall not be construed as a structural review of the project.

APPENDIX A2 – CONTRACTOR LICENSE TAX BILL

LEE'S SUMMIT
MISSOURI

March 1, 2018

B Dean Construction LLC
1024 NE Jib Ct., Unit C
Lee's Summit, MO 64064

Re: License Tax Bill

As a part of your recent building plans submittal, you completed a Tax Application form for your development (see Project Title and Address on attached).

The attached Tax Bill is being provided to you for informational purposes only. The total License Tax amount due noted on the bill must be paid in the Treasury Division, City Hall, 220 SE Green Street, Lee's Summit, Missouri 64063. The tax will be due in compliance with Resolution 00-17.

Should you have any questions, please call me at 969-1820.

Sincerely,

Michael Park, P.E., PTOE
City Traffic Engineer

MP/mg

Enc.

LEE'S SUMMIT
MISSOURI

PUBLIC WORKS ENGINEERING DIVISION

LICENSE TAX BILL

Date: February 27, 2018

B DEAN CONSTRUCTION LLC
1024 NE JIB CT, Unit C
LEES SUMMIT, MO 64064

Application No:	PRLT20180435
Title of Project:	LEES SUMMIT 2018 T-HANGAR PROJECT
Project Address:	
Legal Description:	SEC 19 TWP 48 RNG 31 BEG NE COR OF SEC TH W 960' TH S 1600' TH W 360' TH S 1043' TH E 1320' TH N 2640' TO POB & N 1/2 VAC LEINWEBER RD LY S & ADJ

License Tax: 22 Based Aircraft:
License Tax Fees: 7232302-Industrial/Warehouse License Tax Fee: $6,937.84

License Tax Credit: Tax Exempt Credit: $6,937.84

Total License Tax Fees:	$6,937.84
Total License Tax Credits:	$6,937.84
Total Amout Due:	$0.00

RIGHT TO APPEAL

If the license tax is paid by the building contractor without submitting a notice of appeal (written protest) at the time of tax payment including a valid, authorized signature on the tax receipt, the right to appeal is deemed forfeited by the building contractor.

NOTICE TO APPEAL

The appropriate box must be checked below as the basis of appeal in accordance with city ordinance. No other appeals will be accepted by the city. A letter detailing the basis of appeal must accompany the payment of the tax as well as any supporting documentation requested by the City Administrator in accordance with city ordinance.

_____ 1) Land use classification of the development.

_____ 2) Number of trips generated by the proposed development.

_____ 3) Credit eligibility determination.

_____
Authorized Agent

_____

APPENDIX A3 – STATEMENT OF SPECIAL INSPECTIONS

Intertek-PSI
1211 W. Cambridge Circle Drive
Kansas City, Kansas 66103

Tel +1 913 310 1600
Fax +1 913 310 1601
intertek.com/building

March 14, 2018

City of Lee's Summit Codes Administration
220 SE Green Street
Lee's Summit, Missouri 64063

Re: Special Inspection Letter of Intent
Lee's Summit Municipal Airport
2751 Northeast Douglas Street
Lee's Summit, Missouri 64064

Dear Planning and Development Department:

Professional Service Industries, Inc. is being retained by B Dean Construction to provide the required Special Inspections on the referenced project with respect to the following Items:

- Engineered Grading and/or Filling
- Shallow Foundation Subgrade Verification
- Placement of Reinforcing Steel
- Reinforced Concrete
- Bolts Installed in Concrete
- High Strength Bolting
- Structural Welding
- Steel Frame Observations

If you have any questions concerning this information, please contact this office.

Respectfully submitted,
Professional Service Industries, Inc.

STATE OF MISSOURI
SNEEGAS
NUMBER
PE-2018005023
3-14-18
PROFESSIONAL ENGINEER

Jason Sneegas, PE
Project Manager

Email: kcbrown@bdeanconstruction.com

APPENDIX A4 – GEOTECHNICAL REPORT

REPORT OF GEOTECHNICAL EXPLORATION
NORTHWEST T-HANGAR AND TAXILANE DEVELOPMENT
LEE'S SUMMIT, MISSOURI

Presented to:

CRAWFORD, MURPHY & TILLY, INC.(CMT)
St. Louis, Missouri

Attn: Mr. Ty Sander

Prepared by:
Otto J. Kruger, Jr., P.E.
Tadele M. Akalu

Kruger Technologies, Inc.
Lenexa, Kansas

KTI Project No. 217132G

October 24, 2017

KRUGER TECHNOLOGIES, INC.

GEOTECHNICAL ■ ENVIRONMENTAL ■ TESTING ■ INSPECTION
8271 MELROSE DRIVE ■ LENEXA, KANSAS 66214 ■ VOICE 913-498-1114 ■ FAX 913-498-1116 ■ EMAIL
KTIKC@KTIONLINE.COM

October 24, 2017

Mr. Ty Sander
Crawford, Murphy & Tilly, Inc. (CMT)
One Memorial Dr., Suite 500
St. Louis, MO 63102

Re: KTI Project No.417086G
Northwest T-Hangar Taxilane Development
Lee's Summit, Missouri

Dear Mr. Sander:

Kruger Technologies, Inc. (KTI) has completed the subsurface exploration and geotechnical report for the above referenced project. The purpose of this report was to describe the surface and subsurface conditions encountered at the site, analyze and evaluate this information to prepare a summary of existing conditions, subsurface material characteristics and give site specific geotechnical design recommendations.

We thank you for the opportunity to work with Crawford, Murphy & Tilly, Inc. (CMT). If you have any questions, please contact us at 913.498.1114.

Respectfully submitted,
Kruger Technologies, Inc.

Otto J. Kruger, Jr., P.E.
Missouri: P.E 23994

Tadele M. Akalu
Laboratory Manager

TABLE OF CONTENTS

REPORT OF GEOTECHNICAL EXPLORATION
NORTHWEST T-HANGAR AND TAXILANE DEVELOPMENT
LEE'S SUMMIT, MISSOURI

AUTHORIZATION

The following table presents the authorization documentation history for the work performed and presented in this report by Kruger Technologies, Inc.

Project: Northwest T-Hangar Taxilane Development – Lee's Summit, Missouri		
Document:	**Date:**	**Requested/Provided:**
Request for Proposal	6-31-17	Ty Sander – Crawford, Murphy & Tilly, Inc. (CMT)
KTI Proposal 17GT132	7-2-17	Dylan Kruger – Kruger Technologies, Inc.
Notice to Proceed	8-23-17	Tyler Horn – Crawford, Murphy & Tilly, Inc. (CMT)

PURPOSE AND SCOPE

The purpose of this investigation was to explore the surface and subsurface conditions present within the site and provide recommendations regarding the following:

- Seismic Considerations
- Site Preparation Recommendations
- Shallow Foundations
- Slab on Grade Recommendations
- Surface and Subsurface Drainage Recommendations
- Excavation Considerations
- Trench Backfill Recommendations
- Manhole/Inlet Structure Backfill Recommendations

SITE CONDITIONS

The site at the time of the exploration was located at northwest quadrant of Lee's Summit Municipal Airport in Lee's Summit, Missouri. One proposed T-Hanger Building will be located to the west of the existing taxilane. This area is generally grass covered and slopes down to the west from the taxilane approximately 2-3 feet. The second proposed T-Hangar Building will be located to the east of the existing taxilane. This area is grass and tree covered and slopes down to the east from the taxilane approximately 2-3 feet.

PROJECT DESCRIPTION

It is our understanding that the project consists of the construction of two new T- Hangar metal buildings on either side of existing taxilane at Lee's Summit Municipal Airport, Lee's Summit, Missouri.

FIELD EXPLORATION PROCEDURES

Eight (8) test borings were completed for the above referenced project on September 9, 2017. The borings were selected and field located by the client.

The borings were drilled in the proposed building footprint areas using a track mounted drill rig. Advancement of the test holes was accomplished using 4-inch O.D. continuous flight augers, soil sampling was performed by hydraulically pushing thin wall steel (Shelby) tubes and by standard penetration test (SPT).

Site soils were visually and manually classified in general accordance with ASTM D 2488 by the KTI field engineer as drilling progressed. The recovered soil samples were delivered to the laboratory for verification of the field classifications and laboratory testing. The boring logs were created as the borings were advanced and supplemented with information from the lab test results; the boring logs are attached in Appendix I.

LABORATORY TESTS

Laboratory tests were performed on the recovered samples to determine the engineering characteristics and for additional verification of the field classifications in accordance with ASTM D 2487. The results of these tests, including in-situ moisture content, dry density, plasticity (Atterberg Limits), and unconfined compressive strength of soil, are presented in Appendix II.

GEOLOGY/SUBSURFACE CONDITIONS

Topsoil encountered on the site was generally 1 foot thick. Below the topsoil the site soils on the proposed building site were found to be predominately fill consisting of low to high plasticity clays mixed with organics and asphalt. Fill material 3 to 6.5 feet thick was encountered on all test borings. The fill soils are underlain by lean to fat clay and highly weathered shale bedrock. The site soils would be generally described as impervious materials. Low plasticity clay material would have a higher permeability but would still be in the impervious range with a likely value in the

order of 10^{-7} centimeters per second (cm/sec) while the higher plasticity clay material would have a likely value of 10^{-9} cm/sec.

During advancement of the borings, free water was not encountered at any boring locations. It should be noted that water level determinations made in relatively impervious (clay) soils might not present a reliable indication of the actual water table. However, water level determinations made in relatively pervious (sand/silt) soils are considered an accurate indication of the water table at the time that those measurements are made. Fluctuations in the water table should be expected with changing seasons and annual differences.

DESIGN CRITERIA AND RECOMMENDATIONS

Laboratory test results of the recovered samples showed the following characteristics that were used as criteria for determining the recommendations for bearing values and design data:

In-Situ Moisture	22.7.to 29.7%
Dry Density	91.5 to 104.5 pcf
Liquid Limit	52 to 59
Plasticity Index …	26 to 33
Unconfined Compressive Strength-soil	3,844 to 7,269 psf

Seismic Considerations

Based on the International Building Code (IBC) Section 1615.1.1, the subsurface stratigraphy, and the use of shallow foundations bearing on native soils or engineered fill would experience a general Site Class Definition for structures bearing on soils as Site Class C.

Site Preparation and Engineered Fill

Areas to receive fill should be stripped of vegetation, topsoil, pavement, and any other deleterious materials. Any isolated areas of soft or deleterious materials encountered at subgrade elevation should be removed and replaced with engineered fill. The moisture content of the subgrade soils should be appropriate to achieve the required compaction.

Proper drainage of the construction area should be provided to protect foundations, floor slabs, and pavement subgrades from the detrimental effects of weather conditions. Excavations should be kept as dry as possible. Any loose or soft materials which accumulate or develop on subgrade or bearing surfaces should be removed prior to the placement of concrete or pavement sections.

The natural soil is very clayey and easily disturbed by construction traffic. Construction traffic, including foot traffic, should be minimized. Concrete should be placed in footing excavations as soon as possible after excavations are complete.

Trucks and other heavy construction vehicles should be restricted as much as possible from trafficking on the finished subgrade in the building to prevent unnecessary disturbances of subgrade soils. Excessive rutting or pumping of the subgrade could occur from construction traffic, particularly during periods of wet weather. If such disturbed areas develop, the subgrade may have to be excavated and replaced with properly compacted fill.

Concrete for foundations should be placed as soon after completion of the excavations as possible to avoid disturbance of the bearing material by inflow of surface water, groundwater, or precipitation.

Supplemental engineered fill should be placed in uniform horizontal lifts, with loose thicknesses not exceeding eight inches. The thickness must be appropriate for the method of compaction and the type of equipment used. The geotechnical engineer should approve any off-site material proposed for use as fill. Engineered fill should be compacted to a minimum of 95 percent of maximum density as determined by ASTM D698 (standard Proctor test) at moisture content between 0 and 4 percent above optimum moisture for high plasticity clay material and from -2 to +2 from optimum moisture content for low plasticity clays. The fill should be benched in any sloped areas greater than one vertical to five horizontal in an effort to maintain relatively horizontal lifts. The benching should be placed at not less than 12-inch rises over those areas where it is required as the work is brought up in layers.

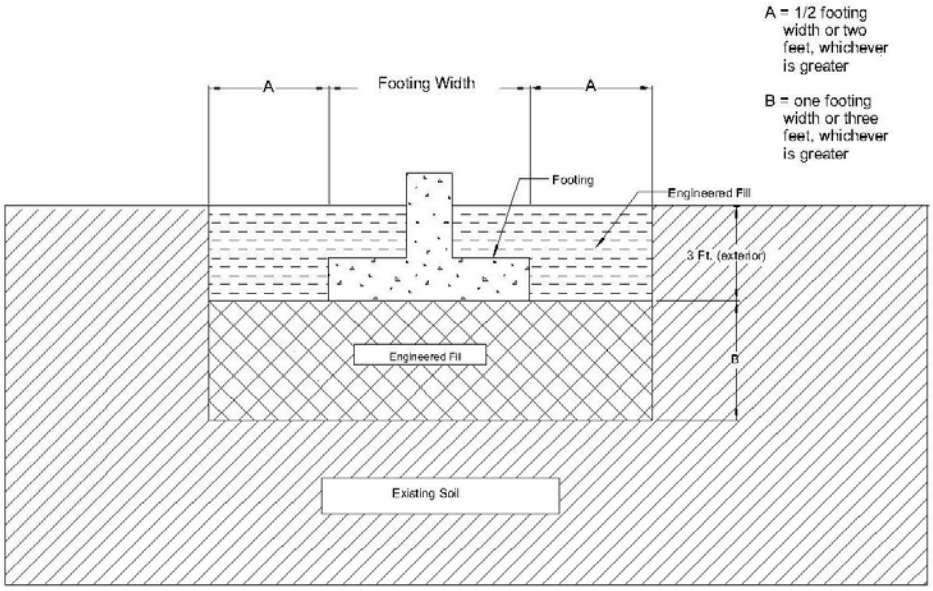
Building Pad – It is recommended that fill placed in the building pad area consist of cleaner soil materials with a maximum particle size of 3 inches. The use of material larger than 3 inches may cause differential settlement below the building slab. Acceptable fill material for below the top 18 inches of the building pad may be GW, GC, GM, SW, SM, SC, ML, MH, CL and CH. Material used in the top 18 inches of the building pad should be a low volume change (LVC) material. Acceptable LVC material is any soil type that has a Liquid Limit (LL) of less than 45 and a Plasticity Index (PI) of less than 25. Crushed rock or sand materials are also considered to be LVC material. The existing fills and native soils encountered on site do not meet the requirements for LVC material.

Shallow Foundations

Based on the information provided by the client, it would be anticipated that a foundation system utilizing shallow standard spread footings would bear in uncontrolled fill and soils which are very expansive (fat) clays.

Since uncontrolled fill and fat clays were encountered, it is recommended that the entire shallow foundation system should be founded on materials with similar material and low swell potential characteristics. Placing a shallow foundation on different material and high swell potential clay could result in differential settlement. To minimize potential differential settlement the following option is recommended:

Over excavate the native material to a minimum depth of three feet below the bottom of footing elevation or deeper if necessary as specified below:



Place and compact lean clay soils (with liquid limit less than 45 and plasticity index less than 25) or crushed aggregate with fines (MoDOT Type-5) or similar material to the bottom of footing elevation. The lean clay soil back fill material can be assumed to exhibit net allowable bearing capacities of 2,500 pounds per square foot (psf) for continuous footings and 3,000 psf for rectangular footings. Crushed aggregate materials can be assumed to exhibit net allowable bearing capacities of 3,500 psf for continuous footings, and 4,000 psf for rectangular footings. Anticipated settlements for these bearing capacities are 0.5-0.75 inches of total settlement, with a likely differential settlement of 0.5 inches over a horizontal distance of 30 feet. The minimum

frost depth for this region is 36 inches. We recommend that the minimum column or isolated footing width be 30 inches and the minimum continuous footing width be 18 inches.

The base of all foundation excavations should be free of water and loose soil/rock prior to placing concrete. Concrete should be placed as soon as possible after excavation to reduce bearing soil disturbance. If the bearing level soils become disturbed the affected soil should be removed prior to placing concrete.

Slab on Grade.

Recommendations for type and placement of fill material are presented in the Site Preparation and Engineered Fill section of this report. The existing fills and native soils were found to be unacceptable for use in the upper 18 inches of the subgrade below the slab on grade as they are not classified as LVC material. Well graded crushed aggregate materials such as MoDOT Type 5 or KDOT AB3 are acceptable for use as LVC material below the slab and the 6 inches of drainage layer.

Please note that conditioning slab on grade and foundation bearing soils can be done at the same time.

Movement between slabs on grade and walls may occur. To minimize the effects of this movement, we recommend that slip joints be incorporated between all slabs and walls. All slabs should contain crack control and construction joints, which are formed on 15 to 25 foot centers, each way, or as designed by the project structural engineer. A capillary moisture barrier should be placed under the slabs. This barrier should be a minimum of a 6-inch thick layer of clean granular material extending to the limits of the foundation walls. Should additional moisture protection be desired, it should be a minimum of 6-mil polyethylene sheeting placed between the slab and the base course.

For the purpose of slab design, a modulus of subgrade reaction (k) of 100-pounds/cubic inch is suggested. This value is based on a subgrade consisting of well-compacted, plastic clay fill. If a stabilized subgrade is used, a k-value of 200-pounds/cubic inch is suggested.

Surface Drainage

In order to reduce the problems related to water infiltration, it is recommended that the final grade around the structure perimeters have a positive slope extending at least six feet away from the

structure. Backfill of soils around the foundation should be compacted at a minimum of 95 percent of maximum dry density at moisture content between optimum and four percent above optimum in accordance with ASTM D 698.

Subsurface Drainage

Although groundwater was not encountered during boring activities, infiltration of surface water and/or perched groundwater could occur. It would be prudent to construct a drain system around the perimeter of below-grade structures or footings. The perimeter drain system should consist of 4-inch PVC or equivalent pipe with at least ¼-inch perforations routed to a sump or by gravity to the exterior. The pipe should be laid with the perforations down and enveloped with gravel. The gravel should be surrounded with Mirafi 140 filter cloth or equivalent.

Excavation Considerations

We believe that the project soils in the upper 8 feet are Type B as classified in the OSHA Excavation Standard Handbook 29 CFR Parts 1926.650 through 1926.652. Type B soils are characterized by cohesive soils above the water table with unconfined compressive strengths greater than 0.5 tons per square foot (tsf) but less than and 1.5 tsf. Type B soils include any fill soils meeting or exceeding the above criteria, as well as undisturbed soils with unconfined compressive strengths of >1.5 tsf which are subject to vibration from traffic. Temporary excavation slopes for Type B soils can be one horizontal to one vertical with a maximum excavation depth of 20 feet. Soils below the 8 feet are loose silty sands and will require temporary shoring.

Excavations deeper than 20 feet may require the use of supplemental shoring and will require the preparation of an excavation design prepared by a registered professional engineer. Competent bedrock material may generally be cut vertically.

Trench Backfill

Deleterious materials such as organic matter, topsoil, rock fragments larger than 3 inches in diameter, debris, and any other materials judged to be unsatisfactory by the geotechnical engineer, should not be included in the backfill. Backfill should not be placed on soft materials or frozen ground. Soil backfill overlying the bedding should be placed in uniform horizontal lifts, with loose thicknesses not exceeding eight inches. The thickness must be appropriate for the method of compaction and the type of equipment used. The geotechnical engineer should approve any

off-site material proposed for use as fill. Trench backfill under driveways/parking lots should be compacted to a minimum of 95 percent of maximum density as defined by Standard Proctor (ASTM D 698) at moisture content according to the recommendations presented in the Site Preparation and Engineered Fill section of this report. In common yard areas, the soil backfill should be compacted to a minimum of 90 percent of maximum density (ASTM D 698) using the above moisture parameters. After preparation of the trench bottom, a pipe bed of a minimum of 6" shall be prepared using crushed stone or crushed gravel meeting the following requirements:

Nominal Pipe Size Diameter	AASHTO M43 Size
15" or Less	67, 7, 8 or washed #9
Greater than 15"	57, 6, or 67

Manhole/Inlet Structure Backfill

Soil backfill around structures should be placed in uniform horizontal lifts, with loose thicknesses not exceeding eight inches. The thickness must be appropriate for the method of compaction and the type of equipment used. The geotechnical engineer should approve any off-site material proposed for use as fill. Backfill should be compacted to a minimum of 95 percent of maximum density as defined by Standard Proctor (ASTM D 698) at a moisture content between 0 and 4 percent above optimum moisture (preferred average of plus 2 percent). Another option is to backfill with a Controlled Low Strength Material (CLSM), or flowable fill. The flowable fill should exhibit a minimum unconfined compressive strength of 250 psi after 28 days. Bedding material for manhole/inlet structure should be clean crushed rock conforming to the following gradation:

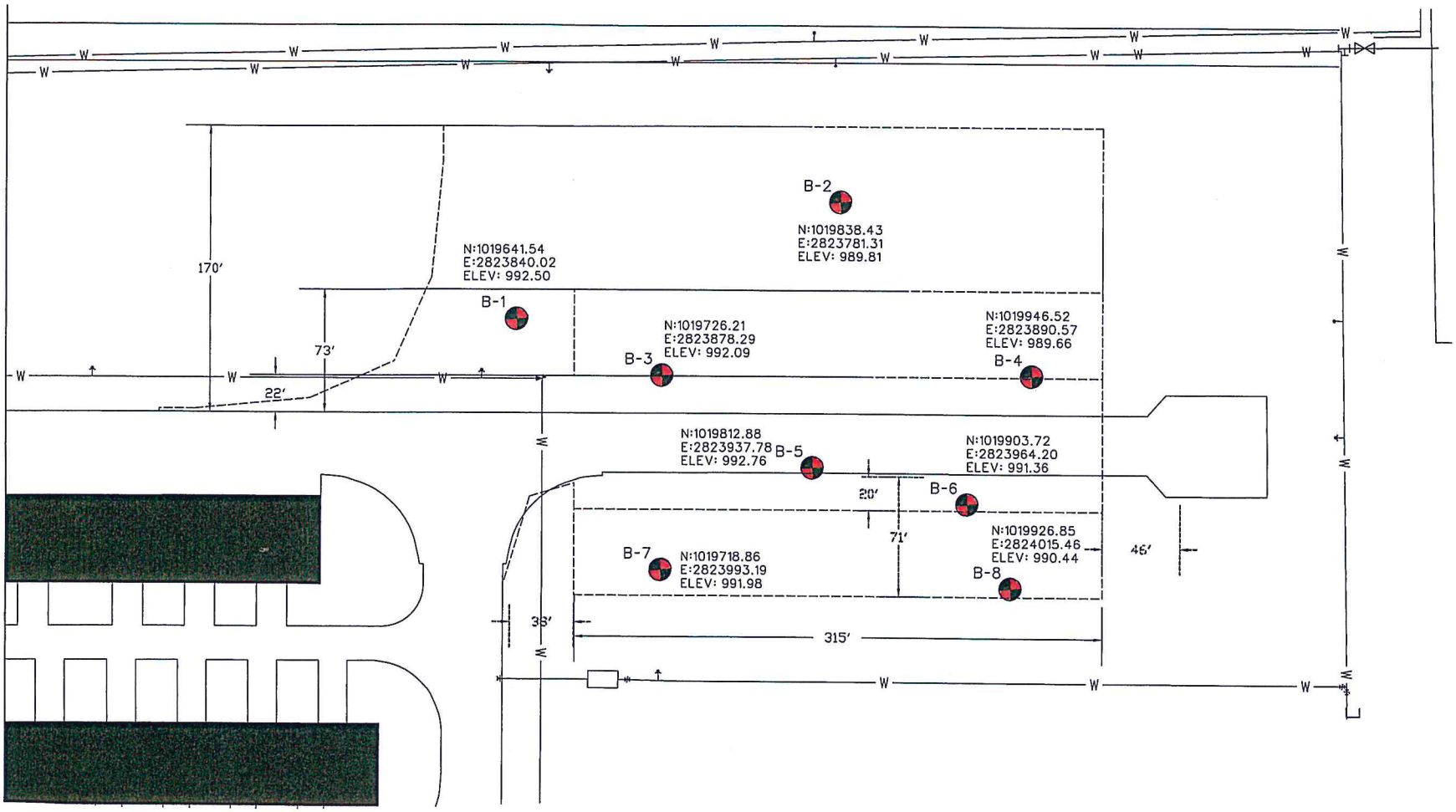
Sieve Designation	Percent Passing by Weight
1 ½"	100
No. 4	0 – 35
No. 200	0 – 8

REMARKS

It is recommended that the geotechnical engineer be retained to review the plans and specifications for the project so that an evaluation and comments can be provided regarding the proper incorporation of information from this geotechnical report into the final construction documents. We further recommend that the geotechnical engineer be retained during construction phases for earthwork, pavement, and foundations to provide observation and testing to aid in determining that design intent has been accomplished.

The findings, recommendations, and suggestions contained in this report are our opinions based on data acquired to date and are assumed to be representative of conditions at locations between borings. Due to the fact that the area at the borings is very small relative to the overall site, and for other reasons, we make no statement warranting the conditions below our borings or at other locations throughout the site. In addition, we do not warrant that the general strata logged at the borings are necessarily typical of the remaining areas of the site.

BORING LOCATION DIAGRAM



Boring Location Diagram
Lee's Summit Northwest T-Hangar &Taxilane Development
Lee's Summit, Missouri

KRUGER TECHNOLOGIES, INC.

Drawn: TMA	Date: 10/22/17	KTI Project No. 217132G

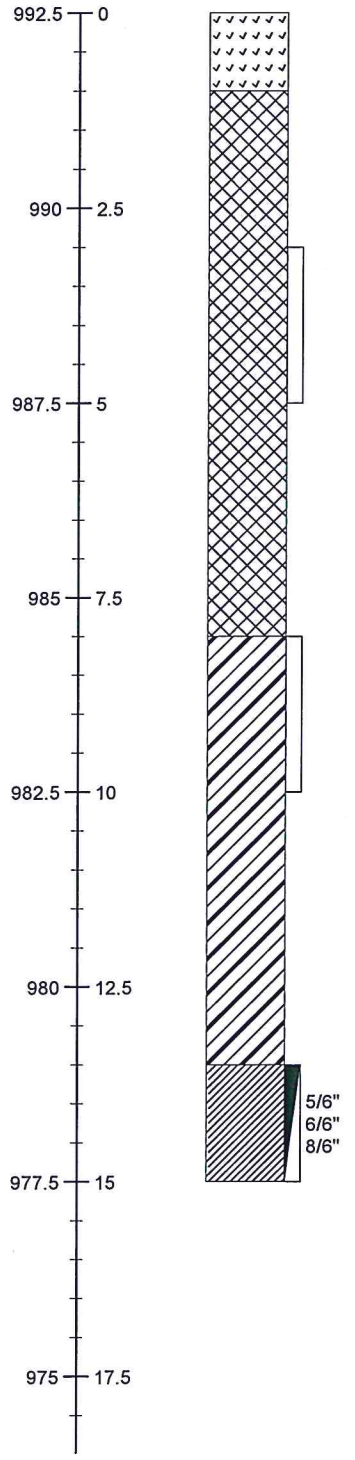
APPENDIX I

Boring Logs

LOG OF TEST BORING
BORING B-1

PROJECT: Northwest T-Hangar and Taxilane Development
CLIENT: Crawford, Murphy & Tilly, Inc.(CMT)
PROJECT NO.: 217132G **START:** 9/6/17
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 10/24/2017
ELEVATION: 992.5
FINISH: 9/6/17
LOGGER: TMA
DATE CHECKED:



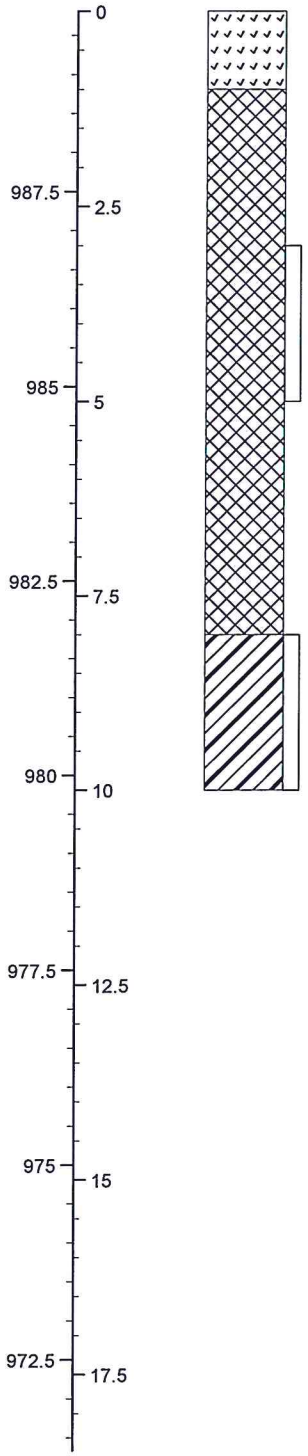
ELEVATION/ DEPTH	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
	T	Topsoil				
	FILL	Fill, lean clay, brown, moist				
	FILL	Fill, lean clay with asphalt and gravel, stiff, dark brown & black, moist	1, ST	99.7	23.0	5296
	CL-CH	Lean to fat clay, stiff, red, moist	2, ST	98.6	26.8	
	CH	Fat clay, very stiff, gray, moist	1, SS			
		Drilling discontinued at 15.0 feet				

Notes:

LOG OF TEST BORING
BORING B-2

PROJECT: Northwest T-Hangar and Taxilane Development
CLIENT: Crawford, Murphy & Tilly, Inc.(CMT)
PROJECT NO.: 217132G **START:** 9/6/17
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 10/23/2017
ELEVATION: 989.81
FINISH: 9/6/17
LOGGER: TMA
DATE CHECKED:



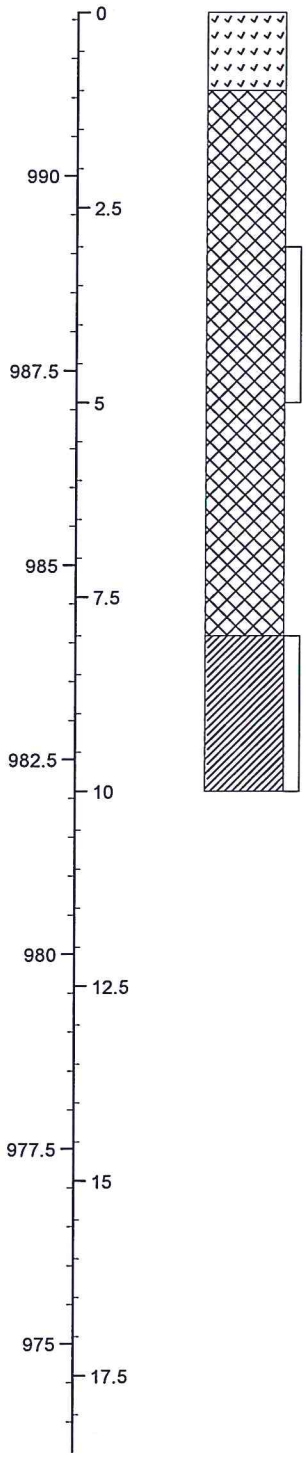
ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		T	Topsoil				
		FILL	Fill, lean clay with gravel, dark brown, moist				
		FILL	Fill, fat clay, stiff, brown and gray, moist	1, ST	103.6	23.5	4724
		CL-CH	Lean to fat clay, stiff, reddish brown, moist	2, ST	101.6	23.5	
			Drilling discontinued at 10.0 feet				

Notes:

LOG OF TEST BORING
BORING B-3

PROJECT: Northwest T-Hangar and Taxilane Development
CLIENT: Crawford, Murphy & Tilly, Inc.(CMT)
PROJECT NO.: 217132G **START:** 9/6/17
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 10/23/2017
ELEVATION: 992.09
FINISH: 9/6/17
LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		T	Topsoil				
		FILL	Fill, lean clay, dark brown, moist				
		FILL	Fill, lean to fat clay, stiff, light brown, moist	1, ST	91.5	28.0	3844
		CH	Fat clay, stiff, red, moist	2, ST	101.1	26.1	
			Drilling discontinued at 10.0 feet				

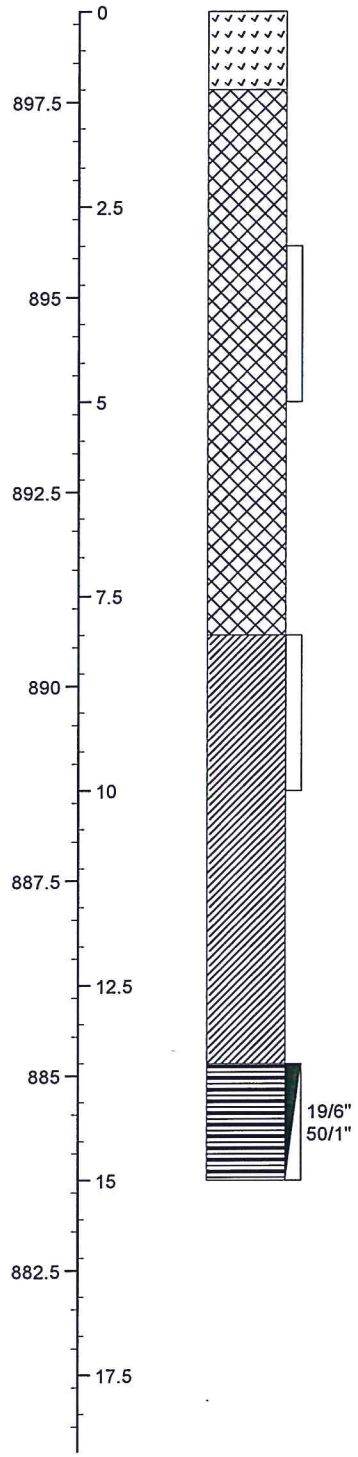
Notes:

LOG OF TEST BORING
BORING B-4

PROJECT: Northwest T-Hangar and Taxilane Development
CLIENT: Crawford, Murphy & Tilly, Inc.(CMT)
PROJECT NO.: 217132G **START:** 9/6/17
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 10/24/2017
ELEVATION: 898.66
FINISH: 9/6/17

LOGGER: TMA
DATE CHECKED:



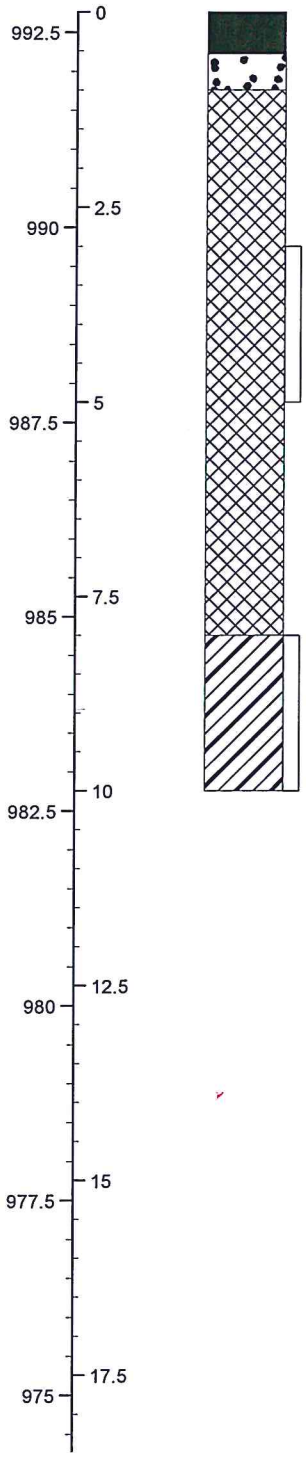
ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		T	Topsoil				
		FILL	Fill, lean clay, dark brown, moist				
		FILL	Fill, lean clay, trace gravel, stiff, brown & gray, moist	1, ST	91.8	29.7	4807
		CH	Fat clay, stiff, yellowish brown, moist	2, ST	101.6	24.2	
		W	Weathered shale and sandstone, hard, gray and reddish brown, dry	1, SS			
			Drilling discontinued at 15.0 feet				

Notes:

LOG OF TEST BORING
BORING B-5

PROJECT: Northwest T-Hangar and Taxilane Development
CLIENT: Crawford, Murphy & Tilly, Inc.(CMT)
PROJECT NO.: 217132G **START:** 9/6/17
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 10/23/2017
ELEVATION: 992.76
FINISH: 9/6/17
LOGGER: TMA
DATE CHECKED:



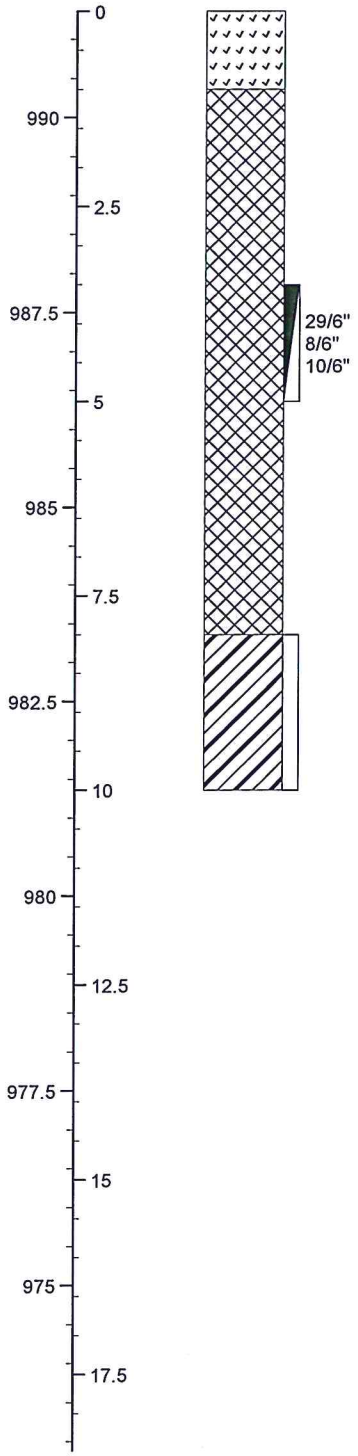
ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		C	Concrete 6 1/2"				
		GP	Poorly graded gravel				
		FILL	Fill, fat clay trace organics, greenish gray, moist				
		FILL	Fill, fat clay, very stiff, trace organics, olive gray & black, moist	1, ST	104.5	22.7	6814
		CL-CH	Fat clay, very stiff, red, moist	2, ST	103.9	24.6	
			Drilling discontinued at 10.0 feet				

Notes:

LOG OF TEST BORING
BORING B-6

PROJECT: Northwest T-Hangar and Taxilane Development
CLIENT: Crawford, Murphy & Tilly, Inc.(CMT)
PROJECT NO.: 217132G **START:** 9/6/17
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 10/23/2017
ELEVATION: 991.36
FINISH: 9/6/17
LOGGER: TMA
DATE CHECKED:



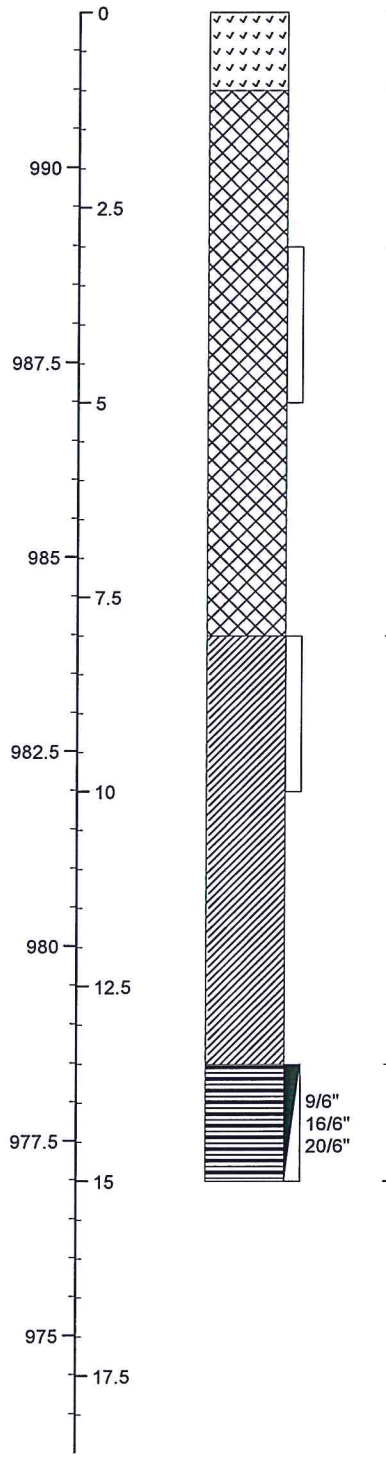
ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		T	Topsoil				
		FILL	Fill, clayey gravel with asphalt, dark brown and black, moist				
		FILL	Fill, lean clay with asphalt and gravel mix, stiff, brown, black and gray, moist	1, SS			
		CL-CH	Lean to fat clay, stiff, reddish brown, moist	2, ST	100.4	25.1	
			Drilling discontinued at 10.0 feet				

Notes:

LOG OF TEST BORING
BORING B-7

PROJECT: Northwest T-Hangar and Taxilane Development
CLIENT: Crawford, Murphy & Tilly, Inc.(CMT)
PROJECT NO.: 217132G **START:** 9/6/17
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 10/24/2017
ELEVATION: 991.98
FINISH: 9/6/17
LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		T	Topsoil				
		FILL	Fill, lean to fat clay, trace gravel, gray & yellowish brown, moist				
		FILL	Fill, lean clay, trace gravel, stiff, brown & gray, moist	1, ST	96.4	27.7	7269
		CH	Fat clay, very stiff, dark grayish brown, moist	2, ST	102.1	25.7	
		W	Weathered shale, hard, gray, moist to dry	1, SS			
			Drilling discontinued at 15.0 feet				

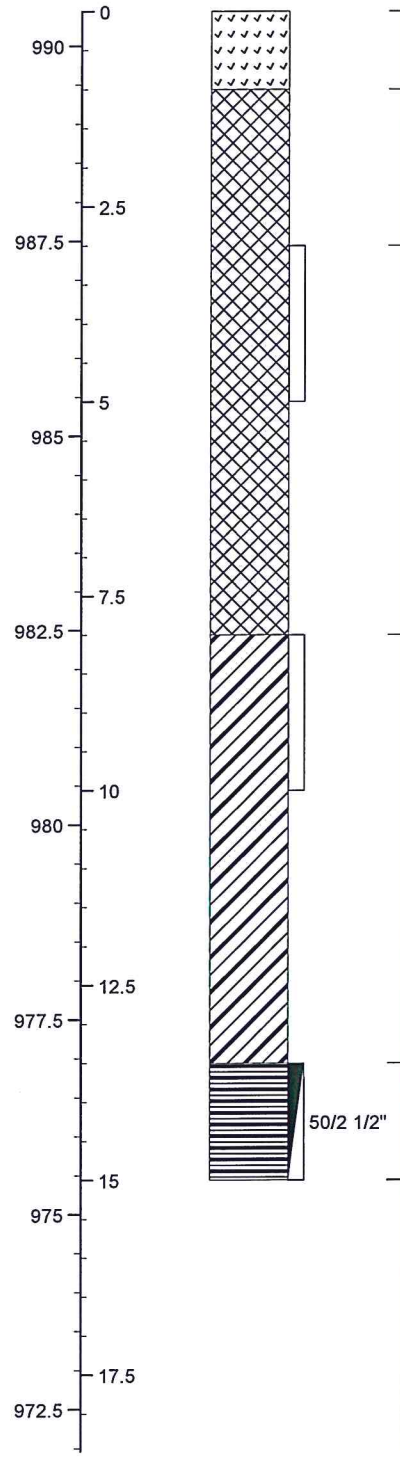
Notes:

LOG OF TEST BORING
BORING B-8

PROJECT: Northwest T-Hangar and Taxilane Development
CLIENT: Crawford, Murphy & Tilly, Inc.(CMT)
PROJECT NO.: 217132G **START:** 9/6/17
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 4" Continuous Flight Augers
DEPTH TO - water None **caving**

DATE: 10/24/2017
ELEVATION: 990.44
FINISH: 9/6/17

LOGGER: TMA
DATE CHECKED:



ELEVATION/ DEPTH	SOIL SYMBOLS SAMPLER SYMBOLS AND FIELD TEST DATA	USCS	Description	Sample # & Type	Density pcf	Moist-ure, %	Qu, psf
		T	Topsoil				
		FILL	Fill, lean clay, trace gravel, dark brown to black, moist				
		FILL	Fill, lean to fat clay, trace gravel, very stiff, dark grayish brown, moist	1, ST	99.5	24.1	5413
		CL-CH	Lean to fat clay, stiff, yellowish brown, moist	2, ST	95.3	27.1	
		W	Weathered limestone, hard, gray, dry	1, SS			
			Drilling discontinued at 15.0 feet				

Notes:

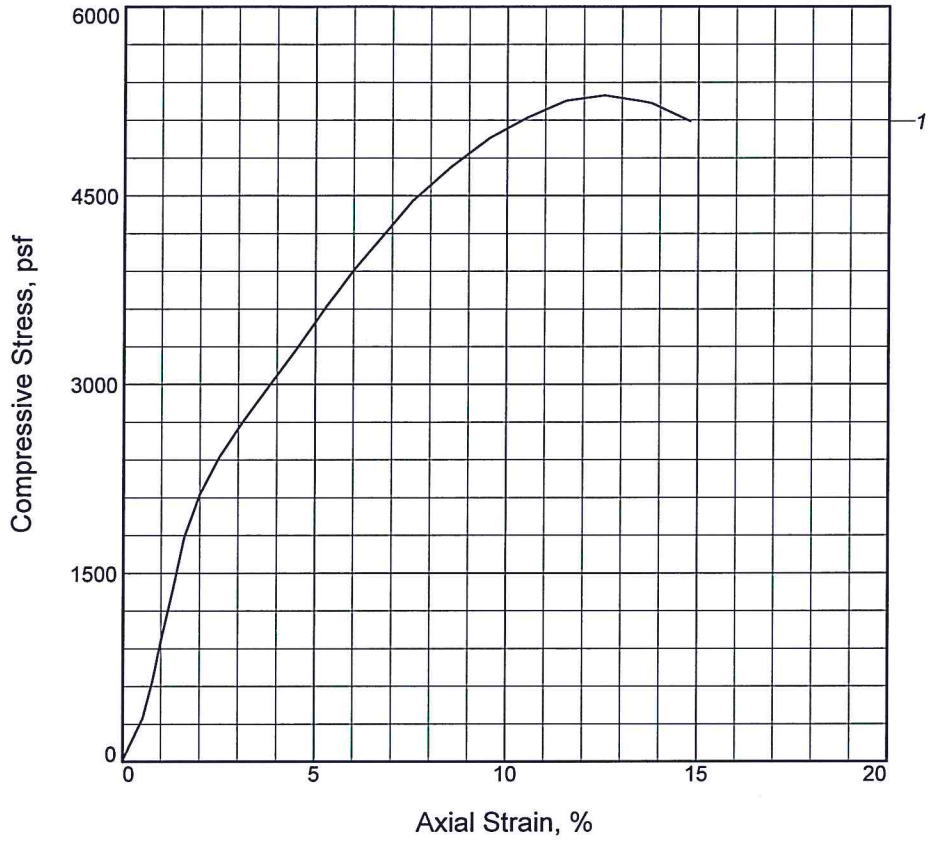
APPENDIX II

Laboratory Results

SUMMARY OF LABORATORY TEST RESULTS

Boring	Depth (Ft)	Sample No./Type	Natural Moisture %	Natural Dry Density (pcf)	Unconfined Compressive Strength (psf)	Atterberg Limits		Soil Type
						Liquid Limit %	Plasticity Index %	
B-1	3.0-5.0	ST-1	23.0	99.7	5296			
B-1	8.0-10.0	ST-2	26.8	98.6				
B-2	3.0-5.0	ST-1	23.5	103.6	4724	59	33	CH
B-2	8.0-10.0	ST-2	23.5	101.6				
B-3	3.0-5.0	ST-1	28.0	91.5	3844			
B-3	8.0-10.0	ST-2	26.1	101.1				
B-4	3.0-5.0	ST-1	29.7	91.8	4807			
B-4	8.0-10.0	ST-2	24.2	101.6				
B-5	3.0-5.0	ST-1	22.7	104.5	6814	52	26	CH
B-5	8.0-10.0	ST-2	24.6	1039				
B-6	8.0-10.0	ST-1	25.1	100.4				
B-7	3.0-5.0	ST-1	27.7	96.4	7269			
B-7	8.0-10.0	ST-2	25.7	102.1				
B-8	3.0-5.0	ST-1	24.1	99.5	5413			
B-8	8.0-10.0	ST-2	27.1	95.3				

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	5296			
Undrained shear strength, psf	2648			
Failure strain, %	12.5			
Strain rate, in./min.	0.050			
Water content, %	23.0			
Wet density, pcf	122.6			
Dry density, pcf	99.7			
Saturation, %	88.9			
Void ratio	0.7030			
Specimen diameter, in.	2.83			
Specimen height, in.	5.55			
Height/diameter ratio	1.96			

Description: Fill, lean clay with asphalt and gravel, stiff, dark brown & black, moist

LL =	PL =	PI =	Assumed GS= 2.72	Type: ST

Project No.: 217132G
Date Sampled: 9/6/17
Remarks:

Figure _____

Client: Crawford, Murphy & Tilly, Inc.(CMT)

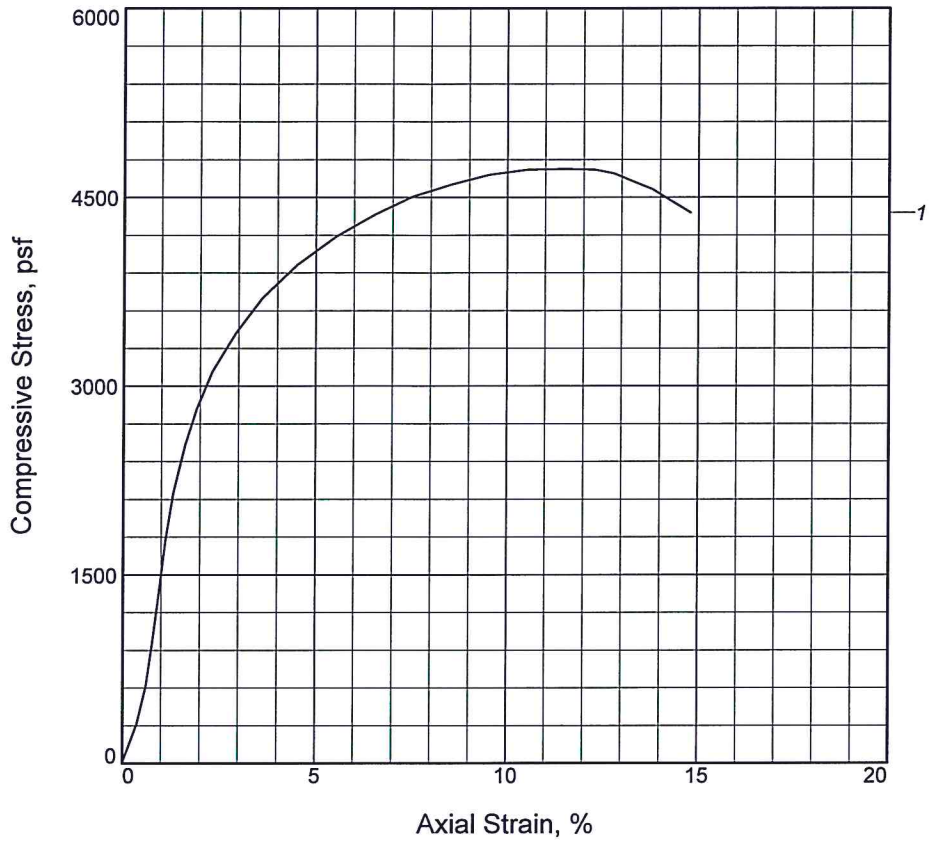
Project: Northwest T-Hangar and Taxilane Development

Source of Sample: B-1 **Depth:** 3
Sample Number: 1

UNCONFINED COMPRESSION TEST
KRUGER TECHNOLOGIES, INC.
LENEXA, KS

Tested By: TMA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	4724			
Undrained shear strength, psf	2362			
Failure strain, %	11.5			
Strain rate, in./min.	0.050			
Water content, %	23.5			
Wet density, pcf	128.0			
Dry density, pcf	103.6			
Saturation, %	100.0			
Void ratio	0.6385			
Specimen diameter, in.	2.80			
Specimen height, in.	5.61			
Height/diameter ratio	2.00			

Description: Fill, fat clay, stiff, brown and gray, moist

LL = 59	**PL =** 26	**PI =** 33	**Assumed GS=** 2.72	**Type:** ST

Project No.: 217132G
Date Sampled: 9/6/17
Remarks:

Figure _____

Client: Crawford, Murphy & Tilly, Inc.(CMT)

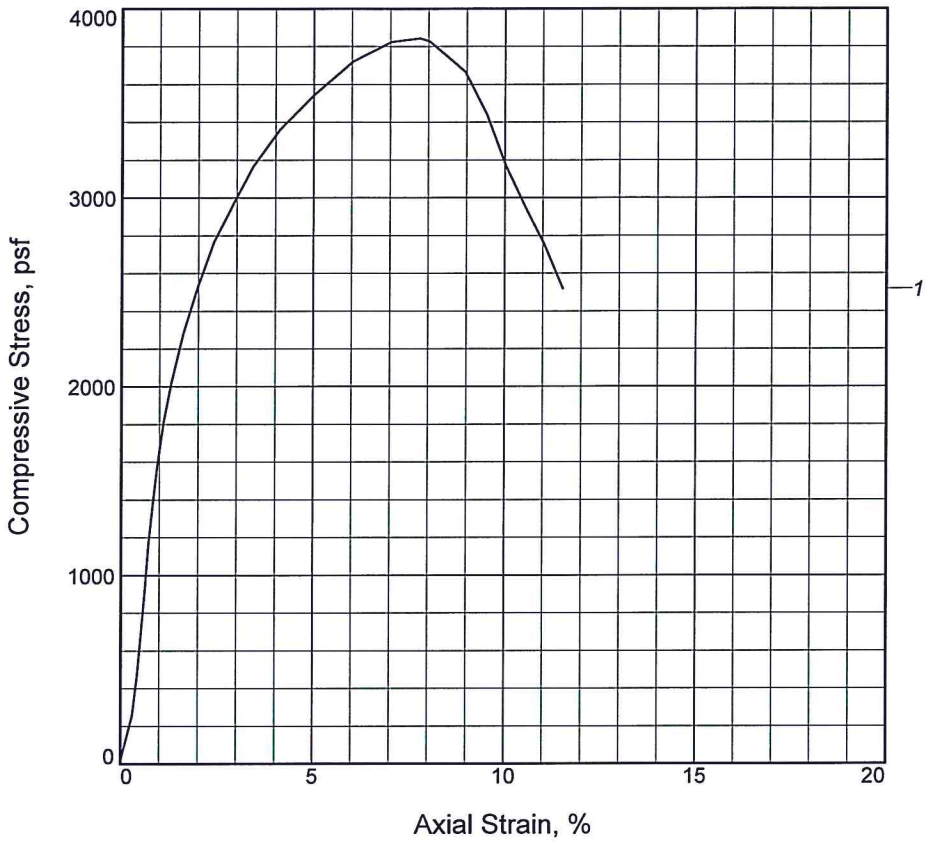
Project: Northwest T-Hangar and Taxilane Development

Source of Sample: B-2 **Depth:** 3
Sample Number: 1

UNCONFINED COMPRESSION TEST
KRUGER TECHNOLOGIES, INC.
LENEXA, KS

Tested By: TMA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	3844			
Undrained shear strength, psf	1922			
Failure strain, %	7.8			
Strain rate, in./min.	0.050			
Water content, %	28.0			
Wet density, pcf	117.2			
Dry density, pcf	91.5			
Saturation, %	89.1			
Void ratio	0.8552			
Specimen diameter, in.	2.80			
Specimen height, in.	5.59			
Height/diameter ratio	2.00			

Description: Fill, lean clay, stiff, brown and gray, moist

LL =	PL =	PI =	Assumed GS= 2.72	Type: ST

Project No.: 217132G
Date Sampled: 9/6/17
Remarks:

Figure _____

Client: Crawford, Murphy & Tilly, Inc.(CMT)

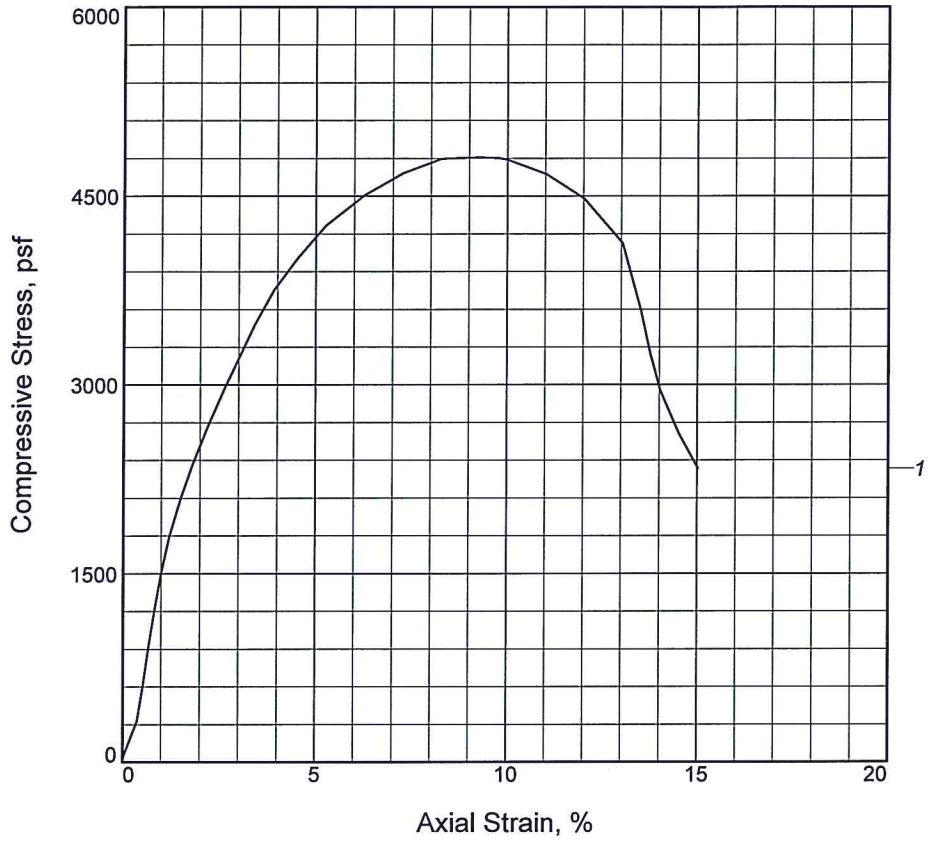
Project: Northwest T-Hangar and Taxilane Development

Source of Sample: B-3 **Depth:** 3
Sample Number: 1

UNCONFINED COMPRESSION TEST
KRUGER TECHNOLOGIES, INC.
LENEXA, KS

Tested By: TMA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	4807			
Undrained shear strength, psf	2403			
Failure strain, %	9.3			
Strain rate, in./min.	0.050			
Water content, %	29.7			
Wet density, pcf	119.1			
Dry density, pcf	91.8			
Saturation, %	95.2			
Void ratio	0.8496			
Specimen diameter, in.	2.84			
Specimen height, in.	5.57			
Height/diameter ratio	1.96			

Description: Fill, lean clay, trace gravel, stiff, brown & gray, moist

LL =	PL =	PI =	Assumed GS= 2.72	Type: ST

Project No.: 217132G
Date Sampled: 9/6/17
Remarks:

Figure _____

Client: Crawford, Murphy & Tilly, Inc.(CMT)

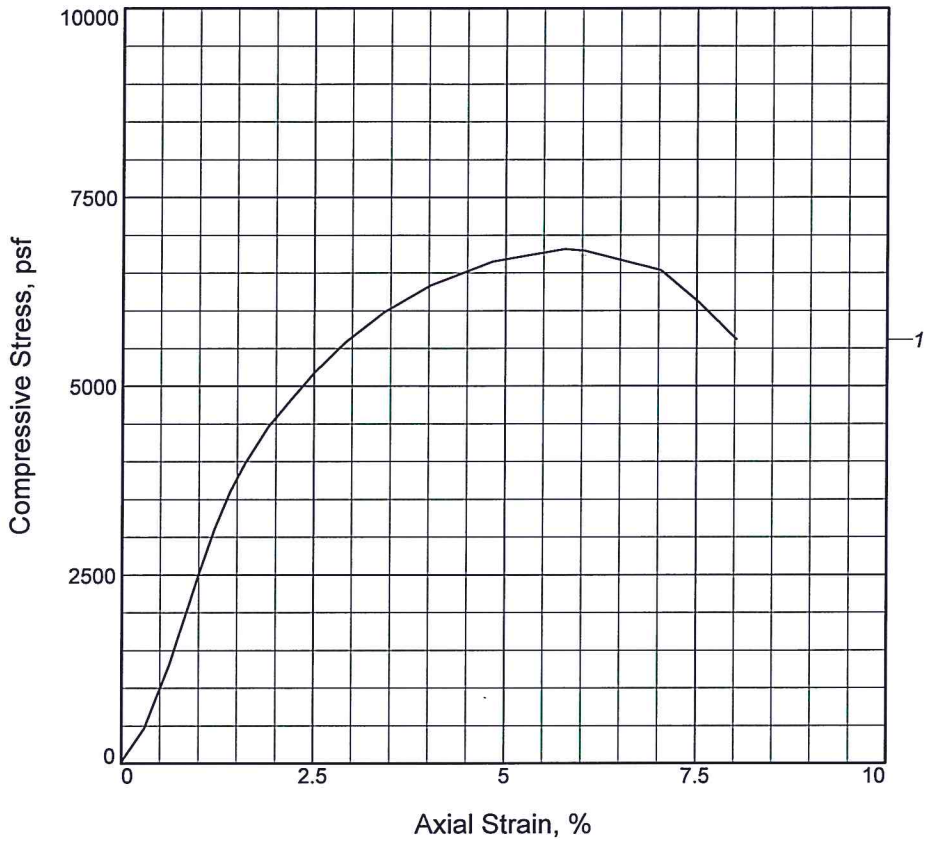
Project: Northwest T-Hangar and Taxilane Development

Source of Sample: B-4 **Depth:** 3
Sample Number: 1

UNCONFINED COMPRESSION TEST
KRUGER TECHNOLOGIES, INC.
LENEXA, KS

Tested By: TMA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	6814			
Undrained shear strength, psf	3407			
Failure strain, %	5.8			
Strain rate, in./min.	0.050			
Water content, %	22.7			
Wet density, pcf	128.2			
Dry density, pcf	104.5			
Saturation, %	98.8			
Void ratio	0.6249			
Specimen diameter, in.	2.86			
Specimen height, in.	5.57			
Height/diameter ratio	1.95			

Description: Fill, Fat clay, very stiff, brown and gray, moist

LL = 52	**PL =** 26	**PI =** 26	**Assumed GS=** 2.72	**Type:** ST

Project No.: 217132G
Date Sampled: 9/6/17
Remarks:

Figure _____

Client: Crawford, Murphy & Tilly, Inc.(CMT)

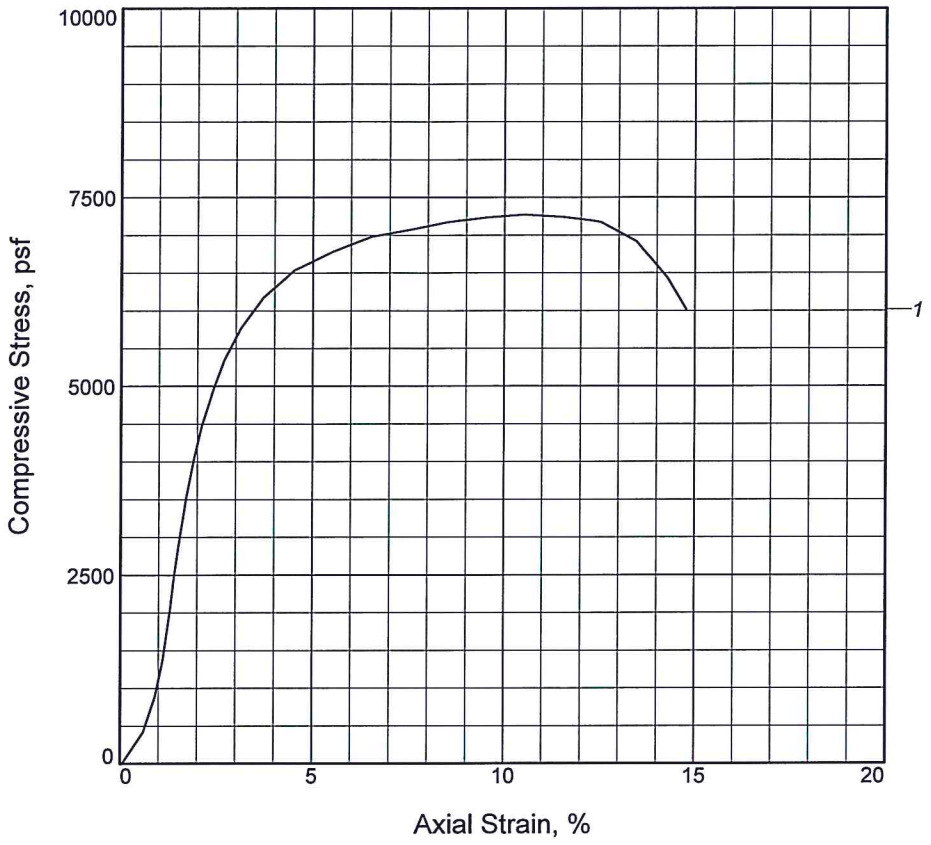
Project: Northwest T-Hangar and Taxilane Development

Source of Sample: B-5 **Depth:** 3
Sample Number: 1

UNCONFINED COMPRESSION TEST
KRUGER TECHNOLOGIES, INC.
LENEXA, KS

Tested By: TMA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	7269			
Undrained shear strength, psf	3634			
Failure strain, %	10.5			
Strain rate, in./min.	0.050			
Water content, %	27.7			
Wet density, pcf	123.1			
Dry density, pcf	96.4			
Saturation, %	99.0			
Void ratio	0.7615			
Specimen diameter, in.	2.86			
Specimen height, in.	5.60			
Height/diameter ratio	1.96			

Description: Fill, lean clay, trace gravel, very stiff, brown & gray, moist

LL =	**PL =**	**PI =**	**Assumed GS=** 2.72	**Type:** ST

Project No.: 217132G
Date Sampled: 9/6/17
Remarks:

Figure _____

Client: Crawford, Murphy & Tilly, Inc.(CMT)

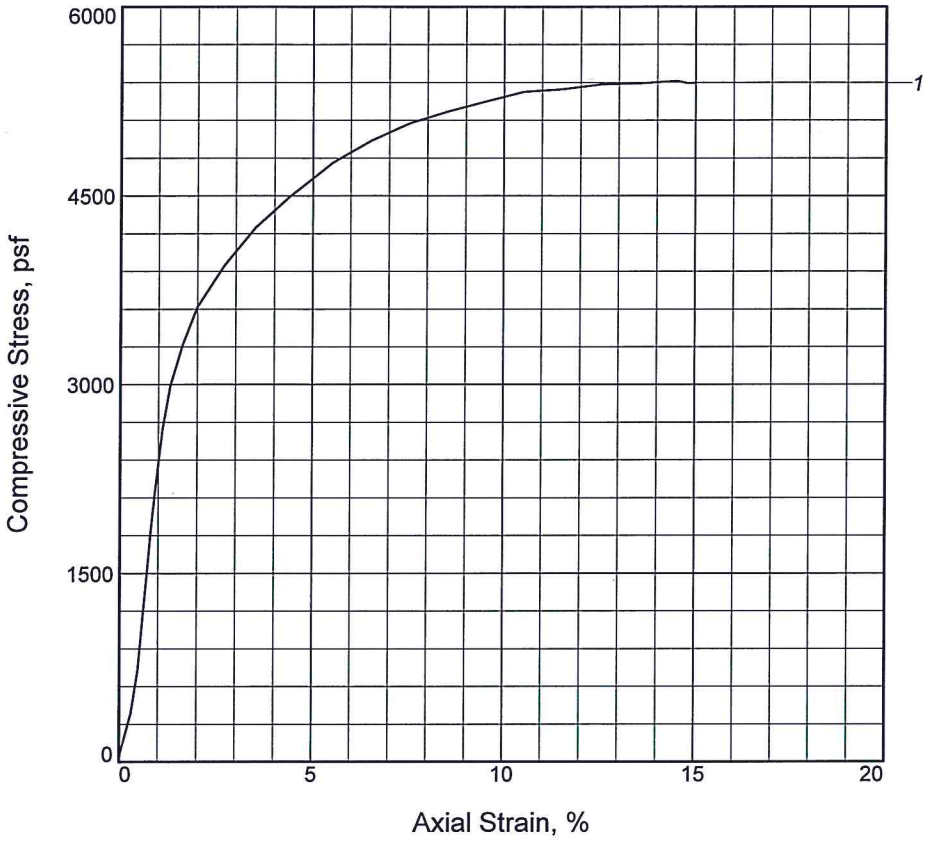
Project: Northwest T-Hangar and Taxilane Development

Source of Sample: B-7 **Depth:** 3
Sample Number: 1

UNCONFINED COMPRESSION TEST
KRUGER TECHNOLOGIES, INC.
LENEXA, KS

Tested By: TMA **Checked By:** OJK

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psf	5413			
Undrained shear strength, psf	2706			
Failure strain, %	14.5			
Strain rate, in./min.	0.050			
Water content, %	24.1			
Wet density, pcf	123.5			
Dry density, pcf	99.5			
Saturation, %	92.8			
Void ratio	0.7068			
Specimen diameter, in.	2.80			
Specimen height, in.	5.60			
Height/diameter ratio	2.00			

Description: Fill, lean to fat clay, trace gravel, very stiff, dark grayish brown, moist

LL =	PL =	PI =	Assumed GS= 2.72	Type: ST

Project No.: 217132G
Date Sampled: 9/6/17
Remarks:

Figure _____

Client: Crawford, Murphy & Tilly, Inc.(CMT)

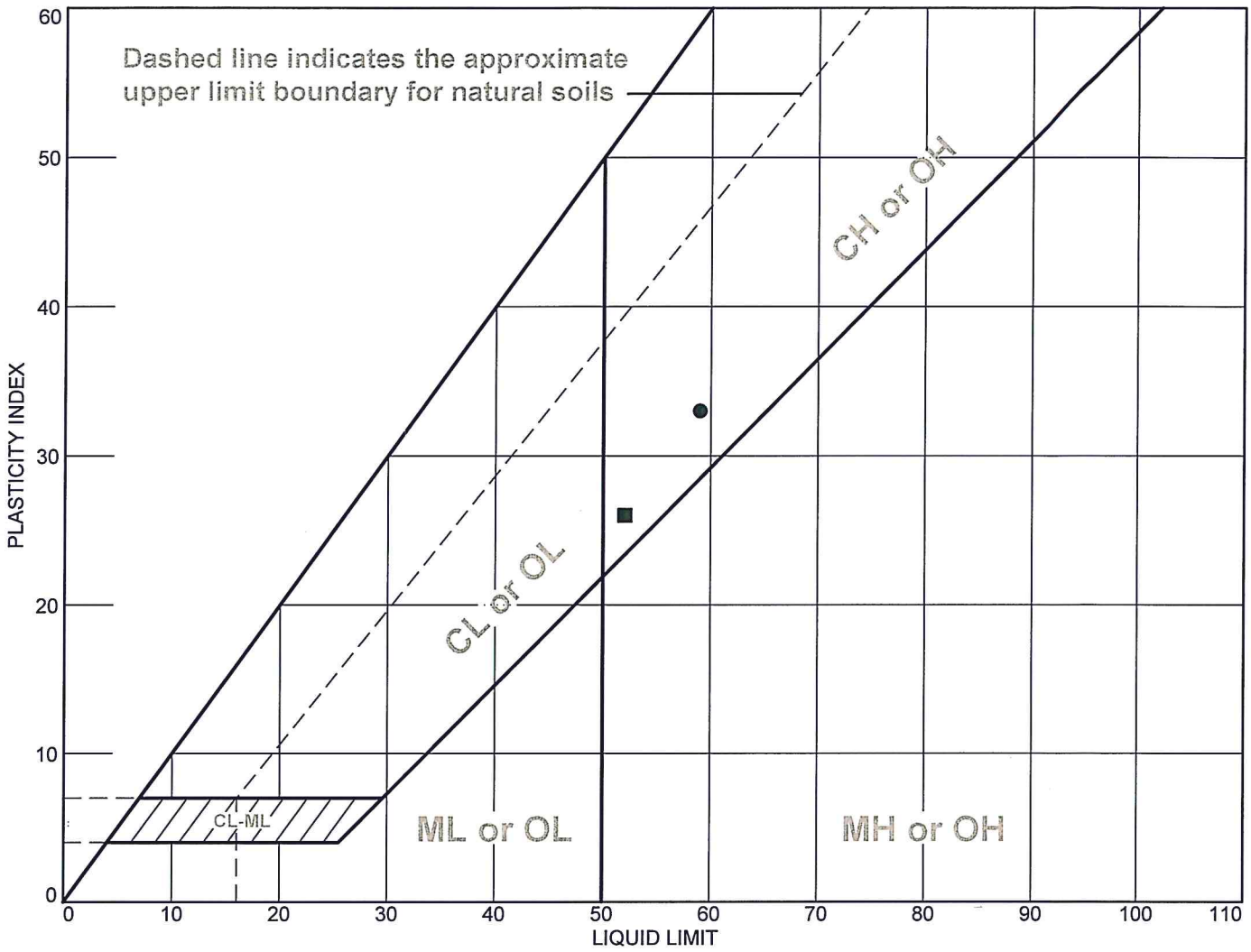
Project: Northwest T-Hangar and Taxilane Development

Source of Sample: B-8 **Depth:** 3
Sample Number: 1

UNCONFINED COMPRESSION TEST
KRUGER TECHNOLOGIES, INC.
LENEXA, KS

Tested By: TMA **Checked By:** OJK

LIQUID AND PLASTIC LIMITS TEST REPORT ASTM D 4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Fill, fat clay, stiff, brown and gray, moist	59	26	33			FILL
■	Fill, Fat clay, very stiff, brown and gray, moist	52	26	26			FILL

Project No. 217132G **Client:** Crawford, Murphy & Tilly, Inc.(CMT)

Project: Northwest T-Hangar and Taxilane Development

● **Source of Sample:** B-2 **Depth:** 3 **Sample Number:** 1

■ **Source of Sample:** B-5 **Depth:** 3 **Sample Number:** 1

KRUGER TECHNOLOGIES, INC.

LENEXA, KS

Remarks:

Figure

GLOSSARY OF GEOTECHNICAL TERMS

ALLUVIUM	Sediments deposited by streams, including riverbeds and floodplains.
ARGILLACEOUS	Rocks composed of or having a notable portion of fine silt and/or clay in their composition.
ATTERBERG LIMITS	Water contents, in percentage of dry weight of soil, that correspond to the boundaries between the states of consistency, i.e. the boundary between the liquid and plastic states (liquid limit) and the boundary between the plastic and solid states (plastic limit).
BEDROCK-IN-PLACE	Continuous rock mass which essentially has not moved from its original depositional position.
CALCAREOUS	Containing calcium carbonate determined by effervescence when tested with dilute hydrochloric acid.
CHANNEL SANDSTONE	Sandstone that has been deposited in a streambed or other channel eroded into the underlying beds.
COLLUVIAL	Rock debris of various sizes loose from in-place bedrock mass, often shifted down gradient in conjunction with soil.
CROSS-BEDDING	Stratification which is inclined to the original horizontal surface upon which the sediment accumulated.
FISSILE BEDDING	Term applied to bedding which consists of laminae less than 2 millimeters in thickness.
FORMATION	A distinctive body of rock that serves as a convenient unit for study and mapping.
FOSSIL DETRITUS	The accumulation of broken, fragmented fossil debris.
FOSSILIFEROUS	Containing organic remains.
GLACIAL ERRATIC	A transported rock fragment different from the bedrock on which it lies, either free or as part of a sediment.
GLACIAL TILL	Nonsorted, nonstratified sediment carried or deposited by a glacier.
GLACIOFLUVIAL	Primarily deposited by streams from glaciers.
GROUP	A lithostratigraphic unit consisting of two or more formations.
JOINT	A fracture in a rock along which no appreciable displacement has occurred.
LIMESTONE	A sedimentary rock composed mostly of calcium carbonate ($CaCO_3$).

LOESS	A homogenous, nonstratified, unindurated deposit consisting predominantly of silt, with subordinate amounts of very fine sand and/or clay.
MICA	A mineral group, consisting of phyllosilicates, with sheetlike structures.
MEMBER	A specially developed part of a varied formation is called a member, if it has considerable geographic extent.
NODULE	A small, irregular, knobby, or rounded rock that is generally harder than the surrounding rock.
PERMEABILITY	The capacity of a material to transmit a fluid.
RECOVERY	The percentage of bedrock core recovered from a core run length.
RELIEF	The difference in elevation between the high and low points of a land surface.
RESIDUAL SOIL	Soil formed in place by the disintegration and decomposition of rocks and the consequent weathering of the mineral materials.
ROCK QUALITY DESIGNATION (RQD)	Refers to percentage of core sample recovered in unbroken lengths of 4 inches or more.
SANDSTONE	Sedimentary rock composed mostly of sand sized particles, usually cemented by calcite, silica, or iron oxide.
SERIES	A time-stratigraphic unit ranked next below a system.
SHALE	A fine-grained plastic sedimentary rock formed by consolidation of clay and mud.
STRATIGRAPHY	Branch of geology that treats the formation, compositions, sequence, and correlation of the stratified rocks as parts of the earth's crust.
SYSTEM	Designates rocks formed during a fundamental chronological unit, a period.
UNCONFORMITY	A surface of erosion or nondeposition, usually the former, which separates younger strata from older rocks.
WEATHERING	The physical and chemical disintegration and decomposition of rocks and minerals.

General Notes

Laboratory Test Symbols	
Symbol	**Definition**
LL	Liquid Limit (ASTM D4318)
PL	Plastic Limit (ASTM D4318)
PI	Plasticity Index (LL minus PL)
Qu	Unconfined Compressive Strength, Pounds per Square Foot (psf)
Qp	Pocket Penetrometer Reading, Tons per Square Foot (TSF)
RQD	Rock Quality Designation % (Sum of rock core pieces >4 inches/length of core run)

Common Soil Classification Symbols

Clay	
Symbol	**Soil Type**
CL	Low plasticity clay
CL-ML	Low plasticity clay and silt
CL/CH	Medium plasticity clay
CH	High plasticity clay

Silt	
Symbol	**Soil Type**
ML	Low plasticity silt
MH	High plasticity silt

Sand	
Symbol	**Soil Type**
SW	Well graded sand
SP	Poorly graded sand
SM	Silty sand
SC	Clayey sand

Gravel	
Symbol	**Soil Type**
GW	Well graded gravel
GP	Poorly graded gravel
GM	Silty gravel
GC	Clayey gravel

Descriptive Terminology

Cohesionless Soils

Relative Density Term	"N" Value
Very Loose	0 - 4
Loose	5 - 9
Medium Dense	10 - 29
Dense	30 – 49
Very Dense	50 or more

Cohesive Soils

Consistency Term	"N" Value
Very soft	0 – 2
Soft	3 – 4
Medium	5 – 8
Stiff	9 – 15
Very Stiff	16 - 30
Hard	> 30

Relative Proportions and Sizes

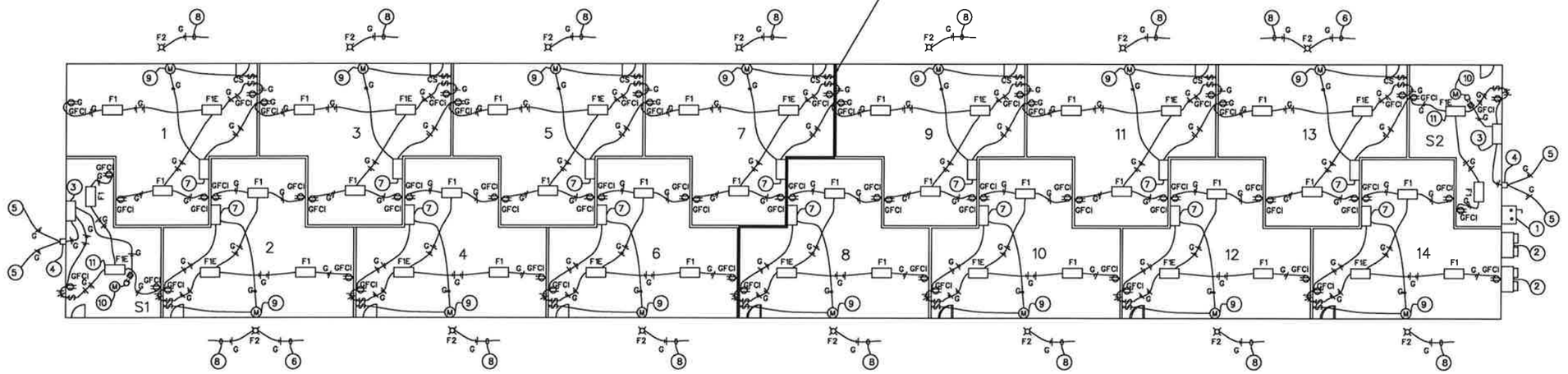
Term	Range
Trace	< 5%
A Little	5 – 15%
Some	15 – 30%
With	30 – 50%

Material	Size
Boulder	> 12"
Cobble	3" – 12"
Gravel	4.75 - 76.2 mm
Sand	0.075 – 4.75 mm
Silt and Clay	< 0.075 mm

APPENDIX A5 – EGRESS EMERGENCY LIGHTING PLAN REVISION

⚠2 NOTE:
INTERIOR LIGHT FIXTURE CLOSEST TO PEDESTRIAN DOOR FOR EACH INDIVIDUAL HANGAR UNIT AND STORAGE UNIT TO BE F1E EMERGENCY LIGHT FIXTURE. SEE SHEET 25 FOR DETAILS.

3-HOUR FIREWALL
(SEE SPECIFICATIONS ITEM 13000- T-HANGAR BUILDING)



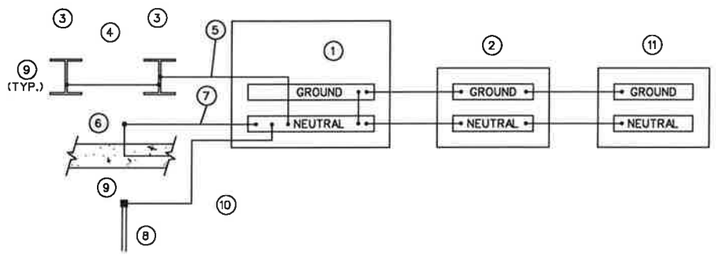
FLOOR PLAN

T-HANGAR BAY WIRING
N.T.S.

T-HANGAR BAY WIRING NOTES

1. SERVICE ENTRANCE DISCONNECT.
2. METER PACK (8 METERS PER PACK).
3. MAIN POWER DISTRIBUTION PANELBOARD.
4. PHOTOCELL, MOUNTED AT ROOF, POINTED NORTH.
5. TO SECURITY LIGHTING (F2).
6. TO PHOTOCELL.
7. T-HANGAR BAY OR S1 LOAD CENTER.
8. TO NEXT SECURITY LIGHT (F2).
9. BI-FOLD DOOR MOTOR OPERATOR.
10. STORAGE S1 & S2 GARAGE DOOR OPENER AND RECEPTACLE.
11. LOCATE LIGHT SO IT IS NOT OBSTRUCTED BY GARAGE DOOR WHEN OPENED.

NOTE: FOR WIRING FROM METER PACK TO T-HANGAR BAY LOAD CENTERS, SEE ONE-LINE DIAGRAM.



SYSTEM GROUNDING AND NEUTRAL WIRING

SYSTEM GROUNDING AND NEUTRAL WIRING NOMENCLATURE

1. 400A SERVICE ENTRANCE DISCONNECT. BOND NEUTRAL BAR TO GROUND BAR HERE.
2. METER PACK. DO NOT BOND NEUTRAL BAR TO GROUND BAR HERE.
3. STRUCTURAL STEEL.
4. BONDING JUMPERS, INSTALLED ONLY IF REQUIRED FOR COMPLIANCE WITH NEC ARTICLE 250.52.
5. #4/0 AWG IN 1" SCHEDULE 40 PVC CONDUIT.
6. T-HANGAR FOUNDATION CONCRETE ENCASED ELECTRODE ("UFER" GROUND).
7. #4 AWG IN 1/2" SCHEDULE 40 PVC CONDUIT.
8. ¾" DIAMETER X 10' LONG COPPERCLAD GROUND ROD. MINIMUM BURY 1'-0".
9. EXOTHERMIC WELD, CADWELD, OR EQUIVALENT.
10. #4/0 AWG IN 1" SCHEDULE 40 PVC CONDUIT.
11. LOAD CENTER (TYP. OF 11). DO NOT BOND NEUTRAL BAR TO GROUND BAR HERE.

COMBINING CIRCUITS NOTES

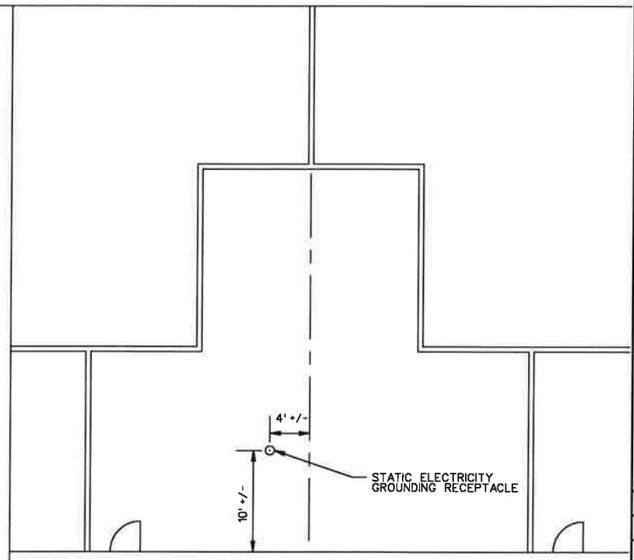
CONTRACTOR SHALL BE PERMITTED TO COMBINE CIRCUITS IN SAME CONDUIT AS DESCRIBED HEREIN:

1. IN T-HANGAR BAYS, LIGHTING AND RECEPTACLE CIRCUITS MAY BE COMBINED, HOWEVER, THE LIGHT FIXTURE ITSELF "SHALL NOT" BE USED AS A RACEWAY FOR RECEPTACLE CIRCUITS.

2. 240V WIRING FOR BI-FOLD DOOR MOTOR OPERATOR SHALL NOT BE COMBINED IN SAME CONDUIT WITH LIGHTING OR RECEPTACLE CIRCUITS.

3. WIRING FROM METER PACK TO T-HANGAR & S1 BAY LOAD CENTERS MAY BE COMBINED AS FOLLOWS:
   - FEEDS TO T-HANGAR BAYS #8 (TWO #8 THWN, ONE #8 THWN NEUTRAL) & #9 (TWO #8 THWN, ONE #8 THWN NEUTRAL) MAY BE COMBINED WITH ONE #10 GROUND IN 1" CONDUIT.
   - FEEDS TO T-HANGAR BAYS #6 (TWO #6 THWN, ONE #6 THWN NEUTRAL) & #7 (TWO #6 THWN, ONE #8 THWN NEUTRAL) MAY BE COMBINED WITH ONE #10 GROUND IN 1-1/4" CONDUIT.
   - FEEDS TO T-HANGAR BAYS #4 (TWO #6 THWN, ONE #6 THWN NEUTRAL) & #5 (TWO #8 THWN, ONE #6 THWN NEUTRAL) MAY BE COMBINED WITH ONE #10 GROUND IN 1-1/4" CONDUIT.
   - FEEDS TO T-HANGAR BAYS #2 (TWO #6 THWN, ONE #6 THWN NEUTRAL) & #3 (TWO #6 THWN, ONE #6 THWN NEUTRAL) MAY BE COMBINED WITH ONE #10 GROUND IN 1-1/4" CONDUIT.
   - FEEDS TO T-HANGAR BAYS #1 (TWO #6 THWN, ONE #6 THWN NEUTRAL) & S1 (TWO #6 THWN, ONE #6 THWN NEUTRAL) MAY BE COMBINED WITH ONE #10 GROUND IN 1-1/4" CONDUIT.

4. "SHARED" NEUTRAL WIRING SHALL NOT BE PERMITTED.



TYPICAL STATIC ELECTRICITY GROUNDING RECEPTACLE
N.T.S.

REVISIONS		
NUMBER	BY	DATE
⚠2	TGH	3/14/18

0 1 2
THIS BAR IS EQUAL TO 2" AT FULL SCALE (34X22), PLOT 1

LEE'S SUMMIT MUNICIPAL AIRPORT
LEE'S SUMMIT, MISSOURI

NORTHWEST QUADRANT T-HANGAR DEVELOPMENT – PHASE 1

STATE OF MISSOURI
TYLER C. WHITE
NUMBER PE-2010000214
PROFESSIONAL ENGINEER
3/14/18

CMT
ONE MEMORIAL DRIVE, SUITE 500
ST. LOUIS, MO 63102
(314) 436-5500
PROFESSIONAL ENGINEERING - 000631

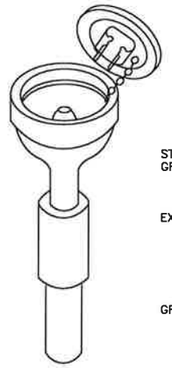
LEE'S SUMMIT PROJECT #47632185

FILE: 023_Wiring_Plan.dgn
DESIGN BY: BDB
DRAWN BY: BDB
CHECKED BY: TCS
APPROVED BY: TCS
DATE: NOVEMBER 10, 2017
JOB No: 17443-01

T-HANGAR WIRING PLAN

SHEET 23 OF 28 SHEETS

3/14/2018
K:\LeesSummit(MO)\17443-01-00\Draw\Sheets\023_Wiring_Plan.dgn

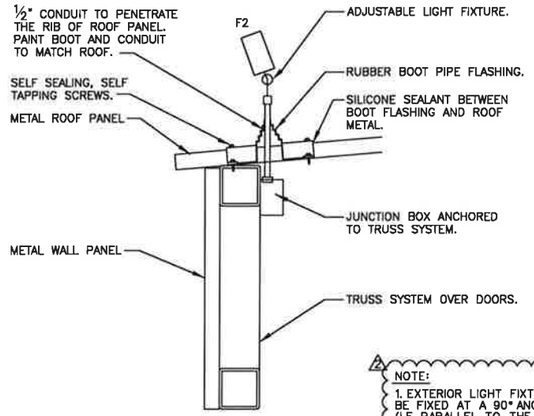


STATIC ELECTRICITY GROUNDING RECEPTACLE

NTS

NOTES:

AIRCRAFT STATIC CHARGE GROUNDING RECEPTICLE IN EACH HANGER BAY SHALL BE BURNDY BAR-1, ERICO B165R, OR EQUIVALENT. THE AIRCRAFT STATIC CHARGE GROUNDING RECEPTICLE SHALL BE INSTALLED ON ¾" DIAMETER X 10' LONG COPPERCLAD GROUND ROD PER MANUFACTURER'S INSTRUCTIONS. EXOTHERMIC WELD SHALL BE CADWELD, OR EQUIVALENT. THE TOP CAP OF AIRCRAFT STATIC CHARGE GROUNDING RECEPTICLE SHALL BE INSTALLED FLUSH WITH THE TOP OF CONCRETE FLOOR SLAB AT LOCATIONS INDICATED ON THE PLANS. ELECTRICAL CONTRACTOR SHALL COORDINATE INSTALLATION OF GROUNDING RECEPTACLE IN FLOOR SLAB WITH BUILDING CONTRACTOR.



FIXTURE F2 INSTALLATION

NTS

2 NOTE:

1. EXTERIOR LIGHT FIXTURE HEAD SHALL BE FIXED AT A 90° ANGLE FROM VERTICAL (I.E. PARALLEL TO THE GROUND) SO THAT LIGHT IS DIRECTED DOWNWARD.

LEGEND

- Ⓜ — BIFOLD DOOR MOTOR OPERATOR, 240V, 1HP (NOM.) 1 PHASE, MULTI-VOLTAGE
- $ — TOGGLE SWITCH (INTERIOR LIGHTS)
- $CS — BIFOLD DOOR MOTOR OPERATOR CONTROL STATION (SUPPLIED WITH DOOR)
- GFCI — GFCI DUPLEX RECEPTACLE
- F1 — INTERIOR LED LIGHT FIXTURE
- F1E — EMERGENCY INTERIOR LED LIGHT FIXTURE
- F2 — EXTERIOR LED SECURITY (FLOOD) LIGHT

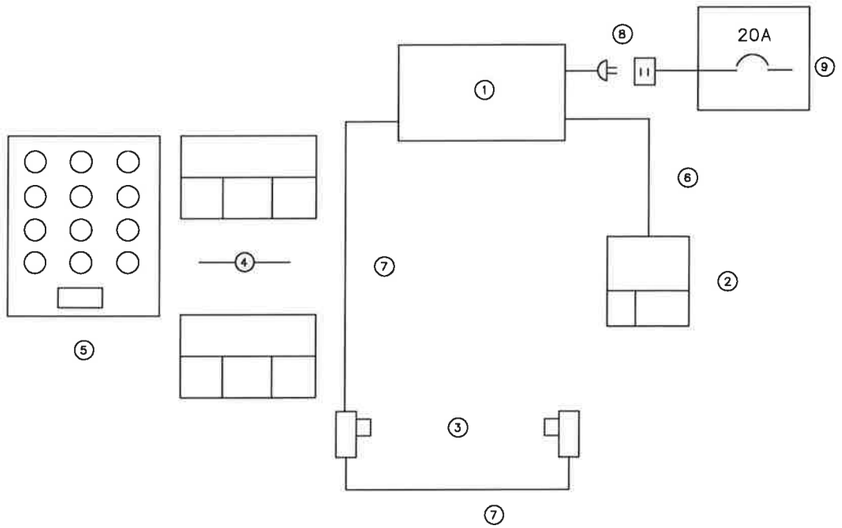
LIGHT FIXTURE SCHEDULE

2 F1 - LUSIO ES3-UL-2MS-40-WIDE-CA-LV-10V-OCC20-C15W
F1E- LITHONIA IBG 12000LM SEF AFL WD 120 OZ10 40K BOCRIBPK PS30250 CS93WL15 LAOZU OR EQUIVALENT

F2 - LITHONIA DSXF2 LED P2 40K WFR 120 THK DDBXD, OR EQUIVALENT. FLOOD LIGHTING.

NOTES:

1. ALL LIGHT FIXTURES SHALL COMPLY WITH "BUY AMERICAN" REQUIREMENTS.
2. LIGHT FIXTURES SHALL INCLUDE LAMPS AND MOUNTING HARDWARE AS REQUIRED.

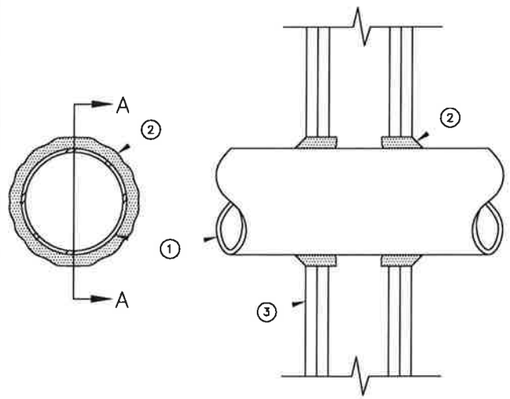


STORAGE S1 & S2 GARAGE DOOR OPENER

NTS

STORAGE GARAGE DOOR OPENER KEYED NOTES

1. GARAGE DOOR OPENER OPERATOR, BELT DRIVE, 1/2 HP, 120V, CHAMBERLAIN LIFTMASTER WD822KD, OR EQUIVALENT.
2. MULTI-FUNCTION DOOR CONTROL PANEL, MOUNTED INSIDE NEXT TO PERSONNEL DOOR.
3. ELECTRIC EYE REVERSING SAFETY SENSORS, MOUNTED ON EACH SIDE AT BOTTOM OF DOOR.
4. WIRELESS THREE BUTTON REMOTE CONTROL (TWO REQUIRED).
5. WIRELESS KEYPAD ENTRY PANEL, MOUNTED OUTSIDE NEXT TO PERSONNEL DOOR.
6. TWO-CONDUCTOR BELL CABLE, PROVIDED WITH DOOR OPENER.
7. TWO-CONDUCTOR CABLE, PROVIDED WITH DOOR OPENER.
8. PROVIDE RECEPTACLE IN METALLIC BACK BOX FOR OPENER.
9. 20A, 1P CIRCUIT BREAKER IN DISTRIBUTION PANELBOARD OR S1 LOAD CENTER, LABELED "OVERHEAD DOOR".



FIRE STOP DETAIL

NTS

FIRE STOP DETAIL NOTES

1. CONDUIT. SEE PLANS FOR SIZE AND QUANTITY.
2. FIRE SEAL COMPOUND. SEE SPECS. INSTALL PER MANUFACTURER REQUIREMENTS AND IN COMPLIANCE WITH NEC.
3. GYPSUM BOARD FIRE RATED WALL, EITHER 2-HOUR OR 3-HOUR AS NOTED ON PLANS.

ELECTRICAL WIRING NOTES

1. ALL WIRING INSIDE T-HANGARS SHALL COMPLY WITH NFPA 70: NATIONAL ELECTRIC CODE, ARTICLE 513: AIRCRAFT HANGARS, INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING:
   - ANY PIT OR DEPRESSION IS A CLASS 1, DIVISION 1 AREA UP TO FLOOR LEVEL [NEC 513.3(A)].
   - THE ENTIRE AREA OF THE HANGAR IS A CLASS 1, DIVISION 2 AREA TO 18" ABOVE FLOOR [NEC 513.3(B)].
   - THE AREA WITHIN 5', BOTH HORIZONTAL AND VERTICAL, FROM AIRCRAFT ENGINES AND FUEL TANKS IS A CLASS 1, DIVISION 2 AREA [NEC 513.3(C)]. NOTE: PROPOSED LIGHTING IS NOT WITHIN THESE AREAS.
   - ANY ELECTRICAL EQUIPMENT THAT MAY PRODUCE SPARKS THAT IS WITHIN 10 FEET ABOVE AIRCRAFT WINGS AND ENGINES, SUCH AS LAMPS AND LAMPHOLDERS, CUTOUTS, SWITCHES, RECEPTACLES, ETC., SHALL BE OF THE TOTALLY ENCLOSED TYPE OR CONSTRUCTED TO PREVENT THE ESCAPE OF SPARKS OR HOT METAL PARTS [NEC 513.7(C)].
2. EXCEPT FOR GROUNDING (EARTHING) AND BONDING, NO CONDUIT, WIRING, ELECTRICAL DEVICES OR ELECTRICAL EQUIPMENT SHALL BE INSTALLED IN CLASS 1, DIVISION 1 OR CLASS 1 DIVISION 2 AREAS.
3. EXCEPT WHERE NOTED OTHERWISE, ALL WIRING INSIDE T-HANGAR BUILDING SHALL BE INSTALLED IN ELECTRICAL METALLIC TUBING (EMT) AND SHALL BE ROUTED OVERHEAD, ATTACHED TO UNDERSIDE OF T-HANGAR ROOF TO CEILING MOUNTED EQUIPMENT AND DOWN TO WALL MOUNTED ELECTRICAL EQUIPMENT AND DEVICES. ELECTRICAL DEVICES (SWITCHES, RECEPTACLES, ETC.) SHALL BE LOCATED NO HIGHER THAN 48" FROM FLOOR TO CENTER OF DEVICE. T-HANGAR BAY LOAD CENTERS SHALL BE LOCATED 5 FEET (60") FROM FLOOR TO TOP OF LOAD CENTER. DISTRIBUTION PANELBOARD SHALL BE LOCATED 6 FEET (72") FROM FLOOR TO TOP OF PANELBOARD.
4. SWITCHES AND RECEPTACLES SHALL BE INSTALLED IN METALLIC DEVICE BOXES. WHERE ATTACHED TO T-HANGAR WALL SIDING, DEVICES SHALL BE MOUNTED TO HORIZONTAL STRUT-TYPE FRAMING WHICH SPANS THE VERTICAL RIBBING OF THE HANGAR WALL TO PROVIDE A RIGID INSTALLATION.
5. THE DOOR MOTOR OPERATOR SHALL NOT BE PLUGGED INTO A RECEPTACLE, BUT SHALL BE "HARD WIRED" IN CONDUIT (THE FINAL 12"-18" SHALL BE IN FLEXIBLE METAL CONDUIT).
6. INTERIOR LED LIGHT FIXTURES SHALL BE SUSPENDED BY STAINLESS STEEL CHAIN OR ATTACHED TO ROOF WIDE FLANGE BEAMS OR PERLINS. LIGHT FIXTURES SHALL BE MOUNTED 14' (NOM.) ABOVE FLOOR.

REVISIONS

NUMBER	BY	DATE
2	TGH	3/14/18

0 1 2

THIS BAR IS EQUAL TO 2" AT FULL SCALE (34X22), PLOT 1

LEE'S SUMMIT MUNICIPAL AIRPORT
LEE'S SUMMIT, MISSOURI

NORTHWEST QUADRANT T-HANGAR DEVELOPMENT – PHASE 1

STATE OF MISSOURI
TYLER G. HORN
PE-2010000214
PROFESSIONAL ENGINEER
3/14/18

CMT
ONE MEMORIAL DRIVE, SUITE 500
ST. LOUIS, MO 63102
(314) 436-3300
© Copyright CMT, INC.
PROFESSIONAL ENGINEERING - 000831

LEE'S SUMMIT PROJECT #47632185

FILE: 025_Electrical_Wiring_Details_2.

DESIGN BY: BDB
DRAWN BY: BDB
CHECKED BY: TCS
APPROVED BY: TCS
DATE: NOVEMBER 10, 2017
JOB No: 17443-01

ELECTRICAL WIRING DETAILS
SHEET 2 OF 2

SHEET 25 OF 28 SHEETS

3/14/2018
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LITHONIA LIGHTING®

F1E

FEATURES & SPECIFICATIONS

INTENDED USE — Ideal one-for-one replacement of conventional HID and fluorescent high bay systems. Applications include warehousing, manufacturing, gymnasiums, and other large indoor spaces with mounting heights up to 60'. **Certain airborne contaminants can diminish the integrity of acrylic and/or polycarbonate.**

CONSTRUCTION — Lightweight aluminum heat sink designed to perform in ambient temperatures up to 55 ° C for maximum naturally convective cooling. Structural elements such as the channel and end caps are fabricated from steel for maximum rigidity. Wireguard attachment points provided.

OPTICS — General, narrow, wide and focus distributions available to meet both horizontal and vertical light level requirements. Injection molded refractors for repeatable photometry. Diffuse lens standard to provide glare control and LED protection.

ELECTRICAL — L88 at 60,000 hours, L70>100,000 hours. Utilizes a 90°C case temperature driver for maximum life at high temperatures. 0.90 power factor and 3kA/6kV level of surge protection is standard. Optional 5kA/10kV surge protection available. Available as 120-277V or 347-480V input.

0-10V dimming standard for a dimming range of 100% to 10%.

WIRELESS NETWORKING — XPoint™ Wireless technology creates a mesh network to ensure communication between fixtures, sensors and wall stations facility-wide. This option provides superior lighting management capabilities including granular control, configuration and custom grouping for increased energy savings.

INSTALLATION — Suitable for suspension by chain, cable, surface-mounting bracket (THUN accessory), hook monopoint or single (pendant) monopoint. Surface mounting not recommended without optional surface mounting bracket. To maintain ambient listing, fixture should be mounted at a minimum plenum height of 18".

LISTINGS — CSA certified to US and Canadian safety standards. Damp location listed. Suitable for ambient temperatures from -40°F (-40°C) to 113°F (45°C) when suspended 18" from ceiling. High ambient option available (HA), suitable for ambient temperatures -40°F (-40°C) to131°F (55°C) when suspended 18" from ceiling. IP5X rated.

DesignLights Consortium® (DLC) Premium qualified product and DLC qualified product. Not all versions of this product may be DLC Premium qualified or DLC qualified.

WARRANTY — 5-year limited warranty.

Note: Actual performance may differ as a result of end-user environment and application.
All values are design or typical values, measured under laboratory conditions at 25 °C. Specifications subject to change without notice.

LED High Bay

IBG

Stock configurations are offered for shorter lead times:

Standard Part Number	Stock Part Number
IBG 12000LM SEF AFL GND MVOLT OZ10 40K 80CRI DWH	**IBG 12L MVOLT**
IBG 15000LM SEF AFL GND MVOLT OZ10 40K 80CRI DWH	**IBG 15L MVOLT**
IBG 18000LM SEF AFL GND MVOLT OZ10 40K 80CRI DWH	**IBG 18L MVOLT**
IBG 24000LM SEF AFL GND MVOLT OZ10 40K 80CRI DWH	**IBG 24L MVOLT**

A+ Capable Luminaire

This item is an A+ capable luminaire, which has been designed and tested to provide consistent color appearance and out-of-the-box control compatibility with simple commissioning.

- All configurations of this luminaire meet the Acuity Brands' specification for chromatic consistency
- This luminaire is part of an A+ Certified solution for nLight® or XPoint™ Wireless control networks marked by a shaded background*

*See ordering tree for details

IBG LED High Bay

A+ Capable options indicated by this color background.

ORDERING INFORMATION Lead times will vary depending on options selected. Consult with your sales representative.

Example: IBG 24000LM SEF AFL GND MVOLT 0Z10 40K 80CRI DWH

IBG								
Series	**Lumens**		**Performance package**	**Lens**	**Distribution**	**Voltage**	**Driver**	**Color temperature**
IBG	8000LM 8,000 lumens	30000LM 30,000 lumens	SEF Standard efficiency	AFL Acrylic, frosted	WD Wide	MVOLT 120-277V	0Z10 0-10V dimming	30K 3000 K
IBGN[1]	12000LM 12,000 lumens	36000LM 36,000 lumens	HEF Premium efficiency	ACL Clear acrylic	GND General	HVOLT 347-480V[2]		35K 3500 K
	15000LM 15,000 lumens	48000LM 48,000 lumens		PCL Clear polycarbonate	ND Narrow	120 120V		40K 4000 K
	18000LM 18,000 lumens	60000LM 60,000 lumens		PFL Semi-diffuse polycarbonate	FD Focus	208 208V		50K 5000 K
	24000LM 24,000 lumens			L/LENS Less lens		240 240V		
						277 277V		
						347 347V[3]		
						480 480V[3,4]		

Coloring rendering index	**Options**		**Finish**
70CRI 70 CRI	HA High ambient[5]	Cord sets:	DNA Natural aluminum
80CRI 80 CRI	SPD Surge protection device[6]	CS1W Straight plug, 120V[15]	DWH Gloss white
90CRI 90 CRI	BPK Fixture backpack[7]	CS3W Twist-lock, 120V[15]	
	PS1050 Emergency battery pack[8]	CS7W Straight plug, 277V[15]	
	PS10250 Emergency battery pack[9]	CS11W Twist-lock, 277V[15]	
	PS30250 Emergency battery pack[10]	CS25W Twist-lock, 347V[15]	
	BGTD Generator transfer device[11]	CS97W Twist-lock, 480V[15]	
	SF Single fuse[12]	CS93W 600 SO white cord, no plug (no voltage required)	
	DF Double fuse[13]	CS93W5CD 600 SO 5-conductor white cord, no plug (no voltage required)	
	OUTCTR Wiring leads pulled through back center of fixture[14]	Controls: [15]	
	OCS RELOC® OnePass® selectable cable 6' installed[15,16]	LCOZU High mount aisleway motion sensor, pre-wired	
	OCU__ RELOC® OnePass® unselectable cable 6' installed (must specify tap position)[15]	LCH0SZU High mount aisleway motion sensor with dimming, pre-wired	
	IMP Integrated modular plug[17]	LCPZU High mount aisleway motion sensor with photocell, pre-wired	
	RRL_ RELOC®-Ready luminaire. See page 10 for ordering information	LAOZU 360° high mount motion sensor, pre-wired	
	WGX Standard wire guard, installed	LAH0SZU 360° high mount motion sensor with dimming, pre-wired	
		LAPZU 360° high mount motion sensor with photocell, pre-wired	
		LAM0SZU 360° high mount motion sensor, dimming & switching photocell, pre-wired	
		LCM0SZU High mount aisleway motion sensor, dimming & switching photocell, pre-wired	
		C6D0SUEM 360° high mount motion sensor, dimming & switching photocell capable, pre-wired; UL924 listed[18]	
		C10D0SUEM 360° low mount motion sensor, dimming & switching photocell capable, pre-wired; UL924 listed[18]	
		nPP16D nLight® dimming & switching module[19]	
		nPP16DER nLight® dimming & switching module with emergency relay[19]	
		nMSI nLight® high mount aisleway motion sensor, pre-wired[19]	
		nMSI360 nLight® 360° high mount motion sensor, pre-wired[19]	
		nMSID nLight® high mount aisleway motion sensor with dimming, pre-wired[19]	
		nMSI360D nLight® 360° high mount motion sensor with dimming, pre-wired[19]	
		MSI6XADL DSCXADL XPoint™ Wireless 360° high mount motion sensor with photocell	
		XPW XPoint™ Wireless 0-10V relay, external (utilizes XPA CMRB0) 55°C max ambient[20]	
		XAD XPoint™ Wireless 0-10V relay, internal, lower max ambient[20,21]	

See Accessories and footnotes on next page

Accessories: *Order as separate catalog number.*

Mounting:

IBAC120 M20	Aircraft cable 10' with hook (one pair)
IBAC240 M20	Aircraft cable 20' with hook (one pair)
IBHMP	Hook monopoint
HBBS36	Chain hanger with chain, 36" (one pair)
IBGACVH	Aircraft 10' V hanger (one pair)
IBGPMPHB	Pendant monopoint splice box, includes side covers (3/4" hub) for use with OUTCTR option
HC36	Chain hanger and jack chain (pair)
THUN	Tong hanger bracket (order 2 per fixture)

Cord sets and sensors for IMP option:

CS1WIMP	Straight plug, 120V
CS3WIMP	Twist-lock, 120V
CS7WIMP	Straight plug, 277V
CS11WIMP	Twist-lock, 277V
CS25WIMP	Twist-lock 347V
CS93WIMP	600V SO white cord, no plug (no voltage required)
CS97WIMP	Twist-lock 480V
IBGMSIIMP	Aisle sensor for use with IMP option
IBGMSI360IMP	360° sensor for use with IMP option

Wire guards:

WGIBG22	Wire guard for IBG 2ft 2-module, gloss white
WGIBG24	Wire guard for IBG 2ft 4-module, gloss white
WGIBG26	Wire guard for IBG 2ft 6-module, gloss white
WGIBG42	Wire guard for IBGN 4ft 2-module, gloss white
WGIBG46	Wire guard for IBG 4ft 6-module, gloss white
WGIBG22DNA	Wire guard for IBG 2ft 2-module, natural aluminum
WGIBG24DNA	Wire guard for IBG 2ft 4-module, natural aluminum
WGIBG26DNA	Wire guard for IBG 2ft 6-module, natural aluminum
WGIBG42DNA	Wire guard for IBGN 4ft 2-module, natural aluminum
WGIBG46DNA	Wire guard for IBG 4ft 6-module, natural aluminum

Notes

1 Available with 18000LM, 24000LM, 30000LM and 36000LM only.

2 Not available with 8000LM. Not available with BTGD, nPP16D, nPP16DER, PS1050, PS10250, PS30250 or XAD.

3 When ordered with 8000LM voltage selected utilizes the fixture back pack.

4 Not available with nPP16D or nPP16DER.

5 55 C when suspended, 45 C when surface mounted. Not available with BGTD, PS1050, PS10250, PS30250, XAD, or XPW.

6 Standard with HVOLT, 347, or 480V - only specify for MVOLT, 120, 208, 240, or 277V. Standard with Motion sensors/controls, BGTD & Power Sentry battery options.

7 Required with PS1050, PS10250, PS30250, BGTD. Required with 8000LM when ordered with 347/480V. Required with Xpoint controls when order with 347/480V. Not available with nLight. Not for use with THUN mount (surface).

8 Requires BPK option. Available 120-277V only. Available with 8000LM only. For ambient temperatures of 32°F to 122°F (0°C to 50°C).

9 Requires BPK option. Available 120-277V only. Not available with 8000LM. For ambient temperatures of 50°F to 122°F (10°C to 50°C).

10 Requires BPK option. 120 or 277V only. Not available with 8000LM. For ambient temperatures of 32°F to 122°F (0°C to 50°C).

11 Requires BPK option. 120 or 277V only. Not available with PS1050, PS10250, PS30250. Not available with 347 or 480V when ordered in combination with XAD or XPW. For ambient temperatures up to 113°F(45°C).

12 Available on 120, 277, 347V. Not available with MVOLT or HVOLT.

13 Available on 208, 240, 480V. Not available with MVOLT or HVOLT.

14 Not available with BPK option. Requires IBGPMPHB accessory to mount fixture. Not available with Cord Set options.

15 Must specify voltage.

16 Cannot be used in dimming applications, must use RRLC12S

17 Not available with BPK, nPP16D, nPP16DER, nMSI, or nMSI360.

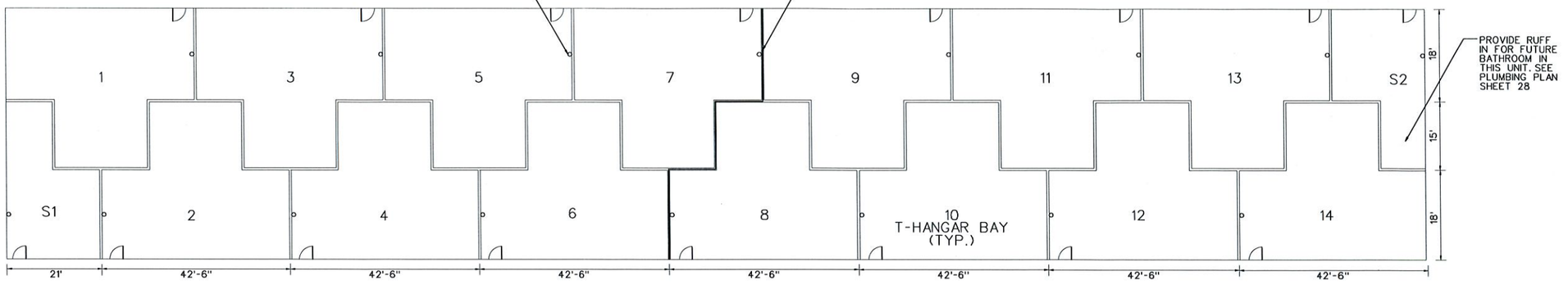
18 Daylight harvesting functionality not enabled by default. See page 9 for default sequence of operation.

19 Not available with 208V, 240V, or 480V.

20 Not available with HVOLT. When ordered with 347or 480V BPK option is required. Requires SPD option if ordered with MVOLT, 120, 208, 240, or 277V.

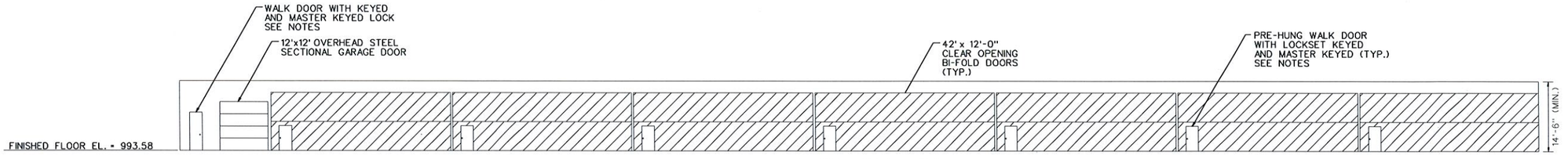
21 Not available with HA option.

APPENDIX A6 – FIRE EXTINGUISHER LOCATION PLAN

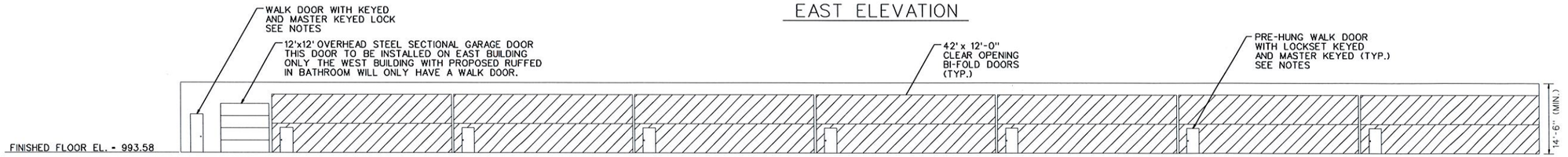


FLOOR PLAN

NOTE: DIMENSIONS ARE FOR ERECT-A-TUBE MODEL N51-42.

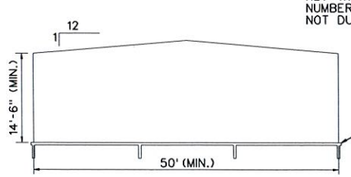


EAST ELEVATION



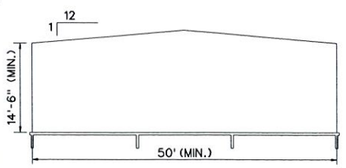
WEST ELEVATION

NOTES:
WALK DOORS TO BE KEYED AND MASTERED TO SCHLAGE LOCK PROVIDED BY AIRPORT KEY BLANKS. KEYS WILL MATCH TYPE AND STYLE. EACH KEY WILL BE STAMPED WITH THE LETTER OF THE BUILDING AND UNIT NUMBER ON ONE SIDE AND THE OTHER SIDE WILL BE STAMPED "DO NOT DUPLICATE". CONTRACTOR WILL PROVIDE 3-KEYS PER UNIT.



NORTH ELEVATION

CONTRACTOR SHALL DESIGN FOUNDATIONS USING REACTIONS FROM METAL BUILDING MFG. FOUNDATIONS SHALL MEET ALL LOCAL REQUIREMENTS. A PRELIMINARY GEOTECHNICAL REPORT HAS BEEN PERFORMED AND IS AVAILABLE UPON REQUEST. FOUNDATIONS SHALL BE SUBMITTED TO SPONSOR FOR REVIEW. FOUNDATION DESIGN SHALL BE SEALED BY REGISTERED PROFESSIONAL STRUCTURAL ENGINEER LICENSED IN THE STATE OF MISSOURI.



SOUTH ELEVATION

NORTH/SOUTH ELEVATION VIEW: BUILDING UNITS 1-14

REVISIONS		
NUMBER	BY	DATE

0 1 2
THIS BAR IS EQUAL TO 2" AT FULL SCALE (34X22). PLOT 1

LEE'S SUMMIT MUNICIPAL AIRPORT
LEE'S SUMMIT, MISSOURI

NORTHWEST QUADRANT T-HANGAR DEVELOPMENT – PHASE 1

STATE OF MISSOURI
TIMOTHY C. SANDER
NUMBER PE-2009015035
PROFESSIONAL ENGINEER
11/10/17

ONE MEMORIAL DRIVE, SUITE 500
ST. LOUIS, MO 63102
(314) 436-5500
CMT

LEE'S SUMMIT PROJECT #47632185

FILE:	021_Floor_Plan.dgn
DESIGN BY:	BDB
DRAWN BY:	BDB
CHECKED BY:	TCS
APPROVED BY:	TCS
DATE:	NOVEMBER 10, 2017
JOB No:	17443-01

T-HANGAR FLOOR PLAN & ELEVATION

SHEET 21 OF 28 SHEETS

11/10/2017
021_Floor_Plan.dgn