PROJECT MANUAL

Radio Tower Replacements

MSHP Troop D and Service Center

Springfield & Carthage, Missouri

Designed By: Selective Site Consultants
7171 West 95th Street, Ste 600
Overland Park, KS 66212

Date Issued: December 15, 2022

Project No.: R2001-01

STATE *of* MISSOURI

OFFICE *of* ADMINISTRATION

Facilities Management, Design & Construction

SECTION 000107 - PROFESSIONAL SEALS AND CERTIFICATIONS

PROJECT NUMBER: R2001-01

THE FOLLOWING DESIGN PROFESSIONALS HAVE SIGNED AND SEALED THE ORIGINAL PLANS AND SPECIFICATIONS FOR THIS PROJECT, WHICH ARE ON FILE WITH THE DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION:

1/30/2023

STATE OF MISSOURI
ROBERT E. JENSEN
NUMBER PE-028974
PROFESSIONAL ENGINEER

DocuSigned by:
4BC6742A0D69421...

1/30/2023

STATE OF MISSOURI
SHELTON KEISLING
NUMBER PE-27323
PROFESSIONAL ENGINEER

DocuSigned by:
EF94D8A5B80B407...

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SECTION 000115 – LIST OF DRAWINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions, Bid Form, and other Division 1 Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section provides a comprehensive list of the drawings that comprise the Bid Documentsfor this project.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 LIST OF DRAWINGS

A. The following list of drawings is a part of the Bid Documents for the Troop D Headquarters and the Troop D Service Center:

TITLE	SHEET #	DATE	CAD #
COVER SHEET	G-001	12/15/2022	R2001-01_Troop_D_G-001
TITLE SHEET	G-002	12/15/2022	R2001-01_Troop_D_G-002
CARTHAGE SURVEY	C-101	12/15/2022	R2001-01_Troop_D_C-101
SPRINGFIELD SURVEY	C-102	12/15/2022	R2001-01_Troop_D_C-102
CARTHAGE GRADING PLAN	C-103	12/15/2022	R2001-01_Troop_D_C-103
SPRINGFIELD GRADING PLAN	C-104	12/15/2022	R2001-01_Troop_D_C-104
GRADING DETAILS	C-501	12/15/2022	R2001-01_Troop_D_C-501
CARTHAGE OVERALL SITE PLAN	A-101	12/15/2022	R2001-01_Troop_D_A-101
CARTHAGE ENLARGED SITE PLAN	A-102	12/15/2022	R2001-01_Troop_D_A-102
CARTHAGE ANTENNA PLANS (1 OF 2)	A-103	12/15/2022	R2001-01_Troop_D_A-103
CARTHAGE ANTENNA PLANS (2 OF 2)	A-104	12/15/2022	R2001-01_Troop_D_A-104
SPRINGFIELD OVERALL SITE PLAN	A-105	12/15/2022	R2001-01_Troop_D_A-105
SPRINGFIELD ENLARGED SITE PLAN	A-106	12/15/2022	R2001-01_Troop_D_A-106
SPRINGFIELD ANTENNA PLANS (1 OF 2)	A-107	12/15/2022	R2001-01_Troop_D_A-107
SPRINGFIELD ANTENNA PLANS (2 OF 2)	A-108	12/15/2022	R2001-01_Troop_D_A-108
CARTHAGE TOWER ELEVATIONS (1 OF 2)	A-201	12/15/2022	R2001-01_Troop_D_A-201
CARTHAGE TOWER ELEVATIONS (2 OF 2)	A-202	12/15/2022	R2001-01_Troop_D_A-202
CARTHAGE TOWER FOUNDATION	A-203	12/15/2022	R2001-01_Troop_D_A-203
CARTHAGE SHELTER EXTERIOR ELEVATIONS	A-204	12/15/2022	R2001-01_Troop_D_A-204

CARTHAGE SHELTER INTERIOR ELEVATIONS	A-205	12/15/2022	R2001-01_Troop_D_A-205
SPRINGFIELD TOWER ELEVATIONS (1 OF 2)	A-206	12/15/2022	R2001-01_Troop_D_A-206
SPRINGFIELD TOWER ELEVATIONS (2 OF 2)	A-207	12/15/2022	R2001-01_Troop_D_A-207
SPRINGFIELD TOWER FOUNDATION DESIGN	A-208	12/15/2022	R2001-01_Troop_D_A-208
SPRINGFIELD SHELTER ELEVATIONS	A-209	12/15/2022	R2001-01_Troop_D_A-209
FENCE DETAILS	A-501	12/15/2022	R2001-01_Troop_D_A-501
CONSTRUCTION DETAILS	A-502	12/15/2022	R2001-01_Troop_D_A-502
CARTHAGE SHELTER FOUNDATION DETAILS	A-503	12/15/2022	R2001-01_Troop_D_A-503
CARTHAGE SHELTER LAYOUT & DETAILS	A-504	12/15/2022	R2001-01_Troop_D_A-504
CARTHAGE UTILITY PLAN	E-101	12/15/2022	R2001-01_Troop_D_E-101
CARTHAGE ENLARGED UTILITY PLAN	E-102	12/15/2022	R2001-01_Troop_D_E-102
CARTHAGE ONE-LINE DIAGRAM	E-103	12/15/2022	R2001-01_Troop_D_E-103
CARTHAGE GROUNDING PLAN	E-104	12/15/2022	R2001-01_Troop_D_E-104
SPRINGFIELD UTILITY PLAN	E-105	12/15/2022	R2001-01_Troop_D_E-104
SPRINGFIELD GROUNDING PLAN	E-106	12/15/2022	R2001-01_Troop_D_E-105
UTILITY DETAILS	E-501	12/15/2022	R2001-01_Troop_D_E-501
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CARTHAGE GENERATOR DETAILS	E-503	12/15/2022	R2001-01_Troop_D_E-503
GROUNDING DETAILS (1 OF 2)	E-504	12/15/2022	R2001-01_Troop_D_E-504
GROUNDING DETAILS (2 OF 2)	E-505	12/15/2022	R2001-01_Troop_D_E-505
TYPICAL GROUNDING RISER DIAGRAM	E-506	12/15/2022	R2001-01_Troop_D_E-506
CARTHAGE SHELTER PANEL SCHEDULE	E-601	12/15/2022	R2001-01_Troop_D_E-601

END OF SECTION 000115

SECTION 001116 - INVITATION FOR BID

1.0 OWNER:

A. The State of Missouri
Office of Administration,
Division of Facilities Management, Design and Construction
Jefferson City, Missouri

2.0 PROJECT TITLE AND NUMBER:

A. Radio Tower Replacements
MSHP Troop D and Service Center
Springfield & Carthage, Missouri
Project No.: R2001-01

3.0 BIDS WILL BE RECEIVED:

A. Until: 1:30 PM, Tuesday, March 21, 2023

B. **Only electronic bids on MissouriBUYS shall be accepted: https://missouribuys.mo.gov. Bidder must be registered to bid.**

4.0 DESCRIPTION:

A. Scope: The Work consists of work at two existing sites. One existing site is located at the Troop D Service Center in Carthage, Missouri. The other existing site is located at the Troop D Headquarters in Springfield, Missouri. The work at Troop D Service Center includes the requirement to furnish and install one new tower with accessories and install the specified antennas and transmission lines. The work also includes the requirement to furnish and install one new prefabricated radio shelter and one new generator with accessories. The work at Troop D Headquarters includes the requirement to furnish and install one new tower with accessories and install the specified antennas and transmission lines. Also, at Troop D Headquarters, the existing tower is to be removed and a portion of the existing compound fence.

B. MBE/WBE/SDVE Goals: MBE 10%, WBE 10%, and SDVE 3%. **NOTE: Only MBE/WBE firms certified by the State of Missouri Office of Equal Opportunity as of the date of bid opening, or SDVE(s) meeting the requirements of Section 34.074, RSMo and 1 CSR 30-5.010, can be used to satisfy the MBE/WBE/SDVE participation goals for this project.**

C. **NOTE: Bidders are provided new Good Faith Effort (GFE) forms on MissouriBUYS.

5.0 PRE-BID MEETING:

A. Place/Time**:** 10 AM, Tuesday, February, 28, 2023, at MSHP Troop D Headquarters, 3131 East Kearney Street, Springfield, MO 64803

B. Access to State of Missouri property requires presentation of a photo ID by all persons

6.0 HOW TO GET PLANS & SPECIFICATIONS:

A. View Only Electronic bid sets are available at no cost or paper bid sets for a **deposit of $100.00** from American Document Solutions (ADS). MAKE CHECKS PAYABLE TO: American Document Solutions. Mail to: American Document Solutions, 1400 Forum Blvd., Suite 7A, Columbia, Missouri 65203. Phone 573-446-7768, Fax 573-355-5433, https://www.adsplanroom.net. NOTE: Prime contractors will be allowed a maximum of two bid sets at the deposit rate shown above. Other requesters will be allowed only one bid set at this rate. Additional bid sets or parts thereof may be obtained by any bidder at the cost of printing and shipping by request to American Document Solutions at the address shown above. **Bidder must secure at least one bid set to become a planholder.**

B. **Refunds: Return plans and specifications in unmarked condition within 15 working days of bid opening to American Document Solutions, 1400 Forum Blvd., Suite 7A, Columbia, Missouri 65203. Phone 573-446-7768, Fax 573-355-5433. Deposits for plans not returned within 15 working days shall be forfeited.**

C. Information for upcoming bids, including downloadable plans, specifications, Invitation for Bid, bid tabulation, award, addenda, and access to the ADS planholders list, is available on the Division of Facilities Management, Design and Construction's web site: https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans.

7.0 POINT OF CONTACT:

A. Designer: Selective Site Consultants, Robert Jensen, (913) 438-7700, email: rjensen@ssc.us.com

B. Project Manager: Scott Zeller, (573) 751-2668, email: Scott.Zeller@oa.mo.gov

8.0 GENERAL INFORMATION:

A. The State reserves the right to reject any and all bids and to waive all informalities in bids. No bid may be withdrawn for a period of 20 working days subsequent to the specified bid opening time. The contractor shall pay not less than the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed, as determined by the Missouri Department of Labor and Industrial Relations and as set out in the detailed plans and specifications.

B. Bid results will be available at https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans after it is verified that at least one bid is awardable and affordable.

Very Important MissouriBUYS Instructions to Help Submit a Bid Correctly

A. The bidder shall submit his or her bid and all supporting documentation on MissouriBUYS eProcurement System. No hard copy bids shall be accepted. Go to https://missouribuys.mo.gov and register. The bidder must register and complete a profile fully with all required documents submitted prior to submitting a bid.

B. Once registered, log in.
1. Under "Solicitation" select "View Current Solicitations."
2. Under "Filter by Agency" select "OA-FMDC-Contracts Chapter 8", then click "Filter Solicitation" button.
3. Select "Active Solicitations" tab.
4. To see the Solicitation Summary, click on the Project Number and the summary will open. Click each heading to open detailed information.

C. Here are simplified instructions for uploading the bid to MissouriBUYS:
1. Find the solicitation by completing Steps 1 through 4 above.
2. Select the three dots under "Actions." Select "Add New Response."
3. When the Quote box opens, give the response a title and select "OK."
4. The detailed solicitation will open. Select "Check All" for the Original Solicitation Documents, open each document, and select "Accept." If this step is not completed, a bid cannot be uploaded. Scroll to the bottom of the page and select "Add Attachments." If you do not see this command, not all documents have been opened and accepted.
5. The Supplier Attachments box will open. Select "Add Attachment" again.
6. The Upload Documents box will open. Read the instructions for uploading. Disregard the "Confidential" check box.
7. Browse and attach up to 5 files at a time. Scroll to bottom of box and select "Upload." The Supplier Attachments box will open. Repeat Steps 5 through 7 if more than 5 files are to be uploaded.
8. When the Supplier Attachments box opens again and uploading is complete, select "Done." A message should appear that the upload is successful. If it does not, go to the Bidder Response tab and select "Submit."
9. The detailed solicitation will open. At the bottom select "Close."

D. Any time a bidder wants to modify the bid, he or she will have to submit a new one. FMDC will open the last response the bidder submits. The bidder may revise and submit the bid up to the close of the solicitation (bid date and time). Be sure to allow for uploading time so that the bid is successfully uploaded prior to the 1:30 PM deadline; we can only accept the bid if it is uploaded before the deadline.

E. If you want to verify that you are uploading documents correctly, please contact Paul Girouard: 573-751-4797, paul.girouard@oa.mo.gov ; April Howser: 573-751-0053, April.Howser@oa.mo.gov ; or Mandy Roberson: 573-522-0074, Mandy.Roberson@oa.mo.gov.

F. If you are experiencing login issues, please contact Web Procure Support (Proactis) at 866-889-8533 anytime from 7:00 AM to 7:00 PM Central Time, Monday through Friday. If you try using a userid or password several times that is incorrect, the system will lock you out. Web Procure Support is the only option to unlock you! If you forget your userid or password, Web Procure Support will provide a temporary userid or password. Also, if it has been a while since your last successful login and you receive an "inactive" message, contact Web Procure (Proactis). If you are having a registration issue, you may contact Cathy Holliday at 573-751-3491 or by email: cathy.holliday@oa.mo.gov.

IMPORTANT REMINDER REGARDING REQUIREMENT FOR OEO CERTIFICATION

A. SECTION 002113 – INSTRUCTIONS TO BIDDERS: Article 15.0, Section D1:

As of July 1, 2020, all MBE, WBE, and MBE/WBE contractors, subcontractors, and suppliers must be certified by the State of Missouri, Office of Equal Opportunity. No certifications from other Missouri certifying agencies will be accepted.

SECTION 002113 – INSTRUCTIONS TO BIDDERS

1.0 - SPECIAL NOTICE TO BIDDERS

A. If awarded a contract, the Bidder's employees, and the employees of all subcontractors, who perform the work on the project must adhere to requirements in Section 013513 – Site Security and Health Requirements as applicable per Agency.

B. The Bidder's prices shall include all city, state, and federal sales, excise, and similar taxes that may lawfully be assessed in connection with the performance of work, and the purchased of materials to be incorporated in the work. THIS PROJECT IS NOT TAX EXEMPT.

2.0 - BID DOCUMENTS

A. The number of sets obtainable by any one (1) party may be limited in accordance with available supply.

B. For the convenience of contractors, sub-contractors and suppliers, copies of construction documents are on file at the office of the Director, Division of Facilities Management, Design and Construction and on the Division's web site - https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans.

3.0 - BIDDERS' OBLIGATIONS

A. Bidders must carefully examine the entire site of the work and shall make all reasonable and necessary investigations to inform themselves thoroughly as to the facilities available as well as to all the difficulties involved in the completion of all work in accordance with the specifications and the plans. Bidders are also required to examine all maps, plans and data mentioned in the specifications. No plea of ignorance concerning observable existing conditions or difficulties that may be encountered in the execution of the work under this contract will be accepted as an excuse for any failure or omission on the part of the contractor to fulfill in every detail all of the requirements of the contract, nor accepted as a basis for any claims for extra compensation.

B. Under no circumstances will contractors give their plans and specifications to another contractor. Any bid received from a contractor whose name does not appear on the list of plan holders may be subject to rejection.

4.0 - INTERPRETATIONS

A. No bidder shall be entitled to rely on oral interpretations as to the meaning of the plans and specifications or the acceptability of alternate products, materials, form or type of construction. Every request for interpretation shall be made in writing and submitted with all supporting documents not less than five (5) working days before opening of bids. Every interpretation made to a bidder will be in the form of an addendum and will be sent as promptly as is practicable to all persons to whom plans and specifications have been issued. All such addenda shall become part of the contract documents.

B. Approval for an "acceptable substitution" issued in the form of an addendum as per Paragraph 4A above, and as per Article 3.1 of the General Conditions; ACCEPTABLE SUBSTITUTIONS shall constitute approval for use in the project of the product.

C. An "acceptable substitution" requested after the award of bid shall be approved if proven to the satisfaction of the Owner and the Designer as per Article 3.1, that the product is acceptable in design, strength, durability, usefulness, and convenience for the purpose intended. Approval of the substitution after award is at the sole discretion of the Owner.

D. A request for "Acceptable Substitutions" shall be made on the Section 006325 Substitution Request Form. The request shall be sent directly to the project Designer. A copy of said request should also be mailed to the Owner, Division of Facilities Management, Design and Construction, Post Office Box 809, Jefferson City, Missouri 65102.

5.0 - BIDS AND BIDDING PROCEDURE

A. Bidders shall submit all submission forms and accompanying documents listed in SECTION 004113 – BID FORM, Article 5.0, ATTACHMENTS TO BID by the stated time or their bid will be rejected for being non-responsive.

Depending on the specific project requirements, **the following is a GENERIC list** of all possible bid forms that may be due with bid submittals and times when they may be due. Please check for specific project requirements on the proposal form (Section 004113). ***Not all of the following bid forms may be required to be submitted.***

Bid Submittal – due before stated date and time of bid opening (see IFB):

004113	Bid Form (all pages are always required)
004322	Unit Prices Form
004336	Proposed Subcontractors Form
004337	MBE/WBE/SDVE Compliance Evaluation Form
004338	MBE/WBE/SDVE Eligibility Determination for Joint Ventures
004339	MBE/WBE/SDVE GFE Determination
004340	SDVE Business Form
004541	Affidavit of Work Authorization
004545	Anti-Discrimination Against Israel Act Certification form

B. All bids shall be submitted without additional terms and conditions, modification or reservation on the bid forms with each space properly filled. Bids not on these forms will be rejected.

C. All bids shall be accompanied by a bid bond executed by the bidder and a duly authorized surety company, certified check, cashier's check or bank draft made payable to the Division of Facilities Management, Design and Construction, State of Missouri, in the amount indicated on the bid form, Section 004113. Failure of the contractor to submit the full amount required shall be sufficient cause to reject his bid. The bidder agrees that the proceeds of the check, draft or bond shall become the property of the State of Missouri, if for any reason the bidder withdraws his bid after closing, or if on notification of award refuses or is unable to execute tendered contract, provide an acceptable performance and payment bond, provide evidence of required insurance coverage and/or provide required copies of affirmative action plans within ten (10) working days after such tender.

D. The check or draft submitted by the successful bidder will be returned after the receipt of an acceptable performance and payment bond and execution of the formal contract. Checks or drafts of all other bidders will be returned within a reasonable time after it is determined that the bid represented by same will receive no further consideration by the State of Missouri. Bid bonds will only be returned upon request.

6.0 - SIGNING OF BIDS

A. A bid from an individual shall be signed as noted on the Bid Form.

B. A bid from a partnership or joint venture shall require only one signature of a partner, an officer of the joint venture authorized to bind the venture or an attorney-in-fact. If the bid is signed by an officer of a joint venture or an attorney-in-fact, a document evidencing the individual's authority to execute contracts should be included with the bid form.

C. A bid from a limited liability company (LLC) shall be signed by a manager or a managing member of the LLC.

D. A bid from a corporation shall have the correct corporate name thereon and the signature of an authorized officer of the corporation manually written. Title of office held by the person signing for the corporation shall appear, along with typed name of said individual. Corporate license number shall be provided and, if a corporation organized in a state other than Missouri, a Certificate of Authority to do business in the State of Missouri shall be attached. In addition, for corporate proposals, the President or Vice-President should sign as the bidder. If the signator is other than the corporate president or vice president, the bidder must provide satisfactory evidence that the signator has the legal authority to bind the corporation.

E. A bid should contain the full and correct legal name of the Bidder. If the Bidder is an entity registered with the Missouri Secretary of State, the Bidder's name on the bid form should appear as shown in the Secretary of State's records.

F. The Bidder should include its corporate license number on the Bid Form and, if the corporation is organized in a state other than Missouri, a Certificate of Authority to do business in the State of Missouri shall be attached to the bid form.

7.0 - RECEIVING BID SUBMITTALS

A. It is the bidder's sole responsibility to assure receipt by Owner of bid submittals by the date and time specified in the Invitation for Bid. Bids received after the date and time specified shall not be considered by the Owner.

B. Bids must be submitted through the MissouriBUYS statewide eProcurement system (https://www.missouribuys.mo.gov/) in accordance with the instructions for that system. The Owner shall only accept bids submitted through MissouriBUYS. Bids received by the Owner through any other means, including hard copies, shall not be considered and will be discarded by the Owner unopened.

C. To respond to an Invitation for Bid, the Bidder must first register with MissouriBUYS by going through the MissouriBUYS Home Page (https://www.missouribuys.mo.gov/), clicking the "Register" button at the top of the page, and completing the Vendor Registration. Once registered, the Bidder accesses its account by clicking the "Login" button at the top of the MissouriBUYS Home Page. Enter your USERID and PASSWORD, which the Bidder will select. Under Solicitations, select "View Current Solicitations." A new screen will open. Under "Filter by Agency" select "OA-FMDC-Contracts Chapter 8." Under "Filter by Opp. No." type in the State Project Number. Select "Submit." Above the dark blue bar, select "Other Active Opportunities." To see the Solicitation Summary, single click the Opp. No. (Project Number) and the summary will open. Single quick click each blue bar to open detailed information. The Bidder must read and accept the Original Solicitation Documents and complete all identified requirements. The Bidder should download and save all of the Original Solicitation Documents on its computer so that the Bidder can prepare its response to these documents. The Bidder should upload its completed response to the downloaded documents as an attachment to the electronic solicitation response.

D. Step-by-step instructions for how a registered vendor responds to a solicitation electronically are provided in Section 001116 – Invitation For Bid.

E. The Bidder shall submit its bid on the forms provided by the Owner on MissouriBUYS with each space fully and properly completed, including all amounts required for alternate bids, unit prices, cost accounting data, etc. The Owner may reject bids that are not on the Owner's forms or that do not contain all requested information.

F. No Contractor shall stipulate in his bid any conditions not contained in the specifications or standard bid form contained in the contract documents. To do so may subject the Contractor's bid to rejection.

G. The completed forms shall be without interlineations, alterations or erasures.

8.0 - MODIFICATION AND WITHDRAWAL OF BIDS

A. Bidder may withdraw his bid at any time prior to scheduled closing time for receipt of bids, but no bidder may withdraw his bid for a period of twenty (20) working days after the scheduled closing time for receipt of bids.

B. The Bidder shall modify his or her original bid by submitting a revised bid on MissouriBUYS.

9.0 - AWARD OF CONTRACT

A. The Owner reserves the right to reject any and/or all bids and further to waive all informalities in bidding when deemed in the best interest of the State of Missouri.

B. The Owner reserves the right to let other contracts in connection with the work, including but not by way of limitation, contracts for the furnishing and installation of furniture, equipment, machines, appliances and other apparatus.

C. In awarding the contract the Owner may take into consideration the bidder's skill, facilities, capacity, experience, responsibility, previous work record, financial standing and the necessity of prompt and efficient completion of work herein described. Inability of any bidder to meet the requirements mentioned above may be cause for rejection of his bid. However, no contract will be awarded to any individual, partnership or corporation, who has had a contract with the State of Missouri declared in default within the preceding twelve months.

D. Award of alternates, if any, will be made in numerical order unless all bids received are such that the order of acceptance of alternates does not affect the determination of the low bidder.

E. No bid shall be considered binding upon the Owner until the written contract has been properly executed, a satisfactory bond has been furnished, evidence of required insurance coverage, submittal of executed Section 004541, Affidavit of Work Authorization form, documentation evidencing enrollment and participation in a federal work authorization program has been received and an affirmative action plan submitted. Failure to execute and return the contract and associated documents within the prescribed period of time shall be treated, at the option of the Owner, as a breach of bidder's obligation and the Owner shall be under no further obligation to bidder.

F. If the successful bidder is doing business in the State of Missouri under a fictitious name, he shall furnish to Owner, attached to the Bid Form, a properly certified copy of the certificate of Registration of Fictitious Name from the State of Missouri, and such certificate shall remain on file with the Owner.

G. Any successful bidder which is a corporation organized in a state other than Missouri shall furnish to the Owner, attached to the Bid Form, a properly certified copy of its current Certificate of Authority to do business in the State of Missouri, such certificate to remain on file with the Owner. No contract will be awarded by the Owner unless such certificate is furnished by the bidder.

H. Any successful bidder which is a corporation organized in the State of Missouri shall furnish at its own cost to the Owner, if requested, a Certificate of Good Standing issued by the Secretary of State, such certificate to remain on file with the Owner.

I. Transient employers subject to Sections 285.230 and 285.234, RSMo, (out-of-state employers who temporarily transact any business in the State of Missouri) may be required to file a bond with the Missouri Department of Revenue. No contract will be awarded by the Owner unless the successful bidder certifies that he has complied with all applicable provisions of Section 285.230-234.

J. Sections 285.525 and 285.530, RSMo, require business entities to enroll and participate in a federal work authorization program in order to be eligible to receive award of any state contract in excess of $5,000. Bidders should submit with their bid an Affidavit of Work Authorization (Section 004541) along with appropriate documentation evidencing such enrollment and participation. Section-004541, Affidavit of Work Authorization is located on the MissouriBUYS solicitation for this project. Bidders must also submit an E-Verify Memorandum before the Owner may award a contract to the Bidder. Information regarding a E-Verify is located at https://www.uscis.gov/e-verify/. The contractor shall be responsible for ensuring that all subcontractors and suppliers associated with this contract enroll in E-Verify.

10.0 - CONTRACT SECURITY

A. The successful bidder shall furnish a performance/payment bond as set forth in General Conditions Article 6.1 on a condition prior to the State executing the contract and issuing a notice to proceed.

11.0 - LIST OF SUBCONTRACTORS

A. If required by "Section 004113 – Bid Form," each bidder must submit as part of their bid a list of subcontractors to be used in performing the work (Section 004336). The list must specify the name of the single designated subcontractor, for each category of work listed in "Section 004336 - Proposed Subcontractors Form." If work within a category will be performed by more than one subcontractor, the bidder must provide the name of each subcontractor and specify the exact portion of the work to be done by each. Failure to list the Bidder's firm, or a subcontractor for each category of work identified on the Bid Form or the listing of more than one subcontractor for any category without designating the portion of work to be performed by each shall be cause for rejection of the bid. If the bidder intends to perform any of the designated subcontract work with the use of his own employees, the bidder shall make that fact

clear, by listing his own firm for the subject category. **If any category of work is left vacant, the bid shall be rejected.**

12.0 - WORKING DAYS

A. Contract duration time is stated in working days and will use the following definition in determining the actual calendar date for contract completion:

1. Working days are defined as all calendar days except Saturdays, Sundays and the following State of Missouri observed holidays: New Year's Day, Martin Luther King, Jr. Day, Lincoln Day, Washington's Birthday, Truman Day, Memorial Day, Juneteenth, Independence Day, Labor Day, Columbus Day, Veterans Day, Thanksgiving Day and Christmas Day.

13.0 - AMERICAN AND MISSOURI - MADE PRODUCTS AND FIRMS

A. By signing the bid form and submitting a bid on this project, the Bidder certifies that it will use American and Missouri products as set forth in Article 1.7 of the General Conditions. Bidders are advised to review those requirements carefully prior to bidding.

B. A preference shall be given to Missouri firms, corporations or individuals, or firms, corporations or individuals that maintain Missouri offices or places of business, when the quality of performance promised is equal or better and the price quoted is the same or less.

C. Pursuant to Section 34.076, RSMo, a contractor or Bidder domiciled outside the boundaries of the State of Missouri shall be required, in order to be successful, to submit a bid the same percent less than the lowest bid submitted by a responsible contractor or Bidder domiciled in Missouri as would be required for such a Missouri domiciled contractor or Bidder to succeed over the bidding contractor or Bidder domiciled outside Missouri on a like contract or bid being let in the person's domiciliary state and, further, the contractor or Bidder domiciled outside the boundaries of Missouri shall be required to submit an audited financial statement as would be required of a Missouri domiciled contractor or Bidder on a like contract or bid being let in the domiciliary state of that contractor or Bidder.

14.0 – ANTI-DISCRIMINATION AGAINST ISRAEL ACT CERTIFICATION:

A. Pursuant to section 34.600, RSMo, if the Bidder meets the section 34.600, RSMo, definition of a "company" and the Bidder has ten or more employees, the Bidder must certify in writing that the Bidder is not currently engaged in a boycott of goods or services from the State of Israel as defined in section 34.600, RSMo, and shall not engage in a boycott of goods or services from the State of Israel, if awarded a contract, for the duration of the contract. The Bidder is requested to complete and submit the applicable portion of Section 004545 - Anti-Discrimination Against Israel Act Certification with their Bid Form. The applicable portion of the exhibit must be submitted prior to execution of a contract by the Owner and issuance of Notice to Proceed. If the exhibit is not submitted, the Owner shall rescind its Intent to Award and move to the next lowest, responsive, responsible bidder.

15.0 - MBE/WBE/SDVE INSTRUCTIONS

A. Definitions:

1. **"MBE"** means a Minority Business Enterprise.

2. **"MINORITY"** has the same meaning as set forth in 1 C.S.R. 10-17.010.

3. **"MINORITY BUSINESS ENTERPRISE"** has the same meaning as set forth in section 37.020, RSMo.

4. **"WBE"** means a Women's Business Enterprise.

5. **"WOMEN'S BUSINESS ENTERPRISE"** has the same meaning as set forth in section 37.020, RSMo.

6. **"SDVE"** means a Service-Disabled Veterans Enterprise.

7. **"SERVICE-DISABLED VETERAN"** has the same meaning as set forth in section 34.074, RSMo.

8. **"SERVICE-DISABLED VETERAN ENTERPRISE"** has the same meaning as "Service-Disabled Veteran Business" set forth in section 34.074, RSMo.

B. MBE/WBE/SDVE General Requirements:

1. For all bids greater than $100,000, the Bidder shall obtain MBE, WBE and SDVE participation in an amount equal to or greater than the percentage goals set forth in the Invitation for Bid and the Bid Form, unless the Bidder is granted a Good Faith Effort waiver by the Director of the Division, as set forth below. If the Bidder does not meet the MBE, WBE and SDVE goals, or make a good faith effort to do so, the Bidder shall be non-responsive, and its bid shall be rejected.

2. The Bidder should submit with its bid all of the information requested in the MBE/WBE/SDVE Compliance Evaluation Form for every MBE, WBE, or SDVE subcontractor or material supplier the Bidder intends to use for the contract work. The Bidder is required to submit all appropriate MBE/WBE/SDVE documentation before the stated time and date set forth in the Invitation for Bid. If the Bidder fails to provide such information by the specified date and time, the Owner shall reject the bid.

3. The Director reserves the right to request additional information from a Bidder to clarify the Bidder's proposed MBE, WBE, and/or SDVE participation. The Bidder shall submit the clarifying information requested by the Owner within two (2) Working Days of receiving the request for clarification.

4. Pursuant to section 34.074, RSMo, a Bidder that is a SDVE doing business as Missouri firm, corporation, or individual, or that maintains a Missouri office or place of business, shall receive a three-point bonus preference in the contract award evaluation process. The bonus preference will be calculated and applied by reducing the bid amount of the eligible SDVE by three percent of the apparent low responsive bidder's bid. Based on this calculation, if the eligible SDVE's evaluation is less than the apparent low responsive bidder's bid, the eligible SDVE's bid becomes the apparent low responsive bid. This reduction is for evaluation purposes only, and will have no impact on the actual amount(s) of the bid or the amount(s) of any contract awarded. In order to be eligible for the SDVE preference, the Bidder must complete and submit with its bid the Missouri Service Disabled Veteran Business Form, and any information required by the form. The form is available on the MissouriBUYS solicitation for this project.

C. Computation of MBE/WBE/SDVE Goal Participation:

1. A Bidder who is a MBE, WBE, or SDVE may count 100% of the contract towards the MBE, WBE or SDVE goal, less any amounts awarded to another MBE, WBE or SDVE. (NOTE: A MBE firm that bids as general contractor must obtain WBE and SDVE participation; a WBE firm that bids as a general contractor must obtain MBE and SDVE participation; and a SDVE firm that bids as general contractor must obtain MBE and WBE participation.) In order for the remaining contract amount to be counted towards the MBE, WBE or SDVE goal, the Bidder must complete the MBE/WBE/SDVE Compliance Evaluation Form (Section 004337) identifying itself as an MBE, WBE or SDVE.

2. The total dollar value of the work granted to a certified MBE, WBE or SDVE by the Bidder shall be counted towards the applicable goal.

3. Expenditures for materials and supplies obtained from a certified MBE, WBE, or SDVE supplier or manufacturer may be counted towards the MBE, WBE and SDVE goals, if the MBE, WBE, or SDVE assumes the actual and contractual responsibility for the provision of the materials and supplies.

4. The total dollar value of the work granted to a second or subsequent tier subcontractor or a supplier may be counted towards a Bidder's MBE, WBE and SDVE goals, if the MBE, WBE, or SDVE properly assumes the actual and contractual responsibility for the work.

5. The total dollar value of work granted to a certified joint venture equal to the percentage of the ownership and control of the MBE, WBE, or SDVE partner in the joint venture may be counted towards the MBE/WBE/SDVE goals.

6. Only expenditures to a MBE, WBE, or SDVE that performs a commercially useful function in the work may be counted towards the MBE, WBE and SDVE goals. A MBE, WBE, or SDVE performs a commercially useful function when it is responsible for executing a distinct element of the work

and carrying out its responsibilities by actually performing, managing and supervising the work or providing supplies or manufactured materials.

D. Certification of MBE/WBE/SDVE Subcontractors:

1. In order to be counted towards the goals, an MBE or WBE must be certified by the State of Missouri Office of Equal Opportunity and an SDVE must be certified by the State of Missouri, Office of Administration, Division of Purchasing and Material Management or by the Department of Veterans Affairs.

2. The Bidder may determine the certification status of a proposed MBE or WBE subcontractor or supplier by referring to the Office of Equal Opportunity (OEO)'s online MBE/WBE directory (https://apps1.mo.gov/MWBCertifiedFirms/). The Bidder may determine the eligibility of a SDVE subcontractor or supplier by referring to the Division of Purchasing and Materials Management's online SDVE directory (https://oa.mo.gov/sites/default/files/sdvelisting.pdf) or the Department of Veterans Affairs' directory (https://vetbiz.va.gov/basic-search/).

3. Additional information, clarifications, etc., regarding the listings in the directories may be obtained by calling the Division at (573)751-3339 and asking to speak to the Contract Specialist of record as shown in the Supplementary Conditions (Section 007300).

E. Waiver of MBE/WBE/SDVE Participation:

1. If a Bidder has made a good faith effort to secure the required MBE, WBE and/or SDVE participation and has failed, the Bidder shall submit with its bid the information requested in MBE/WBE/SDVE Good Faith Effort (GFE) Determination form. The GFE forms are located on the MissouriBUYS solicitation for this project. The Director will determine if the Bidder made a good faith effort to meet the applicable goals. If the Director determines that the Bidder did not make a good faith effort, the bid shall be rejected as being nonresponsive to the bid requirements. Bidders who demonstrate that they have made a good faith effort to include MBE, WBE, and/or SDVE participation will be determined to be responsive to the applicable participation goals, regardless of the percent of actual participation obtained, if the bid is otherwise acceptable.

2. In determining whether a Bidder has made a good faith effort to obtain MBE, WBE and/or SDVE participation, the Director may evaluate the factors set forth in 1 CSR 30-5.010(6)(C) and the following:

   a. The amount of actual participation obtained;

   b. How and when the Bidder contacted potential MBE, WBE, and SDVE subcontractors and suppliers;

   c. The documentation provided by the Bidder to support its contacts, including whether the Bidder provided the names, addresses, phone numbers, and dates of contact for MBE/WBE/SDVE firms contacted for specific categories of work;

   d. If project information, including plans and specifications, were provided to MBE/WBE/SDVE subcontractors;

   e. Whether the Bidder made any attempts to follow-up with MBE, WBE or SDVE firms prior to bid;

   f. Amount of bids received from any of the subcontractors and/or suppliers that the Bidder contacted;

   g. The Bidder's stated reasons for rejecting any bids;

3. If no bidder has obtained any participation in a particular category (MBE/WBE/SDVE) or made a good faith effort to do so, the Director may waive that goal rather than rebid.

F. Contractor MBE/WBE/SDVE Obligations

1. If awarded a contract, the Bidder will be contractually required to subcontract with or obtain materials from the MBE, WBE, and SDVE firms listed in its bid, in amounts equal to or greater than the dollar amount bid, unless the amount is modified in writing by the Owner.

2. If the Contractor fails to meet or maintain the participation requirements contained in the Contractor's bid, the Contractor must satisfactorily explain to the Director why it cannot comply with the requirement and why failing meeting the requirement was beyond the Contractor's control. If the Director finds the Contractor's explanation unsatisfactory, the Director may take any appropriate action including, but not limited to:

    a. Declaring the Contractor ineligible to participate in any contracts with the Division for up to twelve (12) months (suspension); and/or

    b. Declaring the Contractor be non-responsive to the Invitation for Bid, or in breach of contract and rejecting the bid or terminating the contract.

3. If the Contractor replaces an MBE, WBE, or SDVE during the course of this contract, the Contractor shall replace it with another MBE, WBE, or SDVE or make a good faith effort to do so. All MBE, WBE and SDVE substitutions must be approved by the Director.

4. The Contractor shall provide the Owner with regular reports on its progress in meeting its MBE/WBE/SDVE obligations. At a minimum, the Contractor shall report the dollar-value of work completed by each MBE, WBE, or SDVE during the preceding month and the cumulative total of work completed by each MBE, WBE or SDVE to date with each monthly application for payment. The Contractor shall also make a final report, which shall include the total dollar-value of work completed by each MBE, WBE, and SDVE during the entire contract.

STATE OF MISSOURI
DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION
MBE/WBE/SDVE DIRECTORIES

The MBE/WBE Directory for goods and services is maintained by the Office of Equal Opportunity (OEO) and is located at the following web address:

https://apps1.mo.gov/MWBCertifiedFirms/

The SERVICE DISABLED VETERAN ENTERPRISE (SDVE) Directories may be accessed at the following web addresses:

https://purch.oa.mo.gov/media/pdf/listing-certified-missouri-service-disabled-veteran-business-enterprises-sdves

https://veterans.certify.sba.gov/#search

State of Missouri Construction Contract

THIS AGREEMENT is made (DATE) by and between:

Contractor Name and Address

hereinafter called the "Contractor,"

and the **State of Missouri**, hereinafter called the **"Owner"**, represented by the Office of Administration, Division of Facilities Management, Design and Construction.

WITNESSETH, that the Contractor and the Owner, for the consideration stated herein agree as follows:

ARTICLE 1. STATEMENT OF WORK

The Contractor shall furnish all labor and materials and perform all work required for furnishing and installing all labor, materials, equipment and transportation and everything necessarily inferred from the general nature and tendency of the plans and specifications for the proper execution of the work for:

Project Name:	**Radio Tower Replacements** **MSHP Troop D and Service Center** **Springfield & Carthage, Missouri**
Project Number:	**R2001-01**

in strict accordance with the Contract Documents as enumerated in Article 7, all of which are made a part hereof.

ARTICLE 2. TIME OF COMPLETION

The contract performance time is **250 working days** from the transmittal date of this agreement. The contract completion date is **MONTH, DAY, YEAR**. This time includes ten (10) working days for the Contractor to receive, sign and return the contract form along with required bonding and insurance certificates. Failure of the Contractor to provide correct bonding and insurance within the ten (10) working days shall not be grounds for a time extension. Receipt of proper bonding and insurance is a condition precedent to the formation of the contract and if not timely received, may result in forfeiture of the Contractor's bid security. Work may not commence until the Owner issues a written Notice to Proceed and must commence within seven (7) working days thereafter.

ARTICLE 3. LIQUIDATED DAMAGES

Whenever time is mentioned in this contract, time shall be and is of the essence of this contract. The Owner would suffer a loss should the Contractor fail to have the work embraced in this contract fully completed on or before the time above specified. THEREFORE, the parties hereto realize in order to adjust satisfactorily the damages on account of such failure that it might be impossible to compute accurately or estimate the amount of such loss or damages which the Owner would sustain by reason of failure to complete fully said work within the time required by this contract. The Contractor hereby covenants and agrees to pay the Owner, as and for **liquidated damages, the sum of $1,000** per day for each and every day, Sunday and legal holidays excepted, during which the work remains incomplete and unfinished. Any sum which may be due the Owner for such damages shall be deducted and retained by the Owner from any balance which may be due the Contractor when said work shall have been finished and accepted. But such provisions shall not release the Bond of the Contractor from liability according to its terms. In case of failure to complete, the Owner will be under no obligation to show or prove any actual or specific loss or damage.

ARTICLE 4. CONTRACT SUM

The Owner shall pay the Contractor for the prompt, faithful and efficient performance of the conditions and undertakings of this contract, subject to additions, and deductions as provided herein, in current funds the sum of:

Base Bid: $

TOTAL CONTRACT AMOUNT: ($CONTRACT AMOUNT)

UNIT PRICES: The Owner accepts the following Unit Prices:

For changing specified quantities of work from those indicated by the contract drawings and specifications, upon written instructions of Owner, the following unit prices shall prevail. The unit prices include all labor, overhead and profit, materials, equipment, appliances, bailing, shoring, shoring removal, etc., to cover the finished work of the several kinds of work called for. Only a single unit price shall be given and it shall apply for either MORE or LESS work than that shown on the drawings and called for in the specifications or included in the Base Bid. In the event of more or less units than so indicated or included, change orders may be issued for the increased or decreased amount.

ARTICLE 5. PREVAILING WAGE RATE

MISSOURI PREVAILING WAGE LAW (Sections 290.210 to 290.340, RSMo): The Contractor shall pay not less than the specified hourly rate of wages, as set out in the wage order attached to and made part of the specifications for work under this contract, to all workers performing work under the contract, in accordance with sections 290.210 to 290.340, RSMo. The Contractor shall forfeit a penalty to the Owner of one hundred dollars per day (or portion of a day) for each worker that is paid less than the specified rates for any work done under the contract by the Contractor or by any subcontractor, in accordance with section 290.250, RSMo.

ARTICLE 6. MINORITY/WOMEN/SERVICE DISABLED VETERAN BUSINESS ENTERPRISE PARTICIPATION

The Contractor has been granted a waiver of the 10% MBE and 10% WBE and 3% SDVE participation goals. The Contractor agrees to secure the MBE/WBE/SDVE participation amounts for this project as follows: (OR)

The Contractor has met the MBE/WBE/SDVE participation goals and agrees to secure the MBE/WBE/SDVE participation amounts for this project as follows:

MBE/WBE/SDVE Firm: Subcontract Amt:$
MBE/WBE/SDVE Firm: Subcontract Amt:$
MBE/WBE/SDVE Firm: Subcontract Amt:$

Total $

MBE/WBE/SDVE assignments identified above shall not be changed without a contract change signed by the Owner.

The Director of the Division of Facilities Management, Design and Construction or his Designee shall be the final authority to resolve disputes and disagreements between the Contractor and the MBE/WBE/SDVE firms listed above when such disputes impact the subcontract amounts shown above.

ARTICLE 7. CONTRACT DOCUMENTS

The following documents are hereby incorporated into this contract by reference (all division/section numbers and titles are as utilized in the Project Manual published by the Owner for this Project):

1. Division 0 – Procurement and Contracting Information, including, but not limited to:
    a. Invitation for Bid (Section 001116)
    b. Instructions to Bidders (Section 002113)
    c. Supplementary Instructions to Bidders (if applicable) (Section 002213)

d. The following documents as completed and executed by the Contractor and accepted by the Owner, if applicable:
    i. Bid Form (Section 004113)
    ii. Unit Prices (Section 004322)
    iii. Proposed Contractors Form (Section 004336)
    iv. MBE, WBE, SDVE Compliance Evaluation Form(s) (Section 004337)
    v. MBE, WBE, SDVE Eligibility Determination Form for Joint Ventures (Section 004338)
    vi. MBE, WBE, SDVE Good Faith Effort (GFE) Determination Form (Section 004339)
    vii. Missouri Service Disabled Veteran Business Form (Section 004340)
    viii. Affidavit of Work Authorization (Section 004541)
    ix. Affidavit for Affirmative Action (Section 005414)
e. Performance and Payment Bond, completed and executed by the Contractor and surety (Section 006113)
f. General Conditions (Section 007213)
g. Supplementary Conditions (Section 007300)
h. Supplementary General Conditions for Federally Funded/Assisted Construction Projects (Section 007333)
i. Wage Rate(s) (Section 007346)

2. Division 1 – General Requirements
3. All Drawings identified in the Project Manual
4. All Technical Specifications included in the Project Manual
5. Addenda, if applicable

ARTICLE 8 – CERTIFICATION

By signing this contract, the Contractor hereby re-certifies compliance with all legal requirements set forth in Section 6.0, Bidder's Certifications of the Bid Form.

Further, if the Contractor provides any "personal information" as defined in §105.1500, RSMo concerning an entity exempt from federal income tax under Section 501(c) of the Internal Revenue Code of 1986, as amended, the Contractor understands and agrees that it is voluntarily choosing to enter into a state contract and providing such information for that purpose. The state will treat such personal information in accord with §105.1500, RSMo.

By signature below, the parties hereby execute this contract document.

APPROVED:

_____
Brian Yansen, Director
Division of Facilities Management,
Design and Construction

_____
Contractor's Authorized Signature

I, Corporate Secretary, certify that I am Secretary of the corporation named above and that (CONTRACTOR NAME), who signed said contract on behalf of the corporation, was then (TITLE) of said corporation and that said contract was duly signed for and in behalf of the corporation by authority of its governing body, and is within the scope of its corporate powers.

_____
Corporate Secretary

STATE OF MISSOURI
OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION

AFFIDAVIT FOR AFFIRMATIVE ACTION

PROJECT NUMBER

NAME

First being duly sworn on oath states: that

he/she is the ☐ sole proprietor ☐ partner ☐ officer or ☐ manager or managing member of

NAME

a ☐ sole proprietorship ☐ partnership ☐ limited liability company (LLC)

or ☐ corporation, and as such, said proprietor, partner, or officer is duly authorized to make this affidavit on behalf of said sole proprietorship, partnership, or corporation; that under the contract known as

PROJECT TITLE

Less than 50 persons in the aggregate will be employed and therefore, the applicable Affirmative Action requirements as set forth in Article 1.4 of the General Conditions of the State of Missouri have been met.

PRINT NAME & SIGNATURE	DATE

NOTARY INFORMATION

NOTARY PUBLIC EMBOSSER SEAL	STATE OF	COUNTY (OR CITY OF ST. LOUIS)	**USE RUBBER STAMP IN CLEAR AREA BELOW**
	SUBSCRIBED AND SWORN BEFORE ME, THIS DAY OF YEAR		
	NOTARY PUBLIC SIGNATURE	MY COMMISSION EXPIRES	
	NOTARY PUBLIC NAME (TYPED OR PRINTED)		

MO 300-1401 (05/18) FILE/Construction Contract

Bond No._____

SECTION 006113 - PERFORMANCE AND PAYMENT BOND FORM

KNOW ALL MEN BY THESE PRESENTS, THAT we _____

as principal, and _____

_____as Surety, are held and firmly bound unto the

STATE OF MISSOURI. in the sum of _____ Dollars ($)

for payment whereof the Principal and Surety bind themselves, their heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

WHEREAS, the Principal has, by means of a written agreement dated the _____

day of_____, 20_____, enter into a contract with the State of Missouri for

_____

_____

_____

(Insert Project Title and Number)

NOW, THEREFORE, if the Principal shall faithfully perform and fulfill all the undertakings, covenants, terms, conditions and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the State of Missouri, with or without notice to the Surety and during the life of any guaranty required under the contract; and shall also faithfully perform and fulfill all undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said contract that may hereafter be made with or without notice to the Surety; and shall also promptly make payment for materials incorporated, consumed or used in connection with the work set forth in the contract referred to above, and all insurance premiums, both compensation and all other kinds of insurance, on said work, and for all labor performed on such work, whether by subcontractor or otherwise, at not less than the prevailing hourly rate of wages for work of a similar character (exclusive of maintenance work) in the locality in which the work is performed and not less than the prevailing hourly rate of wages for legal holiday and overtime work (exclusive of maintenance work) in the locality in which the work is performed both as determined by the Department of Labor and Industrial Relations or determined by the Court of Appeal, as provided for in said contract and in any and all duly authorized modifications of said contract that may be hereafter made, with or without notice to the Surety, then, this obligation shall be void and of no effect, but it is expressly understood that if the Principal should make default in or should fail to strictly, faithfully and efficiently do, perform and comply with any or more of the covenants, agreements, stipulations, conditions, requirements or undertakings, as specified in or by the terms of said contract, and with the time therein named, then this obligation shall be valid and binding upon each of the parties hereto and this bond shall remain in full force and effect; and the same may be sued on at the instance of any material man, laborer, mechanic, subcontractor, individual, or otherwise to whom such payment is due, in the name of the State of Missouri, to the use of any such person.

AND, IT IS FURTHER specifically provided that any modifications which may hereinafter be made in the terms of the contract or in the work to be done under it or the giving by the Owner of any extension of the time for the performance of the contract or any other forbearance on the part of either the Owner or the Principal to the other, shall not in any way release the Principal and the Surety, or either or any of them, their heirs, executors, administrators and successors, from their liability hereunder, notice to the Surety of any such extension, modifications or forbearance being hereby waived.

IN WITNESS WHEREOF, the above bounden parties have executed the within instrument this _____ day of _____, 20 ____.

AS APPLICABLE:

AN INDIVIDUAL

Name: _____

Signature: _____

A PARTNERSHIP

Name of Partner: _____

Signature of Partner: _____

Name of Partner: _____

Signature of Partner: _____

CORPORATION

Firm Name: _____

Signature of President: _____

SURETY

Surety Name: _____

Attorney-in-Fact: _____

Address of Attorney-in-Fact: _____

_____

Telephone Number of Attorney-in-Fact: _____

Signature Attorney-in-Fact: _____

NOTE: Surety shall attach Power of Attorney

STATE OF MISSOURI
OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION

PRODUCT SUBSTITUTION REQUEST

PROJECT NUMBER

PROJECT TITLE AND LOCATION

CHECK APPROPRIATE BOX

☐ SUBSTITUTION PRIOR TO BID OPENING
(Minimum of (5) working days prior to receipt of Bids as per Article 4 – Instructions to Bidders)

☐ SUBSTITUTION FOLLOWING AWARD
(Maximum of (20) working days from Notice to Proceed as per Article 3 – General Conditions)

FROM: BIDDER/CONTRACTOR (PRINT COMPANY NAME)

TO: ARCHITECT/ENGINEER (PRINT COMPANY NAME)

Bidder/Contractor hereby requests acceptance of the following product or systems as a substitution in accordance with provisions of Division One of the Bidding Documents:

SPECIFIED PRODUCT OR SYSTEM

SPECIFICATION SECTION NO.

SUPPORTING DATA

☐ Product data for proposed substitution is attached (include description of product, standards, performance, and test data)

☐ Sample ☐ Sample will be sent, if requested

QUALITY COMPARISON

	SPECIFIED PRODUCT	SUBSTITUTION REQUEST
NAME, BRAND		
CATALOG NO.		
MANUFACTURER		
VENDOR		

PREVIOUS INSTALLATIONS

PROJECT	ARCHITECT/ENGINEER	
LOCATION		DATE INSTALLED

SIGNIFICANT VARIATIONS FROM SPECIFIED PRODUCT

REASON FOR SUBSTITUTION

DOES PROPOSED SUBSTITUTION AFFECT OTHER PARTS OF WORK?

☐ YES ☐ NO

IF YES, EXPLAIN

SUBSTITUTION REQUIRES DIMENSIONAL REVISION OR REDESIGN OF STRUCTURE OR A/E WORK

☐ YES ☐ NO

BIDDER'S/CONTRACTOR'S STATEMENT OF CONFORMANCE OF PROPOSED SUBSTITUTION TO CONTRACT REQUIREMENT:

We have investigated the proposed substitution. We believe that it is equal or superior in all respects to specified product, except as stated above; that it will provide the same Warranty as specified product; that we have included complete implications of the substitution; that we will pay redesign and other costs caused by the substitution which subsequently become apparent; and that we will pay costs to modify other parts of the Work as may be needed, to make all parts of the Work complete and functioning as a result of the substitution.

BIDDER/CONTRACTOR	DATE

REVIEW AND ACTION

☐ Resubmit Substitution Request with the following additional information:

☐ Substitution is accepted.

☐ Substitution is accepted with the following comments:

☐ Substitution is not accepted.

ARCHITECT/ENGINEER	DATE

STATE OF MISSOURI
OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION

FINAL RECEIPT OF PAYMENT AND RELEASE

PROJECT NUMBER

KNOW ALL MEN BY THESE PRESENT THAT: hereinafter called "Subcontractor" who heretofore entered into an agreement with hereinafter called "Contractor", for the performance of work and/or furnishing of material for the construction of the project entitled

(PROJECT TITLE, PROJECT LOCATION, AND PROJECT NUMBER)

at

(ADDRESS OF PROJECT)

for the State of Missouri (Owner) which said subcontract is by this reference incorporated herein, in consideration of such final payment by Contractor.

DOES HEREBY:

1. ACKNOWLEDGE that they have been **PAID IN FULL** all sums due for work and materials contracted or done by their Subcontractors, Material Vendors, Equipment and Fixture Suppliers, Agents and Employees, or otherwise in the performance of the Work called for by the aforesaid Contract and all modifications or extras or additions thereto, for the construction of said project or otherwise.
2. RELEASE and fully, finally, and forever discharge the Owner from any and all suits, actions, claims, and demands for payment for work performed or materials supplied by Subcontractor in accordance with the requirements of the above referenced Contract.
1. REPRESENT that all of their Employees, Subcontractors, Material Vendors, Equipment and Fixture Suppliers, and everyone else has been **paid in full** all sums due them, or any of them, in connection with performance of said Work, or anything done or omitted by them, or any of them in connection with the construction of said improvements, or otherwise.

DATED this day of , 20 .

NAME OF SUBCONTRACTOR

BY (TYPED OR PRINTED NAME)

SIGNATURE

TITLE

ORIGINAL: FILE/Closeout Documents

STATE OF MISSOURI
OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT,
DESIGN AND CONSTRUCTION

PAY APP NO.	PROJECT NUMBER
CHECK IF FINAL ☐**FINAL**	DATE

MBE/WBE/SDVE PROGRESS REPORT

Remit with **ALL** Progress and Final Payments

(Please check appropriate box) ☐CONSULTANT ☐CONSTRUCTION

PROJECT TITLE	
PROJECT LOCATION	
FIRM	
ORIGINAL CONTRACT SUM (Same as Line Item 1. on Form A of Application for Payment) **$**	TOTAL CONTRACT SUM TO DATE (Same as Line Item 3. on Form A of Application for Payment) **$**

THE TOTAL MBE/WBE/SDVE PARTICIPATION DOLLAR AMOUNT OF THIS PROJECT AS INDICATED IN THE ORIGINAL CONTRACT: **$**

SELECT MBE, WBE, SDVE	TOTAL AMOUNT OF SUBCONTRACT	$ AMOUNT PAID-TO-DATE (include approved contract changes)	CONSULTANT/SUBCONSULTANT OR CONTRACTOR/SUBCONTRACTOR/SUPPLIER COMPANY NAME
☐ MBE ☐ WBE ☐ SDVE	$	$	
☐ MBE ☐ WBE ☐ SDVE	$	$	
☐ MBE ☐ WBE ☐ SDVE	$	$	
☐ MBE ☐ WBE ☐ SDVE	$	$	
☐ MBE ☐ WBE ☐ SDVE	$	$	
☐ MBE ☐ WBE ☐ SDVE	$	$	

Revised 05/21

INSTRUCTIONS FOR MBE/WBE/SDVE PROGRESS REPORT

CONTRACTOR OR CONSULTANT TO FILL OUT AND REMIT WITH EACH PAY APPLICATION:

The MBE/WBE/SDVE Progress Report for the project is issued with the contract comprising values reported in the consultant's Proposal or on the successful contractor's Section 004337 Compliance Evaluation Forms.

At Initial Pay Application fill in the following:

1. Pay App No. Start with 1.
2. Fill in the Project Number and Date.
3. Enter Project Title, Project Location, and Firm.
4. Fill in the "Original Contract Sum" and "Total Contract Sum To Date" (Reference applicable Line Items on Form A of Application for Payment).
5. Indicate the Total Participation Dollar Amount from the Original Contract.
6. Select MBE, WBE, or SDVE for each Consultant/Subconsultant or Contractor/Subcontractor/Supplier.
7. Enter the "Total Amount of Subcontract", "$ Amount (Paid-To-Date)", and Company Name.

For all subsequent Pay Applications fill in the following:

1. Pay App No.
2. If Final Pay App, check box.
3. Fill in the Project Number and Date.
4. Enter Project Title, Project Location, and Firm
5. At each Pay App fill in the "Original Contract Sum" and "Total Contract Sum To Date" (reference applicable Line Items on Form A of Application for Payment).
6. Indicate the Total Participation Dollar Amount from the Original Contract.
7. Select MBE, WBE, or SDVE for each Consultant/Subconsultant or Contractor/Subcontractor/Supplier
8. Enter the "Total Amount of Subcontract", "$ Amount (Paid-To-Date)", and Company Name.

STATE OF MISSOURI
OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION
AFFIDAVIT – COMPLIANCE WITH PREVAILING WAGE LAW

PROJECT NUMBER

Before me, the undersigned Notary Public, in and for the County of _____

State of _____ personally came and appeared _____
(NAME)

_____ of the _____
(POSITION) (NAME OF THE COMPANY)

(a corporation) (a partnership) (a proprietorship) and after being duly sworn did depose and say that all provisions and requirements set out in Chapter 290, Sections 290.210 through and including 290.340, Missouri Revised Statutes, pertaining to the payment of wages to workmen employed on public works project have been fully satisfied and there has been no exception to the full and completed compliance with said provisions and requirements and with Wage Determination No: _____ issued by the Department of Labor and Industrial Relations, State of Missouri on the _____ day of _____ 20 __ in carrying out the contract and working in connection with _____
(NAME OF PROJECT)

Located at _____ in _____ County
(NAME OF THE INSTITUTION)

Missouri, and completed on the _____ day of _____ 20 __

SIGNATURE

NOTARY INFORMATION

NOTARY PUBLIC EMBOSSER OR BLACK INK RUBBER STAMP SEAL	STATE		COUNTY (OR CITY OF ST. LOUIS)
	SUBSCRIBED AND SWORN BEFORE ME, THIS DAY OF YEAR		**USE RUBBER STAMP IN CLEAR AREA BELOW**
	NOTARY PUBLIC SIGNATURE	MY COMMISSION EXPIRES	
	NOTARY PUBLIC NAME (TYPED OR PRINTED)		

FILE: Closeout Documents

GENERAL CONDITIONS

INDEX

SECTION 007213 - GENERAL CONDITIONS

A. These General Conditions apply to each section of these specifications. The Contractor is subject to the provisions contained herein.

B. The General Conditions are intended to define the relationship of the Owner, the Designer and the Contractor thereby establishing certain rules and provisions governing the operation and performance of the work so that the work may be performed in a safe, orderly, expeditious and workmanlike manner.

ARTICLE 1 – GENERAL PROVISIONS

ARTICLE 1.1 - DEFINITIONS

As used in these contract documents, the following terms shall have the meanings and refer to the parties designated in these definitions.

1. **"COMMISSIONER":** The Commissioner of the Office of Administration.
2. **"CONSTRUCTION DOCUMENTS":** The "Construction Documents" shall consist of the Project Manual, Drawings and Addenda.
3. **"CONSTRUCTION REPRESENTATIVE:"** Whenever the term "Construction Representative" is used, it shall mean the Owner's Representative at the work site.
4. **"CONTRACTOR"**: Party or parties who have entered into a contract with the Owner to furnish work under these specifications and drawings.
5. **"DESIGNER"**: When the term "Designer" is used herein, it shall refer to the Architect, Engineer, or Consultant of Record specified and defined in Paragraph 2.0 of the Supplemental Conditions, or his duly authorized representative. The Designer may be either a consultant or state employee.
6. **"DIRECTOR"**: Whenever the term "Director" is used, it shall mean the Director of the Division of Facilities Management, Design and Construction or his Designee, representing the Office of Administration, State of Missouri. The Director is the agent of the Owner.
7. **"DIVISION":** Shall mean the Division of Facilities Management, Design and Construction, State of Missouri.
8. **"INCIDENTAL JOB BURDENS":** Shall mean those expenses relating to the cost of work, incurred either in the home office or on the job-site, which are necessary in the course of doing business but are incidental to the job. Such costs include office supplies and equipment, postage, courier services, telephone expenses including long distance, water and ice and other similar expenses.
9. **"JOINT VENTURE"**: An association of two (2) or more businesses to carry out a single business enterprise for profit for which purpose they combine their property, capital, efforts, skills and knowledge.
10. **"OWNER"**: Whenever the term "Owner" is used, it shall mean the State of Missouri.
11. **"PROJECT"**: Wherever the term "Project" is used, it shall mean the work required to be completed by the construction contract.
12. **"PROJECT MANUAL"**: The "Project Manual" shall consist of Introductory Information, Invitation for Bid, Instructions to Bidders, Bid Documents, Additional Information, Standard Forms, General Conditions, Supplemental General Conditions, General Requirements and Technical Specifications.
13. **"SUBCONTRACTOR"**: Party or parties who contract under, or for the performance of part or this entire Contract between the Owner and Contractor. The subcontract may or may not be direct with the Contractor.
14. **"WORK"**: Labor, material, supplies, plant and equipment required to perform and complete the service agreed to by the Contractor in a safe, expeditious, orderly and workmanlike manner so that the project shall be complete and finished in the best manner known to each respective trade.
15. "**WORKING DAYS**": are all calendar days except Saturdays, Sundays and the following holidays: New Year's Day, Martin Luther King, Jr. Day, Lincoln Day, Washington's Birthday (observed), Truman Day, Memorial Day, Juneteenth, Independence Day, Labor Day, Columbus Day, Veterans Day (observed), Thanksgiving Day, Christmas Day.

ARTICLE 1.2 DRAWINGS AND SPECIFICATIONS

A. In case of discrepancy between drawings and specifications, specifications shall govern. Should discrepancies in architectural drawings, structural drawings and mechanical drawings occur,

architectural drawings shall govern and, in case of conflict between structural and mechanical drawings, structural drawings shall govern.

B. Specifications are separated into titled divisions for convenience of reference only and to facilitate letting of contracts and subcontracts. The Contractor is responsible for establishing the scope of work for subcontractors, which may cross titled divisions. Neither the Owner nor Designer will establish limits and jurisdiction of subcontracts.

C. Figured dimensions take precedence over scaled measurements and details over smaller scale general drawings. In the event of conflict between any of the documents contained within the contract, the documents shall take precedence and be controlling in the following sequence: addenda, supplementary general conditions, general conditions, division 1 specifications, technical division specifications, drawings, bid form and instructions to bidders.

D. Anything shown on drawings and not mentioned in these specifications or vice versa, as well as any incidental work which is obviously necessary to complete the project within the limits established by the drawings and specifications, although not shown on or described therein, shall be performed by the Contractor at no additional cost as a part of his contract.

E. Upon encountering conditions differing materially from those indicated in the contract documents, the Contractor shall promptly notify the Designer and Construction Representative in writing before such conditions are disturbed. The Designer shall promptly investigate said conditions and report to the Owner, with a recommended course of action**.** If conditions do materially differ and cause an increase or decrease in contract cost or time required for completion of any portion of the work, a contract change will be initiated as outlined in Article 4 of these General Conditions.

E. Only work included in the contract documents is authorized, and the Contractor shall do no work other than that described therein or in accordance with appropriately authorized and approved contract changes.

ARTICLE 1.3 - COMPLIANCE WITH LAWS, PERMITS, REGULATIONS AND INSPECTIONS

A. Since the Owner is the State of Missouri, municipal or political subdivisions, zoning ordinances, construction codes (other than licensing of trades), and other like ordinances are not applicable to construction on Owner's property, and Contractor will not be required to submit drawings and specifications to any municipal or political subdivision, authority, obtain construction permits or any other licenses (other than licensing of trades) or permits from or submit to inspections by any municipality or political subdivision relating to the construction for this project. All permits or licenses required by municipality or political subdivision for operation on property not belonging to Owner shall be obtained by and paid for by Contractor. Each Contractor shall comply with all applicable laws, ordinances, rules and regulations that pertain to the work of this contract.

B. Contractors, subcontractors and their employees engaged in the businesses of electrical, mechanical, plumbing, carpentry, sprinkler system work, and other construction related trades shall be licensed to perform such work by the municipal or political subdivision where the project is located, if such licensure is required by local code. Local codes shall dictate the level (master, journeyman, and apprentice) and the number, type and ratio of licensed tradesmen required for this project within the jurisdiction of such municipal or political subdivision.

C. Equipment and controls manufacturers and their authorized service and installation technicians that do not maintain an office within the jurisdiction of the municipal or political subdivision but are a listed or specified contractor or subcontractor on this project are exempt from Paragraph 1.3 B above.

D. The Contractor shall post a copy of the wage determination issued for the project and included as a part of the contract documents, in a prominent and easily accessible location at the site of construction for the duration of the project.

E. Any contractor or subcontractor to such contractor at any tier signing a contract to work on this project shall provide a ten-hour Occupational Safety and Health Administration (OSHA) construction safety program for their on-site employees which includes a course in construction safety and health approved by OSHA or a similar program approved by the Department of Labor and Industrial Relations which is at least as stringent as an approved OSHA program. The contractor shall forfeit as a penalty to the public body on whose behalf the contract is made or awarded, two thousand five hundred dollars plus one hundred dollars for each employee employed by the contractor or subcontractor, for each calendar day, or portion thereof, such employee is employed without the required training.

ARTICLE 1.4 - NONDISCRIMINATION IN EMPLOYMENT

A. The Contractor and his subcontractors will not discriminate against individuals based on race,

color, religion, national origin, sex, disability, or age, but may use restrictions which relate to bona fide occupational qualifications. Specifically, the Contractor and his subcontractors shall not discriminate:

1. Against recipients of service on the basis of race, color, religion, national origin, sex, disability or age.
2. Against any employee or applicant, for employment on the basis of race, color, religion, national origin, sex or otherwise qualified disability status.
3. Against any applicant for employment or employee on the basis of age, where such applicant or employee is between ages 40 and 70 and where such Contractor employs at least 20 persons.
4. Against any applicant for employment or employee on the basis of that person's status as a disabled or Vietnam-era veteran.

The Contractor and his Subcontractors will take affirmative action to insure applicants for employment and employees are treated equally without regard to race, color, religion, national origin, sex, disability, or age. Such action shall include, but not be limited to, the following: employment, upgrading, demotion and transfer; recruitment or recruitment advertising; and selection for training, including apprenticeship. The Contractor and his Subcontractors will give written notice of their commitments under this clause to any labor union with which they have bargaining or other agreements.

B. The Contractor and his subcontractors shall develop, implement, maintain and submit in writing to the Owner an affirmative action program if at least fifty (50) persons in the aggregate are employed under this contract. If less than fifty (50) persons in the aggregate are to be employed under this contract, the Contractor shall submit, in lieu of the written affirmative action program, a properly executed Affidavit for Affirmative Action in the form included in the contract specifications. For the purpose of this section, an "affirmative action program" means positive action to influence all employment practices (including, but not limited to, recruiting, hiring, promoting and training) in providing equal employment opportunity regardless of race, color, sex, national origin, religion, age (where the person affected is between age 40 and 70), disabled and Vietnam-era veteran status, and disability. Such "affirmative action program" shall include:

   1. A written policy statement committing the total organization to affirmative action and assigning management responsibilities and procedures for evaluation and dissemination;
   2. The identification of a person designated to handle affirmative action;
   3. The establishment of non-discriminatory selection standards, objective measures to analyze recruitment, an upward mobility system, a wage and salary structure, and standards applicable to lay-off, recall, discharge, demotion and discipline;
   4. The exclusion of discrimination from all collective bargaining agreements; and
   5. Performance of an internal audit of the reporting system to monitor execution and to provide for future planning.

   In the enforcement of this non-discrimination clause, the Owner may use any reasonable procedures available, including, but not limited to: requests, reports, site visits and inspection of relevant documents of contractors and subcontractors.

C. In the event of the Contractor's or his subcontractor's noncompliance with any provisions of this Article of the Contract, the Owner may cancel this contract in whole or in part or require the Contractor to terminate his contract with the subcontractor.

ARTICLE 1.5 - ANTI-KICKBACK

No employee of the division, shall have or acquire any pecuniary interest, whether direct or indirect, in this contract or in any part hereof. No officer, employee, designer, attorney, or administrator of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory or other similar functions in connection with the construction of the project, shall have or acquire any pecuniary interest, whether direct or indirect, in this contract, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the project.

ARTICLE 1.6 - PATENTS AND ROYALTIES

A. The Contractor shall hold and save the Owner and its officers, agents, servants and employees harmless from liabilities of any nature or kind, including cost and expenses, for, or on account of, any patented or unpatented invention, process, article or appliance manufactured or used in the performance of this contract, including its use by the Owner, unless otherwise specifically stipulated in the contract documents.

B. If the Contractor uses any design, device or materials covered by letters, patent or copyright,

the Contractor shall provide for such use by suitable agreement with the Owner of such patented or copyrighted design, device or material. It is mutually agreed and understood, without exception, that the contract prices shall include all royalties or costs arising from the use of such design, device or materials, in any way involved in the work. The Contractor and/or his sureties shall indemnify and save harmless the Owner of the project from any and all claims for infringement by reason of the use of such patented or copyrighted design, device or materials or any trademark or copyright in connection with work agreed to be performed under this contract and shall indemnify the Owner for any cost, expense or damage it may be obliged to pay by reason of such infringement at any time during the prosecution of the work or after completion of the work.

ARTICLE 1.7 - PREFERENCE FOR AMERICAN AND MISSOURI PRODUCTS AND SERVICES

A. By virtue of statutory authority a preference will be given to Missouri labor and to products of mines, forests and quarries of the state of Missouri when they are found in marketable quantities in the state, and all such materials shall be of the best quality and suitable character that can be obtained at reasonable market prices, all as provided for in Section 8.280, Missouri Revised Statutes and Cumulative Supplements.

B. Furthermore, pursuant to Section 34.076 Missouri Revised Statutes and Cumulative Supplements, a preference shall be given to those persons doing business as Missouri firms, corporations, or individuals, or which maintain Missouri offices or places of business, when the quality of performance promised is equal or better and the price quoted is the same or less. In addition, in order for a non-domiciliary bidder to be successful, his bid must be that same percentage lower than a domiciliary Missouri bidder's bid, as would be required for a Missouri bidder to successfully bid in the non-domiciliary state.

C In accordance with the Missouri Domestic Products Procurement Act Section 34.350 RSMo and Cumulative Supplements any manufactured goods or commodities used or supplied in the performance of this contract or any subcontract thereto shall be manufactured, assembled or produced in the United States, unless the specified products are not manufactured, assembled or produced in the United States in sufficient quantities to meet the agency's requirements or cannot be manufactured, assembled or produced in the United States within the necessary time in sufficient quantities to meet the contract requirements, or if obtaining the specified products manufactured, assembled or produced in the United States would increase the cost of this contract for purchase of the product by more than ten percent.

ARTICLE 1.8 - COMMUNICATIONS

A. All notices, requests, instructions, approvals and claims must be in writing and shall be delivered to the Designer and copied to the Construction Representative for the project except as required by Article 1.12 Disputes and Disagreements, or as otherwise specified by the Owner in writing as stated in Section 012600. Any such notice shall be deemed to have been given as of the time of actual receipt.

B. The Contractor shall attend on-site progress and coordination meetings, as scheduled by the Construction Representative, no less than once a month.

C. The Contractor shall ensure that major subcontractors and suppliers shall attend monthly progress meetings as necessary to coordinate the work, and as specifically requested by the Construction Representative.

ARTICLE 1.9 - SEPARATE CONTRACTS AND COOPERATION

A. The Owner reserves the right to let other contracts in connection with this work. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work and shall properly connect and coordinate his work with theirs.

B. The Contractor shall consult the drawings for all other contractors in connection with this work. Any work conflicting with the above shall be brought to the attention of the Owner’s Representative before the work is performed. If the Contractor fails to do this, and constructs any work which interferes with the work of another contractor, the Contractor shall remove any part so conflicting and rebuild same, as directed by the Owner’s Representative at no additional cost to the Owner.

C. Each contractor shall be required to coordinate his work with other contractors so as to afford others reasonable opportunity for execution of their work. No contractor shall delay any other contractor by neglecting to perform contract work at the proper time. If any contractor causes delay to another, they shall be liable directly to that contractor for such delay in addition to any liquidated damages which might be due the Owner.

D. Should the Contractor or project associated subcontractors refuse to cooperate with the instructions and reasonable requests of other Contractors or other subcontractors in the overall

coordinating of the work, the Owner may take such appropriate action and issue directions, as required, to avoid unnecessary and unwarranted delays.

E. Each Contractor shall be responsible for damage done to Owner's or other Contractor's property by him/her or workers in his employ through their fault or negligence.

F. Should a Contractor sustain any damage through any act or omission of any other Contractor having a contract with the Owner, the Contractor so damaged shall have no claim or cause of action against the Owner for such damage, but shall have a claim or cause of action against the other Contractor to recover any and all damages sustained by reason of the acts or omissions of such Contractor. The phrase "acts or omissions" as used in this section shall be defined to include, but not be limited to, any unreasonable delay on the part of any such contractors.

ARTICLE 1.10 - ASSIGNMENT OF CONTRACT

A. No assignment by Contractor of any amount or any part of this contract or of the funds to be received there under will be recognized unless such assignment has had the written approval of the Director and the surety has been given due notice of such assignment and has furnished written consent thereto. In addition to the usual recitals in assignment contracts, the following language must be set forth: "It is agreed that the funds to be paid to the assignee under this assignment are subject to performance by the Contractor of this contract and to claims or liens for services rendered or materials supplied for the performance of the work called for in said contract in favor of all persons, firms or corporations rendering such services or supplying such materials."

ARTICLE 1.11 - INDEMNIFICATION

A. Contractor agrees to indemnify and save harmless Owner and its respective commissioners, officers, officials, agents, consultants and employees and Designer, their agents, servants and employees, from and against any and all liability for damage arising from injuries to persons or damage to property occasioned by any acts or omissions of Contractor, any subcontractors, agents, servants or employees, including any and all expense, legal or otherwise, which may be incurred by Owner or Designer, its agents, servants or employees, in defense of any claim, action or suit.

B. The obligations of the Contractor under this paragraph shall not extend to the liability of the Designer, his agents or employees, arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, contract changes, design or specifications, or (2) giving of or the failure to give directions or instructions by the Designer, his agents or employees as required by this contract documents provided such giving or failure to give is the primary cause of the injury or damage.

ARTICLE 1.12 - DISPUTES AND DISAGREEMENTS

It is hereby expressly agreed and understood that in case any controversy or difference of opinion arises during construction, best efforts will be given to resolution at the field level. Should those efforts be unsuccessful, the Contractor has the right to appeal in writing, the decision of the Director's Designee to the Director at Room 730 Truman Building, P.O. Box 809, Jefferson City, Missouri 65102. The decision of the Director shall be final and binding on all parties.

ARTICLE 2 -- OWNER/DESIGNER RESPONSIBILITIES

A. The Owner shall give all orders and directions contemplated under this contract relative to the execution of the work. During progress of work the Owner will be represented at the project site by the Construction Representative and/or Designer, whose responsibilities are to see that this contract is properly fulfilled.

B. The Owner shall at all times have access to the work whenever it is in preparation or progress. The Contractors shall provide proper facilities for such access and for inspection and supervision.

C. All materials and workmanship used in the work shall be subject to the inspection of the Designer and Construction Representative, and any work which is deemed defective shall be removed, rebuilt or made good immediately upon notice. The cost of such correction shall be borne by the Contractor. Contractor shall not be entitled to an extension of the contract completion date in order to remedy defective work. All rejected materials shall be immediately removed from the site of the work.

D. If the Contractor fails to proceed at once with the correction of rejected defective materials or workmanship, the Owner may, by separate contract or otherwise, have the defects remedied or rejected. Materials removed from the site and charge the cost of the same against any monies which may be due the Contractor, without prejudice to any other rights or remedies of the Owner.

E. Failure or neglect on the part of Owner to observe faulty work, or work done which is not in accordance with the drawings and specifications shall not relieve the Contractor from responsibility

for correcting such work without additional compensation.

F. The Owner shall have the right to direct the Contractor to uncover any completed work.

1. If the Contractor fails to adequately notify the Construction Representative and/or Designer of an inspection as required by the Contract Documents, the Contractor shall, upon written request, uncover the work. The Contractor shall bear all costs associated with uncovering and again covering the work exposed.

2. If the Contractor is directed to uncover work, which was not otherwise required by the Contract Documents to be inspected, and the work is found to be defective in any respect, no compensation shall be allowed for this work. If, however, such work is found to meet the requirements of this contract, the actual cost of labor and material necessarily involved in the examination and replacement plus 10% shall be allowed the Contractor.

G. The Designer shall give all orders and directions contemplated under this contract relative to the scope of the work and shall give the initial interpretation of the contract documents.

H. The Owner may file a written notice to the Contractor to dismiss immediately any subcontractors, project managers, superintendents, foremen, workers, watchmen or other employees whom the Owner may deem incompetent, careless or a hindrance to proper or timely execution of the work. The Contractor shall comply with such notice as promptly as practicable without detriment to the work or its progress.

I. If in the Owner's judgment it becomes necessary at any time to accelerate work, when ordered by the Owner in writing, the Contractor shall redirect resources to such work items and execute such portions of the work as may be required to complete the work within the current approved contract schedule.

ARTICLE 3 -- CONTRACTOR RESPONSIBILITIES

The Contractor shall register and utilize the Owner's eBuilder digital project management system for submission of documents described in the following sections. This includes but is not limited to submittals as required by designer, payment applications, Request for Information (RFI), construction change orders, Request for Proposals (RFP), Designer Supplemental Instructions (DSI), etc.

ARTICLE 3.1 -- ACCEPTABLE SUBSTITUTIONS

A. The Contractor may request use of any article, device, product, material, fixture, form or type of construction which in the judgment of the Owner and Designer is equal in all respects to that named. Standard products of manufacturers other than those specified will be accepted when, prior to the ordering or use thereof, it is proven to the satisfaction of the Owner and Designer that they are equal in design, strength, durability, usefulness and convenience for the purpose intended.

B. Any changes required in the details and dimensions indicated on the drawings for the substitution of products other than those specified shall be properly made at the expense of the Contractor requesting the substitution or change.

C. The Contractor shall submit a request for such substitutions in writing to the Owner and Designer within twenty (20) working days after the date of the "Notice to Proceed." Thereafter no consideration will be given to alternate forms of accomplishing the work. This Article does not preclude the Owner from exercising the provisions of Article 4 hereof.

D. Any request for substitution by the Contractor shall be submitted in accordance with SECTION 002113 - INSTRUCTIONS TO BIDDERS.

E. When a material has been approved, no change in brand or make will be permitted unless:

1. Written verification is received from the manufacturer stating they cannot make delivery on the date previously agreed, or

2. Material delivered fails to comply with contract requirements.

ARTICLE 3.2 -- SUBMITTALS

A. The Contractor's submittals must be submitted with such promptness as to allow for review and approval so as not to cause delay in the work. The Contractor shall coordinate preparation and processing of submittals with performance of construction activities.

Coordinate each submittal with fabrication, = purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

Submit four (4) copies to the Designer and additional copies as required for the subcontractors and material suppliers. Also provide copies to meet the requirements for maintenance manuals.

B. All subcontractors' shop drawings and schedules shall be submitted by the Contractor and shall bear evidence that Contractor has received, reviewed, and approved them. Any shop drawings and

schedules submitted without this evidence will be returned to the Contractor for resubmission.

C. The Contractor shall include with the shop drawing, a letter indicating any and all deviations from the drawings and/or specifications. Failure to notify the Designer of such deviations will be grounds for subsequent rejection of the related work or materials. If, in the opinion of the Designer, the deviations are not acceptable, the Contractor will be required to furnish the item as specified and indicated on the drawings.

D. The Designer shall check shop drawings and schedules with reasonable promptness and approve them only if they conform to the design concept of the project and comply with the information given in the contract documents. The approval shall not relieve the Contractor from the responsibility to comply with the drawings and specifications, unless the Contractor has called the Designer's attention to the deviation, in writing, at the time of submission and the Designer has knowingly approved thereof. An approval of any such modification will be given only under the following conditions:

1. It is in the best interest of the Owner
2. It does not increase the contract sum and/or completion time
3. It does not deviate from the design intent
4. It is without prejudice to any and all rights under the surety bond.

E. No extension of time will be granted because of the Contractor's failure to submit shop drawings and schedules in ample time to allow for review, possible resubmission, and approval. Fabrication of work shall not commence until the Contractor has received approval. The Contractor shall furnish prints of approved shop drawings and schedules to all subcontractors whose work is in any way related to the work under this contract. Only prints bearing this approval will be allowed on the site of construction

F. The Contractor shall maintain a complete file on-site of approved shop drawings available for use by the Construction Representative.

ARTICLE 3.3 – AS-BUILT DRAWINGS

A. The Contractor shall update a complete set of the construction drawings, shop drawings and schedules of all work monthly by marking changes, and at the completion of their work (prior to submission of request for final payment) note all changes and turn the set over to the Construction Representative. The updates shall show all addenda, all field changes that were made to adapt to field conditions, changes resulting from contract changes or supplemental instructions, and all locations of structures, buried installations of piping, conduit, and utility services. All buried and concealed items both inside and outside shall be accurately located as to depth and referenced to permanent features such as interior or exterior wall faces and dimensions shall be given in a neat and legible manner in a contrasting colored pencil or ink. If approved by the Designer, an electronic file format may be provided.

ARTICLE 3.4 – GUARANTY AND WARRANTIES

A. General Guaranty

1. Neither the final certificate of payment nor any provision in the contract documents nor partial use or occupancy of the premises by the Owner shall constitute an acceptance of work not done in accordance with contract requirements.
2. The Contractor or surety shall remedy any defects in the work and pay for any damage to property resulting there from which shall appear within a period of one (1) year from the date of substantial completion unless a longer period is otherwise specified or a differing guaranty period has been established in the substantial completion certificate. The Owner will give notice of observed defects with reasonable promptness.
3. In case of default on the part of the Contractor in fulfilling this part of this contract, the Owner may correct the work or repair the damage and the cost and expense incurred in such event shall be paid by or recoverable from the Contractor or surety.
4. The work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's guaranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment

B. Extended Warranty

Manufacturer's certificates of warranty shall be obtained for all major equipment. Warranty shall be obtained for at least one year. Where a longer

period is offered at no additional cost or called for in the specific equipment specifications, the longer period shall govern.

ARTICLE 3.5 -- OPERATION AND MAINTENANCE MANUALS

A. Immediately after equipment submittals are approved and no later than ten (10) working days prior to the substantial completion inspection, the Contractor shall provide to the Designer three (3) copies of operating instructions and service manuals, containing the following:

1. Start-up and Shut-down Procedures: Provide a step-by-step write up of all major equipment. When manufacturer's printed start-up, trouble shooting and shut-down procedures are available; they may be incorporated into the operating manual for reference.
2. Operating Instructions: Written operating instructions shall be included for the efficient and safe operation of all equipment.
3. Equipment List: List of all major equipment as installed shall be prepared to include model number, capacities, flow rate, name place data, shop drawings and air and water balance reports.
4. Service Instructions: Provide the following information for all pieces of equipment.
    a. Recommended spare parts including catalog number and name of local supplier or factory representative.
    b. Belt sizes, types, and lengths.
    c. Wiring diagrams.
5. Manufacturer's Certificate of Warranty as described in Article 3.4.
6. Prior to the final payment, furnish to the Designer three (4) copies of parts catalogs for each piece of equipment furnished by him/her on the project with the components identified by number for replacement ordering.

B. Submission of operating instructions shall be done in the following manner.

1. Manuals shall be in quadruplicate, and all materials shall be bound into volumes of standard 8½" x 11" hard binders. Large drawings too bulky to be folded into 8½" x 11" shall be separately bound or folded and in envelopes, cross referenced and indexed with the manuals.
2. The manuals shall identify project name, project number, and include the name and address of the Contractor, subcontractors and manufacturers who were involved with the activity described in that particular manual.
3. Internally subdivide the binder contents with permanent page dividers, logically organized with tab titles clearly printed under reinforced laminated plastic tabs.
4. Contents: Prepare a Table of Contents for each volume, with each product or system description identified.

ARTICLE 3.6 – OTHER CONTRACTOR RESPONSIBILITIES

A. The Contractor shall keep on site, during progress of the work, a competent superintendent satisfactory to the Construction Representative. The superintendent shall represent the Contractor and all agreements made by the superintendent shall be binding. The superintendent shall carefully study and compare all drawings, specifications and other instructions and shall promptly notify the Construction Representative and Designer, in writing, any error, inconsistency or omission which may be discovered. The superintendent shall coordinate all work on the project. Any change of the superintendent shall be approved by the Construction Representative.

B. Contractor shall, at all times, enforce strict discipline and good order among his employees, and shall not employ on the work any unfit person or anyone not skilled in the work assigned to him/her.

C. The Contractor shall supply sufficient labor, material, plant and equipment and pay when due any laborer, subcontractor or supplier for supplies furnished and otherwise prosecute the work with diligence to prevent work stoppage and insure completion thereof within the time specified.

D. The Contractor and each of his subcontractors shall submit to the Construction Representative, through the Designer such schedules of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as the Owner may request concerning work performed or to be performed under this contract.

E. The Contractor, subcontractors, and material suppliers shall upon written request, give the Owner access to all time cards, material invoices, payrolls, estimates, profit and loss statements, and all other direct or indirect costs related to this work.

F. The Contractor shall be responsible for laying out all contract work such as layout of architectural, structural, mechanical and electrical work, which shall be coordinated with layouts of subcontractors

for general construction work. The Contractor is also responsible for unloading, uncrating and handling of all materials and equipment to be erected or placed by him/her, whether furnished by Contractor or others. No extra charges or compensation will be allowed as a result of failure to verify dimensions before ordering materials or fabricating items.

G. The Contractor must notify the Construction Representative at least one working day before placing concrete or burying underground utilities, pipelines, etc.

H. Contractors shall prearrange time with the Construction Representative for the interruption of any facility operation. Unless otherwise specified in these documents, all connections, alterations or relocations as well as all other portions of the work will be performed during normal working hours.

I. The Contractor shall coordinate all work so there will not be prolonged interruptions of existing equipment operation. Any existing plumbing, heating, ventilating, air conditioning or electrical disconnections necessary for the project, which affect portions of this construction or building or any other building must be scheduled with the Construction Representative to minimize or avoid any disruption of facility operations. In no case, unless previously approved in writing by the Construction Representative, shall utilities be left disconnected at the end of a work day or over a weekend. Any interruption of utilities either intentionally or accidentally shall not relieve the Contractor responsible for the interruption from the responsibility to repair and restore the utility to normal service. Repairs and restoration shall be made before the workers responsible for the repair and restoration leave the job.

J. Contractors shall limit operations and storage of materials to the area within the project, except as necessary to connect to existing utilities, and shall not encroach on neighboring property. The Contractor shall be responsible for repair of their damage to property on or off the project site occurring during construction of project. All such repairs shall be made to the satisfaction of the property owner.

K. Unless otherwise permitted, all materials shall be new and both workmanship and materials shall be of the best quality.

L. Unless otherwise provided and stipulated within these specifications, the Contractor shall furnish, construct, and/or install and pay for materials, devices, mechanisms, equipment, all necessary personnel, utilities including, but not limited to water, heat, light and electric power, transportation services, applicable taxes of every nature, and all other facilities necessary for the proper execution and completion of the work.

M. Contractor shall carefully examine the plans and drawings and shall be responsible for the proper fitting of his material, equipment and apparatus into the building.

N. The Contractor or subcontractors shall not overload, or permit others to overload, any part of any structure during the performance of this contract.

O. All temporary shoring, bracing, etc., required for the removal of existing work and/or for the installation of new work shall be included in this contract. The Contractor shall make good, at no cost to the Owner, any damage caused by improper support or failure of shoring in any respect. Each Contractor shall be responsible for shoring required to protect his work or adjacent property and improvements of Owner and shall be responsible for shoring or for giving written notice to adjacent property owners. Shoring shall be removed only after completion of permanent supports.

P. The Contractor shall provide at the proper time such material as is required for support of the work. If openings are required, whether shown on drawings or not, the Contractor shall see that they are properly constructed.

Q. During the performance of work the Contractor shall be responsible for providing and maintaining warning signs, lights, signal devices, barricades, guard rails, fences and other devices appropriately located on site which will give proper and understandable warning to all persons of danger of entry onto land, structure or equipment.

R. The Contractor shall be responsible for protection, including weather protection, and proper maintenance of all equipment and materials.

S. The Contractor shall be responsible for care of the finished work and shall protect same from damage or defacement until substantial completion by the Owner. If the work is damaged by any cause, the Contractor shall immediately begin to make repairs in accordance with the drawings and specifications. Contractor shall be liable for all damage or loss unless attributable to the acts or omissions of the Owner or Designer. Any claim for reimbursement shall be submitted in accordance with Article 4. After substantial completion the Contractor will only be responsible for damage resulting from acts or omissions of the Contractor or subcontractors through final warranty.

T. In the event the Contractor encounters an unforeseen hazardous material, the Contractor

shall immediately stop work in the area affected and report the condition to the Owner and Designer in writing. The Contractor shall not be required, pursuant to Article 4, to perform, any work relating to hazardous materials.

U. In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 4.

V. Before commencing work, Contractors shall confer with the Construction Representative and facility representative and review any facility rules and regulations which may affect the conduct of the work.

W. Project signs will only be erected on major projects and only as described in the specifications. If no sign is specified, none shall be erected.

ARTICLE 3.7 -- SUBCONTRACTS

A. Subcontractor assignments as identified in the bid form shall not be changed without written approval of the Owner. The Owner will not approve changes of a listed subcontractor unless the Contractor documents, to the satisfaction of the Owner that the subcontractor cannot or will not perform the work as specified.

B. The Contractor is fully responsible to the Owner for the acts and omissions of all subcontractors and of persons either directly or indirectly employed by them.

C. Every subcontractor shall be bound by the applicable terms and provisions of these contract documents, but no contractual relationship shall exist between any subcontractor and the Owner unless the right of the Contractor to proceed with the work is suspended or this contract is terminated as herein provided, and the Owner in writing elects to assume the subcontract.

D. The Contractor shall upon receipt of "Notice to Proceed" and prior to submission of the first payment request, notify the Designer and Construction Representative in writing of the names of any subcontractors to be used in addition to those identified in the bid form and all major material suppliers proposed for all parts of the work.

ARTICLE 4 -- CHANGES IN THE WORK

4.1 CHANGES IN THE WORK

A. The Construction Representative, without giving notice to the surety and without invalidating this contract, may order extra work or make changes by altering, adding to or deducting from the work, this contract sum being adjusted accordingly. All such work shall be executed under the conditions of the original contract. A claim for extension of time caused by any change must be adjusted at the time of ordering such change. No future request for time will be considered.

B. Each Contract Change shall include all costs required to perform the work including all labor, material, equipment, overheads and profit, delay, disruptions, or other miscellaneous expenses. No subsequent requests for additional compensation including claims for delay, disruption, or reduced efficiency as a result of each change will be considered. Values from the Schedule of Values will not be binding as a basis for additions to or deductions from the contract price.

C. The amount of any adjustment in this contract price for authorized changes shall be agreed upon before such changes become effective and shall be determined, through submission of a request for proposal, as follows:

1. By an acceptable fixed price proposal from the Contractor. Breakdowns shall include all takeoff sheets of each Contractor and subcontractor. Breakdown shall include a listing of each item of material with unit prices and number of hours of labor for each task. Labor costs per hour shall be included with labor burden identified, which shall be not less than the prevailing wage rate, etc. Overhead and profit shall be shown separately for each subcontractor and the Contractor.

2. By a cost-plus-fixed-fee (time and material) basis with maximum price, total cost not to exceed said maximum. Breakdown shall include a listing of each item of material with unit prices and number of hours of labor for each task. Labor costs per hour shall be included with labor burden identified, which shall be not less than the prevailing wage rate, etc. Overhead and profit shall be shown separately for each subcontractor and the Contractor.

3. By unit prices contained in Contractor's original bid form and incorporated in the construction contract.

D. Overhead and Profit on Contract Changes shall be applied as follows:

1. The overhead and profit charge by the Contractor and all subcontractors shall be considered to include, but is not limited to: incidental job burdens, small truck (under 1 ton) expense, mileage, small hand tools,

warranty costs, company benefits and general office overhead. Project supervision including field supervision and job site office expense shall be considered a part of overhead and profit unless a compensable time extension is granted.

2. The percentages for overhead and profit charged on Contract Changes shall be negotiated, and may vary according to the nature, extent, and complexity of the work involved. However, the overhead and profit for the Contractor or subcontractor actually performing the work shall not exceed 14%. When one or more tiers of subcontractors are used, in no event shall any Contractor or subcontractor receive as overhead and profit more than 3% of the cost of the work performed by any of his subcontractors. In no case shall the total overhead and profit paid by the Owner on any Contract Changes exceed twenty percent (20%) of the cost of materials, labor and equipment (exclusive of Contractor or any Subcontractor overhead and profit) necessary to put the contract change work in place.

3. The Contractor will be allowed to add the cost of bonding and insurance to their cost of work. This bonding and insurance cost shall not exceed 2% and shall be allowed on the total cost of the added work, including overhead and profit.

4. On proposals covering both increases and decreases in the amount of this contract, the application of overhead and profit shall be on the net change in the cost of the work.

5. The percentage for overhead and profit to be credited to the Owner on Contract Changes that are solely decreases in the quantity of work or materials shall be negotiated, and may vary according to the nature, extent and complexity of the work involved, but in no case shall be less than ten percent (10%). If the percentage for overhead and profit charged for work added by Contract Changes for this contract has been negotiated to less than 10%, the negotiated rate shall then apply to credits as well.

E. No claim for an addition to this contract sum shall be valid unless authorized as aforesaid in writing by the Owner. In the event that none of the foregoing methods are agreed upon, the Owner may order the Contractor to perform work on a time and material basis. The cost of such work shall be determined by the Contractor's actual labor and material cost to perform the work plus overhead and profit as outlined herein. The Designer and Construction Representative shall approve the Contractor's daily time and material invoices for the work involved.

F. If the Contractor claims that any instructions involve extra cost under this contract, the Contractor shall give the Owner's Representative written notice thereof within a reasonable time after the receipt of such instructions, and in any event before proceeding to execute the work. No such claim shall be valid unless so made and authorized by the Owner, in writing.

G. In an emergency affecting the safety of life or of the structure or of adjoining property, the Contractor, without special instruction or authorization from the Construction Representative, is hereby permitted to act at their discretion to prevent such threatened loss or injury. The Contractor shall submit a claim for compensation for such emergency work in writing to the Owner's Representative.

ARTICLE 4.2 – CHANGES IN COMPLETION TIME

A. Extension of the number of work days stipulated in the Contract for completion of the work with compensation may be made when:

1. The contractor documents that proposed Changes in the work, as provided in Article 4.1, extends construction activities critical to contract completion date, OR

2. The Owner suspends all work for convenience of the Owner as provided in Article 7.3, OR

3. An Owner caused delay extends construction activities critical to contract completion (except as provided elsewhere in these General Conditions). The Contractor is to review the work activities yet to begin and evaluate the possibility of rescheduling the work to minimize the overall project delay.

B. Extension of the number of work days stipulated in the Contract for completion of the work <u>without</u> compensation may be made when:

1. Weather-related delays occur, subject to provisions for the inclusion of a specified number of "bad weather" days when provided for in Section 012100-Allowances, OR

2. Labor strikes or acts of God occur, OR

3. The work of the Contractor is delayed on account of conditions which were beyond the control of the Contractor, subcontractors or suppliers, and were not the result of their fault or negligence.

C. No time extension or compensation will be provided for delays caused by or within the control

of the Contractor, subcontractors or suppliers and for concurrent delays caused by the Owner.

D. The Contractor shall notify the Owner promptly of any occurrence or conditions which in the Contractor's opinion results in a need for an extension of time. The notice shall be in writing and shall include all necessary supporting materials with details of any resultant costs and be submitted in time to permit full investigation and evaluation of the Contractor's claim. The Owner shall promptly acknowledge the Contractor's notice and, after recommendation from the Owner's Representative and/or Designer, shall provide a decision to the Contractor. Failure on the part of the Contractor to provide such notice and to detail the costs shall constitute a waiver by the Contractor of any claim. Requests for extensions of time shall be for working days only.

ARTICLE 5 - CONSTRUCTION AND COMPLETION

ARTICLE 5.1 – CONSTRUCTION COMMENCEMENT

A. Upon receipt of the "Intent to Award" letter, the Contractor must submit the following properly executed instruments to the Owner:

1. Contract;
2. Performance/payment bond as described in Article 6.1;
3. Certificates of Insurance, or the actual policies themselves, showing that the Contractor has obtained the insurance coverage required by Article 6.2.
4. Written Affirmative Action Plans as required in Article 1.4.

Above referenced items must be received by the Owner within ten (10) working days after the effective date of the contract. If not received, the Owner may treat the failure to timely submit them as a refusal by the Contractor to accept a contract for this work and may retain as liquidated damages the Contractor's bid bond, cashier's check or certified check as provided in the Instructions to Bidders. Upon receipt the Owner will issue a "Notice to Proceed" with the work to the Contractor.

B. Within the time frame noted in Section 013200 - Schedules, following receipt of the "Notice to Proceed", the Contractor shall submit to the Owner a progress schedule and schedule of values, showing activities through the end of the contract period. Should the Contractor not receive written notification from the Owner of the disapproval of the schedule of values within fifteen (15) working days, the Contractor may consider it approved for purpose of determining when the first monthly Application and Certification for Payment may be submitted.

C. The Contractor may commence work upon receipt of the Division of Facilities Management, Design and Construction's "Notice to Proceed" letter. Contractor shall prosecute the work with faithfulness and energy, and shall complete the entire work on or before the completion time stated in the contract documents or pay to the Owner the damages resulting from the failure to timely complete the work as set out within Article 5.4.

ARTICLE 5.2 -- PROJECT CONSTRUCTION

A. Each Contractor shall submit for the Owner's approval, in reproducible form, a progress schedule showing the rate of progress and the order of the work proposed to carry on various phases of the project. The schedule shall be in conformance with the requirements outlined in Section 013200 – Schedules.

B. Contractor shall employ and supply a sufficient force of workers, material, and equipment and shall pay when due, any worker, subcontractor or supplier and otherwise prosecute the work with such diligence so as to maintain the rate of progress indicated on the progress schedule, prevent work stoppage, and insure completion of the project within the time specified.

ARTICLE 5.3 -- PROJECT COMPLETION

A. Substantial Completion. A Project is substantially complete when construction is essentially complete and work items remaining to be completed can be done without interfering with the Owner's ability to use the Project for its intended purpose.

1. Once the Contractor has reached what they believe is Substantial Completion, the Contractor shall notify the Designer and the Construction Representative of the following:
   a. That work is essentially complete with the exception of certain listed work items. The list shall be referred to as the "Contractor's Punch."
   b. That all Operation and Maintenance Manuals have been assembled and submitted in accordance with Article 3.5A.
   c. That the Work is ready for inspection by the Designer and Construction Representative. The Owner shall be entitled to a minimum of ten working

days notice before the inspection shall be performed.

2. If the work is acceptable, the Owner shall issue a Certificate of Substantial Completion, which shall set forth the responsibilities of the Owner and the Contractor for utilities, security, maintenance, damage to the work and risk of loss. The Certificate shall also identify those remaining items of work to be performed by the Contractor. All such work items shall be complete within 30 working days of the date of the Certificate, unless the Certificate specifies a different time. If the Contractor shall be required to perform tests that must be delayed due to climatic conditions, it is understood that such tests and affected equipment will be identified on the Certificate and shall be accomplished by the Contractor at the earliest possible date. Performance of the tests may not be required before Substantial Completion can be issued. The date of the issuance of the Certificate of Substantial Completion shall determine whether or not the work was completed within the contract time and whether or not Liquidated Damages are due.

3. If the work is not acceptable, and the Owner does not issue a Certificate of Substantial Completion, the Owner shall be entitled to charge the Contractor with the Designer's and Owner's costs of re-inspection, including time and travel.

B. Partial Occupancy. Contractor agrees that the Owner shall be permitted to occupy and use any completed or partially completed portions of the Project, when such occupancy and use is in the Owner's best interest. Owner shall notify Contractor of its desire and intention to take Partial Occupancy as soon as possible but at least ten (10) working days before the Owner intends to occupy. If the Contractor believes that the portion of the work the Owner intends to occupy is not ready for occupancy, the Contractor shall notify the Owner immediately. The Designer shall inspect the work in accordance with the procedures above. If the Contractor claims increased cost of the project or delay in completion as a result of the occupancy, he shall notify the Owner immediately but in all cases before occupancy occurs.

C. Final Completion. The Project is finally complete when the Certificate of Substantial Completion has been issued and all work items identified therein as incomplete have been completed, and when all administrative items required by the contract have been completed. Final Completion entitles the Contractor to payment of the outstanding balance of the contract amount including all change orders and retainage. Within five (5) working days of the date of the Certificate of Substantial Completion, the Contractor shall identify the cost to complete any outstanding items of work. The Designer shall review the Contractor's estimate and either approve it or provide an independent estimate for all such items. If the Contractor fails to complete the remaining items within the time specified in the Certificate, the Owner may terminate the contract and go to the surety for project completion in accordance with Article 7.2 or release the contract balance to the Contractor less 150% of the approved estimate to complete the outstanding items. Upon completion of the outstanding items, when a final cost has been established, any monies remaining shall be paid to the Contractor. Failure to complete items of work does not relieve the Contractor from the obligation to complete the administrative requirements of the contract, such as the provisions of Article 5.3 FAILURE TO COMPLETE ALL ITEMS OF WORK UNDER THE CONTRACT SHALL BE CONSIDERED A DEFAULT AND BE GROUNDS FOR CONTRACT TERMINATION AND DEBARMENT.

D. Liquidated Damages. Contractor agrees that the Owner may deduct from the contract price and retain as liquidated damages, and not as penalty or forfeiture, the sum stipulated in this contract for each work day after the Contract Completion Day on which work is not Substantially Complete. Assessment of Liquidated Damages shall not relieve the Contractor or the surety of any responsibility or obligation under the Contract. In addition, the Owner may, without prejudice to any other rights, claims, or remedies the Owner may have including the right to Liquidated Damages, charge the Contractor for all additional expenses incurred by the Owner and/or Designer as the result of the extended contract period through Final Completion. Additional Expenses shall include but not be limited to the costs of additional inspections.

E. Early Completion. The Contractor has the right to finish the work before the contract completion date; however, the Owner assumes no liability for any hindrances to the Contractor unless Owner caused delays result in a time extension to the contract completion date. The Contractor shall not be entitled to any claims for lost efficiencies or for delay if a Certificate of Substantial Completion is given on or before the Contract Completion Date.

ARTICLE 5.4 -- PAYMENT TO CONTRACTOR

A. Payments on account of this contract will be made monthly in proportion to the work which has been completed. Request for payment must be submitted on the Owner's forms. No other pay request will

be processed. Supporting breakdowns must be in the same format as Owner's forms and must provide the same level of detail. The Designer will, within 5 working days from receipt of the contractor's request for payment either issue a Certificate for Payment to the Owner, for such amount as the Designer determines is properly due, or notify the Contractor in writing of reasons for withholding a Certificate. The Owner shall make payment within 30 calendar days after the "Application and Certification for Payment" has been received and certified by the Designer. The following items are to be attached to the contractor's pay request:

1. Updated construction schedule
2. Certified payrolls consisting of name, occupation and craft, number of hours worked and actual wages paid for each individual employee, of the Contractor and all subcontractors working on the project

B. The Owner shall retain 5 percent of the amount of each such payment application, except as allowed by Article 5.4, until final completion and acceptance of all work covered by this contract.

C. Each payment made to Contractor shall be on account of the total amount payable to Contractor and all material and work covered by paid partial payment shall thereupon become the sole property of Owner. This provision shall not be construed as relieving Contractor from sole responsibility for care and protection of materials and work upon which payments have been made or restoration of any damaged work or as a waiver of the right of Owner to require fulfillment of all terms of this contract.

D. Materials delivered to the work site and not incorporated in the work will be allowed in the Application and Certification for Payment on the basis of one hundred (100%) percent of value, subject to the 5% retainage providing that they are suitably stored on the site or in an approved warehouse in accordance with the following requirements:

1. Material has previously been approved through submittal and acceptance of shop drawings conforming to requirements of Article 3.2 of General Conditions.
2. Delivery is made in accordance with the time frame on the approved schedule.
3. Materials, equipment, etc., are properly stored and protected from damage and deterioration and remain so - if not, previously approved amounts will be deleted from subsequent pay applications.
4. The payment request is accompanied by a breakdown identifying the material equipment, etc. in sufficient detail to establish quantity and value.

E. The Contractor shall be allowed to include in the Application and Certification for Payment, one hundred (100%) of the value, subject to retainage, of major equipment and material stored off the site if all of the following conditions are met:

1. The request for consideration of payment for materials stored off site is made at least 15 working days prior to submittal of the Application for Payment including such material. Only materials inspected will be considered for inclusion on Application for Payment requests.
2. Materials stored in one location off site are valued in excess of $25,000.
3. That a Certificate of Insurance is provided indicating adequate protection from loss, theft conversion or damage for materials stored off site. This Certificate shall show the State of Missouri as an additional insured for this loss.
4. The materials are stored in a facility approved and inspected, by the Construction Representative.
5. Contractor shall be responsible for, Owner costs to inspect out of state facilities, and any delays in the completion of the work caused by damage to the material or for any other failure of the Contractor to have access to this material for the execution of the work.

F. The Owner shall determine the amount, quality and acceptability of the work and materials which are to be paid for under this contract. In the event any questions shall arise between the parties, relative to this contract or specifications, determination or decision of the Owner or the Construction Representative and the Designer shall be a condition precedent to the right of the Contractor to receive any money or payment for work under this contract affected in any manner or to any extent by such question.

G. Payments Withheld: The Owner may withhold or nullify in whole or part any certificate to such extent as may be necessary to protect the Owner from loss on account of:

1. Defective work not remedied. When a notice of noncompliance is issued on an item or items, corrective action shall be undertaken immediately. Until corrective action is completed, no monies will be paid and no additional time will be allowed for the item or

items. The cost of corrective action(s) shall be borne by the Contractor.

2. A reasonable doubt that this contract can be completed for the unpaid balance.

3. Failure of the Contractor to update as-built drawings monthly for review by the Construction Representative.

4. Failure of the Contractor to update the construction schedule.

When the Construction Representative is satisfied the Contractor has remedied above deficiencies, payment shall be released.

H. Final Payment: Upon receipt of written notice from the Contractor to the Designer and Project Representative that the work is ready for final inspection and acceptance, the Designer and Project Representative, with the Contractor, shall promptly make such inspection. If the work is acceptable and the contract fully performed, the Construction Representative shall complete a final acceptance report and the Contractor will be directed to submit a final Application and Certification for Payment. If the Owner approves the same, the entire balance shall be due and payable, with the exception of deductions as provided for under Article 5.4.

1. Where the specifications provide for the performance by the Contractor of (certain tests for the purpose of balancing and checking the air conditioning and heating equipment and the Contractor shall have furnished and installed all such equipment in accordance with the specifications, but said test cannot then be made because of climatic conditions, such test shall may be considered as required under the provisions of the specifications, Section 013300 and this contract may be substantial Full payment will not be made until the tests have been made and the equipment and system is finally accepted. If the tests are not completed when scheduled, the Owner may deduct 150% of the value of the tests from the final payment.

2. The final payment shall not become due until the Contractor delivers to the Construction Representative:

a) A complete file of releases, on the standard form included in the contract documents as "Final Receipt of Payment and Release Form", from subcontractors and material suppliers evidencing payment in full for services, equipment and materials, as the case may require, if the Owner approves, or a consent from the Surety to final payment accepting liability for any unpaid amounts.

b) An Affidavit of Compliance with Prevailing Wage Law, in the form as included in this contract specifications, properly executed by each subcontractor, and the Contractor

c) Certified copies of all payrolls

d) As-built drawings

3. If any claim remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all monies that the latter may be compelled to pay in discharging such a claim including all costs and a reasonable attorney's fee.

4. Missouri statute requires prompt payment from the Owner to the Contractor within thirty calendar days and from the Contractor to his subcontractors within fifteen calendar days. Failure to make payments within the required time frame entitles the receiving party to charge interest at the rate of one and one half percent per month calculated from the expiration of the statutory time period until paid.

5. The value of all unused unit price allowances and/or 150% of the value of the outstanding work items, and/or liquidated damages may be deducted from the final pay request without executing a Contract Change. Any unit price items which exceed the number of units in the contract may be added by Contract Change.

ARTICLE 6 -- INSURANCE AND BONDS

ARTICLE 6.1 -- BOND

A. Contractor shall furnish a performance/payment bond in an amount equal to 100% of the contract price to guarantee faithful performance of the contract and 100% of the contract price to guarantee the payment of all persons performing labor on the project and furnishing materials in connection therewith under this contract as set forth in the standard form of performance and payment bond included in the contract documents. The surety on such bond shall be issued by a surety company authorized by the Missouri Department of Insurance to do business in the state of Missouri.

B. All Performance/Payment Bonds furnished in response to this provision shall be provided by a bonding company with a rating of B+ or higher as established by A.M. Best Company, Inc. in their most recent publication.

ARTICLE 6.2 – INSURANCE

A. The successful Contractor shall procure and maintain for the duration of the contract issued a policy or policies of insurance for the protection of both the Contractor and the Owner and their respective officers, officials, agents, consultants and employees. The Owner requires certification of insurance coverage from the Contractor prior to commencing work.

B. Minimum Scope and Extent of Coverage

1. General Liability

Commercial General Liability, ISO coverage form number or equivalent CG 00 01 ("occurrence" basis), or I-SO coverage form number CG 00 02, or ISO equivalent.

If ISO equivalent or manuscript general liability coverage forms are used, minimum coverage will be as follows: Premises/Operations; Independent Contractors; Products/Completed Operations; personal Injury; Broad Form Property Damage including Completed Operations; Broad Form Contractual Liability Coverage to include Contractor's obligations under Article 1.11 Indemnification and any other Special Hazards required by the work of the contract.

2. Automobile Liability

Business Automobile Liability Insurance, ISO Coverage form number or equivalent CA 00 01 covering automobile liability, code 1 "ANY AUTO".

3. Workers' Compensation and Employer's Liability

Statutory Workers' Compensation Insurance for Missouri and standard Employer's Liability Insurance, or the authorization to self-insure for such liability from the Missouri Division of Workers' Compensation.

4. Builder's Risk or Installation Floater Insurance

Insurance upon the work and all materials, equipment, supplies, temporary structures and similar items which may be incident to the performance of the work and located at or adjacent to the site, against loss or damage from fire and such other casualties as are included in extended coverage in broad "All Risk" form, including coverage for Flood and Earthquake, in an amount not less than the replacement cost of the work or this contact price, whichever is greater, with loss payable to Contractor and Owner as their respective interests may appear.

Contractor shall maintain sufficient insurance to cover the full value of the work and materials as the work progresses, and shall furnish Owner copies of all endorsements. If Builder's Risk Reporting- Form of Endorsement is used, Contractor shall make all reports as required therein so as to keep in force an amount of insurance which will equal the replacement cost of the work, materials, equipment, supplies, temporary structures, and other property covered thereby; and if, as a result of Contractor's failure to make any such report, the amount of insurance so recoverable shall be less than such replacement cost, Contractor's interest in the proceeds of such insurance, if any, shall be subordinated to Owner's interest to the end that Owner may receive full reimbursement for its loss.

C. Minimum Limits of Insurance

1. General Liability

Contractor

$2,000,000	combined single limit per occurrence for bodily injury, personal injury, and property damage
$2,000,000	annual aggregate

2. Automobile Liability

$2,000,000	combined single limit per occurrence for bodily injury and property damage

3. Workers' Compensation and Employers Liability

Workers' Compensation limits as required by applicable State Statutes (generally unlimited) and minimum of $1,000,000 limit per accident for Employer's Liability.

General Liability and Automobile Liability insurance may be arranged under individual policies for the full limits required or by a combination of underlying policies with the balance provided by a form-following Excess or Umbrella Liability policy.

D. Deductibles and Self-Insured Retentions

All deductibles, co-payment clauses, and self-insured retentions must be declared to and approved by the Owner. The Owner reserves the right to request the reduction or elimination of unacceptable deductibles or self-insured retentions, as they would apply to the Owner, and their respective officers, officials, agents, consultants and employees. Alternatively, the Owner may request Contractor to procure a bond guaranteeing

payment of losses and related investigations, claims administration, and defense expenses.

E. Other Insurance Provisions and Requirements

The respective insurance policies and coverage, as specified below, must contain, or be endorsed to contain the following conditions or provisions:

1. General Liability

The Owner, and its respective commissioners, officers, officials, agents, consultants and employees shall be endorsed as additional insured's by ISO form CG 20 26 Additional Insured - Designated Person or Organization. As additional insured's, they shall be covered as to work performed by or on behalf of the Contractor or as to liability which arises out of Contractor's activities or resulting from the performance of services or the delivery of goods called for by the Contract.

Contractor's insurance coverage shall be primary with respect to all additional insured's. Insurance of self-insurance programs maintained by the designated additional -insured's shall be excess of the Contractor's insurance and shall not contribute with it.

Additionally, the Contractor and Contractor's general liability insurer shall agree to waive all rights of subrogation against the Owner and any of their respective officers, officials, agents, consultants or employees for claims, losses, or expenses which arise out of Contractor's activities or result from the performance of services or the delivery of goods called for by the Contract.

Contractor's failure to comply with the terms and conditions of these insurance policies shall not affect or abridge coverage for the Owner, or for any of their officers, officials, agents, consultants or employees.

2. Automobile Insurance

The Owner, and their respective officers, officials, agents, consultants and employees shall be endorsed as additional insured's by ISO form CG 20 26 - Additional Insured Designated Person or Organization. As additional insured's, they shall be covered as to work performed by or on behalf of the Contractor or as to liability which arises out of Contractor's activities or resulting from the performance of services or the delivery of goods called for by the Contract.

Contractor's insurance coverage shall be primary with respect to all additional insured's. Insurance or self-insurance programs maintained by the designated additional insured's shall be in excess of the Contractor's insurance and shall not contribute with it.

Additionally, the Contractor and Contractor's automobile insurer shall agree to waive all rights of subrogation against the Owner and any of their respective officers, officials, agents, consultants or employees for claims, losses, or expenses which arise out of Contractor's activities or result from the performance of services or the delivery of goods called for by the Contract.

Contractor's failure to comply with the terms and conditions of these insurance policies shall not affect or abridge coverage for the Owner or for any of its officers, officials, agents, consultants or employees.

3. Workers' Compensation/Employer's Liability

Contractor's workers' compensation insurance shall be endorsed with NCCI form WC 00 03 01 A - Alternative Employer Endorsement. The Alternative Employer Endorsement shall designate the Owner as "alternate employers."

4. All Coverages

Each insurance policy required by this section of the Contract shall contain a stipulation, endorsed if necessary, that the Owner will receive a minimum of a thirty (30) calendar day advance notice of any policy cancellation. Ten (10) calendar days advance notice is required for policy cancellation due to non-payment of premium.

F. Insurer Qualifications and Acceptability

Insurance required hereunder shall be issued by an A.M. Best, "B+" rated, Class IX insurance company approved to conduct insurance business in the state of Missouri.

G. Verification of Insurance Coverage

Prior to Owner issuing a Notice to Proceed, the Contractor-shall furnish the Owner with Certificate(s) of Insurance and with any applicable original endorsements evidencing the required insurance coverage. The insurance certificates and endorsements are to be signed by a person authorized by that insurer to bind coverage on its behalf. All certificates and endorsements received by the Owner are subject to review and approval by the Owner. The Owner reserves the right to require certified copies of all required policies at any time. If the scope of this contract will exceed one (1) year - or, if any of Contractor's applicable insurance coverage expires prior to completion of the work or services required under this contract -

the Contractor will provide a renewal or replacement certificate before continuing work or services hereunder. If the Contractor fails to provide documentation of required insurance coverage, the Owner may issue a stop work order and no additional contract completion time and/or compensation shall be granted as a result thereof.

ARTICLE 7 – SUSPENSION OR TERMINATION OF CONTRACT

ARTICLE 7.1 - FOR SITE CONDITIONS

When conditions at the site of the proposed work are considered by the Owner to be unsatisfactory for prosecution of the work, the Contractor may be ordered in writing to suspend the work or any part thereof until reasonable conditions exist. When such suspension is not due to fault or negligence of the Contractor, time allowed for completion of such suspended work will be extended by a period of time equal to that lost due to delay occasioned by ordered suspension. This will be a no cost time extension.

ARTICLE 7.2 - FOR CAUSE

A. Termination or Suspension for Cause:

1. If the Contractor shall file for bankruptcy, or should make a general assignment for the benefit of the creditors, or if a receiver should be appointed on account of insolvency, or if the contractor should persistently or repeatedly refuse or fail to supply enough properly skilled workers or proper materials, or if the contractor should fail to make prompt payment to subcontractors or for material or labor, or persistently disregard laws, ordinances or the instructions of the Owner, or otherwise be guilty of a substantial violation of any provision of this contract, then the Owner may serve notice on the Contractor and the surety setting forth the violations and demanding compliance with this contract. Unless within ten (10) consecutive calendar days after serving such notice, such violations shall cease and satisfactory arrangements for correction be made, the Owner may suspend the Contractor's right to proceed with the work or terminate this contract.

2. In the event the Owner suspends Contractor's right to proceed with the work or terminates the contract, the Owner may demand that the Contractor's surety take over and complete the work on this contract, after the surety submits a written proposal to the Owner and receives written approval and upon the surety's failure or refusal to do so within ten (10) consecutive calendar days after demand therefore, the Owner may take over the work and prosecute the same to completion by bid or negotiated contract, or the Owner may elect to take possession of and utilize in completing the work such materials, supplies, appliances and plant as may be on the site of the work, and all subcontractors, if the Owner elects, shall be bound to perform their contracts.

B. The Contractor and its surety shall be and remain liable to the Owner for any excess cost or damages occasioned to the Owner as a result of the actions above set forth.

C. The Contractor in the event of such suspension or termination shall not be entitled to receive any further payments under this contract until the work is wholly finished. Then if the unpaid balance under this contract shall exceed all expenses of the Owner as certified by the Director, such excess shall be paid to the Contractor; but, if such expenses shall exceed the unpaid balance as certified by the Director, the Contractor and their surety shall be liable for and shall pay the difference and any damages to the Owner.

D. In exercising Owner's right to secure completion of the work under any of the provisions hereof, the Director shall have the right to exercise Owner's sole discretion as to the manner, methods and reasonableness of costs of completing the work.

E. The rights of the Owner to suspend or terminate as herein provided shall be cumulative and not exclusive and shall be in addition to any other remedy provided by law.

F. The Contractor in the event of such suspension or termination may be declared ineligible for Owner contracts for a minimal period of twelve (12) months. Further, no contract will be awarded to any Contractor who lists in their bid form any subcontractor whose prior performance has contributed, as determined by the Owner, to a breach of a contract. In order to be considered for state-awarded contracts after this period, the Contractor/subcontractor will be required to forward acceptance reports to the Owner regarding successful completion of non-state projects during the intervening twelve (12) months from the date of default. No contracts will be awarded to a subcontractor/Contractor until the ability to perform responsibly in the private sector has been proven to the Owner.

ARTICLE 7.3 -- FOR CONVENIENCE

A. The Owner may terminate or suspend the Contract or any portion of the Work without cause at any time, and at the Owner's convenience. Notification of a termination or suspension shall be in writing

and shall be given to the Contractor and their surety. If the Contract is suspended, the notice will contain the anticipated duration of the suspension or the conditions under which work will be permitted to resume. If appropriate, the Contractor will be requested to demobilize and re-mobilize and will be reimbursed time and costs associated with the suspension.

B. Upon receipt of notification, the Contractor shall:

1. Cease operations when directed.

2. Take actions to protect the work and any stored materials.

3. Place no further subcontracts or orders for material, supplies, services or facilities except as may be necessary to complete the portion of the Contract that has not been terminated. No claim for payment of materials or supplies ordered after the termination date shall be considered.

4. Terminate all existing subcontracts, rentals, material, and equipment orders.

5. Settle all outstanding liabilities arising from termination with subcontractors and suppliers.

6. Transfer title and deliver to the Owner, work in progress, completed work, supplies and other material produced or acquire for the work terminated, and completed or partially completed plans, drawings information and other property that, if the Contract had been completed, would be required to be furnished to the Owner.

C. For termination without cause and at the Owner's convenience, in addition to payment for work completed prior to date of termination, the Contractor may be entitled to payment of other documented costs directly associated with the early termination of the contract. Payment for anticipated profit and unapplied overhead will not be allowed.

SECTION 007300 - SUPPLEMENTARY CONDITIONS

1.0 GENERAL:

A. These Supplementary General Conditions clarify, add, delete, or otherwise modify standard terms and conditions of DIVISION 0, BIDDING AND CONTRACTING REQUIREMENTS.

2.0 CONTACTS:

Designer:
Robert Jensen
Selective Site Consultants
7171 West 95th Street, Ste 600
Overland Park, KS 66212
Telephone: (913) 438-7700
Email: rjensen@ssc.us.com

Construction Representative:
Don Wagner
Division of Facilities Management, Design and Construction
149 Park Central Square RM 328B
Springfield, MO 65806
Telephone: (417) 895-5001
Email: Don.Wagner@oa.mo.gov

Project Manager:
Scott Zeller
Division of Facilities Management, Design and Construction
301 West High Street, Room 730
Jefferson City, Missouri 65101
Telephone: (573) 751-2668
Email: Scott.Zeller@oa.mo.gov

Contract Specialist:
Mandy Roberson
Division of Facilities Management, Design and Construction
301 West High Street, Room 730
Jefferson City, Missouri 65101
Telephone: 573-522-0074
Email: mandy.roberson@oa.mo.gov

3.0 NOTICE: ALL BID MATERIALS ARE DUE AT THE TIME OF BID SUBMITTAL. THERE IS NO SECOND SUBMITTAL FOR THIS PROJECT.

4.0 FURNISHING CONSTRUCTION DOCUMENTS:

A. The Owner will furnish the Contractor with approximately 5 complete sets of drawings and specifications at no charge.

B. The Owner will furnish the Contractor with approximately 5 sets of explanatory or change drawings at no charge.

C. The Contractor may make copies of the documents as needed with no additional cost to the Owner.

5.0 SAFETY REQUIREMENTS

Contractor and subcontractors at any tier shall comply with RSMo 292.675 and Article 1.3, E, of Section 007213, General Conditions.

Missouri
Division of Labor Standards
WAGE AND HOUR SECTION

MICHAEL L. PARSON, Governor

Annual Wage Order No. 29

Section 039
GREENE COUNTY

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards, P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by
Todd Smith, Director
Division of Labor Standards

Filed With Secretary of State: **March 10, 2022**

Last Date Objections May Be Filed: **April 11, 2022**

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	$32.85
Boilermaker	$29.20*
Bricklayer	$50.58
Carpenter	$45.61
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	$38.00
Plasterer	
Communications Technician	$27.82
Electrician (Inside Wireman)	$46.27
Electrician Outside Lineman	$29.20*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	$29.20*
Glazier	$40.53
Ironworker	$63.40
Laborer	$38.31
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	$46.95
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	$42.14
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	$36.40
Plumber	$49.22
Pipe Fitter	
Roofer	$40.77
Sheet Metal Worker	$48.70
Sprinkler Fitter	$62.37
Truck Driver	$29.20*
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. The public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.
**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in Section 290.210 RSMo.

Heavy Construction Rates for
GREENE County

Section 039

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	$50.57
Millwright	
Pile Driver	
Electrician (Outside Lineman)	$29.20*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	$41.69
General Laborer	
Skilled Laborer	
Operating Engineer	$48.05
Group I	
Group II	
Group III	
Group IV	
Truck Driver	$46.10
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

Use Heavy Construction Rates on Highway and Heavy construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(3).

Use Building Construction Rates on Building construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(2).

If a worker is performing work on a heavy construction project within an occupational title that is not listed on the Heavy Construction Rate Sheet, use the rate for that occupational title as shown on the Building Construction Rate Sheet.

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. The public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in Section 290.210 RSMo.

OVERTIME
and
HOLIDAYS

OVERTIME

For all work performed on a Sunday or a holiday, not less than twice (2x) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work.

For all overtime work performed, not less than one and one-half (1½) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work or contractual obligation. For purposes of this subdivision, **"overtime work"** shall include work that exceeds ten hours in one day and work in excess of forty hours in one calendar week; and

A thirty-minute lunch period on each calendar day shall be allowed for each worker on a public works project, provided that such time shall not be considered as time worked.

HOLIDAYS

January first;
The last Monday in May;
July fourth;
The first Monday in September;
November eleventh;
The fourth Thursday in November; and
December twenty-fifth;

If any holiday falls on a Sunday, the following Monday shall be considered a holiday.

Missouri
Division of Labor Standards
WAGE AND HOUR SECTION

MICHAEL L. PARSON, Governor

Annual Wage Order No. 29

Section 049
JASPER COUNTY

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards, P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by
Todd Smith, Director
Division of Labor Standards

Filed With Secretary of State: **March 10, 2022**

Last Date Objections May Be Filed: **April 11, 2022**

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	$34.90
Boilermaker	$25.69*
Bricklayer	$25.69*
Carpenter	$47.77
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	$25.69*
Plasterer	
Communications Technician	$25.69*
Electrician (Inside Wireman)	$46.79
Electrician Outside Lineman	$25.69*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	$25.69*
Glazier	$39.99
Ironworker	$63.70
Laborer	$37.46
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	$25.69*
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	$25.69*
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	$25.69*
Plumber	$49.11
Pipe Fitter	
Roofer	$39.83
Sheet Metal Worker	$25.69*
Sprinkler Fitter	$63.06
Truck Driver	$25.69*
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. The public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.
**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in Section 290.210 RSMo.

Heavy Construction Rates for
JASPER County

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	$25.69*
Millwright	
Pile Driver	
Electrician (Outside Lineman)	$25.69*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	$42.13
General Laborer	
Skilled Laborer	
Operating Engineer	$48.33
Group I	
Group II	
Group III	
Group IV	
Truck Driver	$25.69*
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

Use Heavy Construction Rates on Highway and Heavy construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(3).

Use Building Construction Rates on Building construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(2).

If a worker is performing work on a heavy construction project within an occupational title that is not listed on the Heavy Construction Rate Sheet, use the rate for that occupational title as shown on the Building Construction Rate Sheet.

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. The public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in Section 290.210 RSMo.

OVERTIME
and
HOLIDAYS

OVERTIME

For all work performed on a Sunday or a holiday, not less than twice (2x) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work.

For all overtime work performed, not less than one and one-half (1½) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work or contractual obligation. For purposes of this subdivision, **"overtime work"** shall include work that exceeds ten hours in one day and work in excess of forty hours in one calendar week; and

A thirty-minute lunch period on each calendar day shall be allowed for each worker on a public works project, provided that such time shall not be considered as time worked.

HOLIDAYS

January first;
The last Monday in May;
July fourth;
The first Monday in September;
November eleventh;
The fourth Thursday in November; and
December twenty-fifth;

If any holiday falls on a Sunday, the following Monday shall be considered a holiday.

SECTION 011000 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and Division 1 Specification Sections apply to this Section.

B. These specifications and construction drawings describe the work to be done and the materials to be furnished for construction. Plans are not to be scaled.

C. The drawings and specifications are intended to be fully explanatory and supplementary, however, should anything be shown, indicated or specified on one and not the other, it shall be done the same as if shown, indicated or specified in both.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The intention of documents is to include all labor and materials reasonably necessary for the proper execution and completion of the work as stipulated in the contract.

B. The Project consists of work to furnish and install two self- supporting communication towers and one equipment shelter. Antennas, transmission lines and other tower accessories will also be furnished and installed. The work also includes sitework, foundations, grounding, security fence and generator installation. Removals consist of one existing tower.

1. Project Locations: Troop D Service Center at 5190 Grand Avenue Carthage, Missouri 64836 and Troop D Headquarters at 3131 East Kearney Street Springfield, Missouri 64803

2. Owner: State of Missouri, Office of Administration, Division of Facilities Management, Design and Construction, Harry S Truman State Office Building, Post Office Box 809, 301 West High Street, Jefferson City, Missouri 65102.

C. Contract Documents, dated December 15, 2022 were prepared for the Project by Selective Site Consultants, Inc. 7171 West 95th Street Suite 600, Overland Park, Kansas.

D. The Work consists of work at two existing sites. One existing site is located at the Troop D Service Center in Carthage, Missouri. The other existing site is located at the Troop D Headquarters in Springfield, Missouri. The work at Troop D Service Center includes the requirement to furnish and install one new tower with accessories and install the specified antennas and transmission lines. The work also includes the requirement to furnish and install one new prefabricated radio shelter and one new generator with accessories. The work at Troop D Headquarters includes the requirement to furnish and install one new tower with accessories and install the specified antennas and transmission lines. Also, at Troop D Headquarters the existing tower is to be removed and a portion of the existing compound fence.

1. The Work includes sitework, foundations, security fence, gravel, concrete paving, station grounding, tower appurtenances and associated equipment.

E. The contractor is responsible for procurement and maintaining all applicable licenses and bonds.

F. The Work will be constructed under a single prime contract.

1.3 WORK UNDER OTHER CONTRACTS

A. Separate Contract: The Owner has not awarded a separate contract for performance of construction operations at the site.

1.4 FUTURE WORK

A. Future Contract: The Owner has not awarded a separate contract for additional work to be performed at the site.

1.5 CONTRACTOR USE OF PREMISES

A. General: During the construction period the Contractor shall have full use of the premises for construction operations, including use of the site. The Contractor's use of the premises limited only by the Owner's right to perform work or to retain other contractors on portions of the Project.

B. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

1. Owner Occupancy: Allow for Owner occupancy and use by the public.
2. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner, the Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Use of the Existing Building: Maintain the existing building in a weathertight condition throughout the construction period. Repair damage cause by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period.

D. Storage: all materials must be stored in a level and dry fashion that does not obstruct the flow of other work. Any storage method must meet all recommendations of the associated manufacturer.

E. Clean up: the contractor shall keep the site free from accumulation of waste materials or rubbish at all times.

1.6 OCCUPANCY REQUIREMENTS

A. Full Owner Occupancy: The Owner will occupy the site and existing building during the entire construction period. Cooperate with the Owner during construction operations to minimize conflicts and facilitate owner usage. Perform the Work so as not to interfere with the Owner's operations.

B. Partial Owner Occupancy: The Owner reserves the right to occupy and to place and install equipment in completed areas of the building prior to Substantial Completion, provided such occupancy does not interfere with completion of the Work. Such placing of equipment and partial occupancy shall not constitute acceptance of the total Work.

1. The Designer will prepare a Certificate of Partial Occupancy for each specific portion of the Work to be occupied prior to substantial completion.
2. Prior to partial Owner occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully

completed. Upon occupancy, the Owner will operate and maintain mechanical and electrical systems serving occupied portions for the building.

3. Upon occupancy, the Owner will assume responsibility for maintenance and custodial service for occupied portions for the building.

END OF SECTION 011000

‘SECTION 012100 – ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions and other Division 1 Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing allowances.

1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements willbe issued by Contract Change.

B. Types of allowances include the following:

1. Weather allowances.

C. Related Sections include the following:

1. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Contract Changes for allowances.

2. Division 1 Section "Unit Prices" for procedures for using unit prices.

1.3 WEATHER ALLOWANCE

A. Included within the completion period for this project are a specified number of “bad weather” days (see Schedule of Allowances).

B. In the event weather conditions preclude performance of critical work activities for 50% or more of the Contractor’s scheduled workday, that day shall be declared unavailable for work due to weather (a “bad weather” day) and charged against the above allowance. Critical work activities will be determined by review of the Contractor’s current progress schedule.

C. The Contractor’s Representative and the Construction Representative shall agree monthly on the number of “bad weather” days to be charged against the allowance. This determination will be documented in writing and be signed by the Contractor and the Construction Representatives. If there is a failure to agree on all or part of the “bad weather” days for a particular month, that disagreement shall be noted on this written document and signed by each party’s representative. Failure of the Contractor’s representative to sign the “bad weather” day documentation after it is presented, with or without the notes of disagreement, shall constitute agreement with the “bad weather” day determination contained in that document.

1.4 SELECTION AND PURCHASE

A. Purchase products and systems selected by Engineer from the designated supplier.

1.5 SUBMITTALS (Not Applicable)

1.6 COORDINATION (Not Applicable)

1.7 [LUMP-SUM] ALLOWANCES (Not Applicable)

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION (Not Applicable)

3.2 PREPARATION (Not Applicable)

3.3 SCHEDULE OF ALLOWANCES

A. Weather Allowance: Included within the completion period for this Project forty (40) "badweather" days.

END OF SECTION 012100

SECTION 012200 – UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1. Drawings and general provisions of the Contract including General and Supplementary Conditions and other Division 1 Specification Sections apply to this Section.

2. Quantities of Units to be included in the Base Bid are indicated in Section 004322 – Unit Prices.

1.2 SUMMARY

1. This Section includes administrative and procedural requirements for Unit Prices.

2. Related Sections include the following:
    1. Division 1 Section "Allowances" for procedures for using Unit Prices to adjust quantity allowances.
    2. Division 1 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

1.3 DEFINITIONS

1. Unit Price is an amount proposed by bidders, stated on the Bid Form Attachment 004322, a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

1. Unit Prices include all necessary material plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

2. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of Unit Prices. Methods of measurement and payment for Unit Prices are specified in those Sections.

3. Owner reserves the right to reject Contractor's measurement of Work in-place that involves use of established Unit Prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

4. List of Unit Prices: A list of Unit Prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each Unit Price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

1. Unit Price No. 1 – Springfield Parking Lot Asphalt Repair:
    1. Description: Cold patch asphalt repair according to Division 015000 Construction Facilities and Temporary Controls.
    2. Unit of Measurement: Square Foot
    3. Base Bid Quantity: 400 Square Feet
2. Unit Price No. 2 - Rock Excavation:
    1. Description: Rock Excavation according to Division 310000 Earthwork.
    2. Unit of Measurement: Cubic Yard
    3. Base Bid Quantity: 10 Cubic Yards

END OF SECTION 012200

SECTION 012600 – CONTRACT MODIFICATION PROCEDURES

PART 4 - GENERAL

4.1 RELATED DOCUMENTS

1. Drawings and general provisions of the Contract including General and Supplementary Conditions and other Division 1 Specification Sections apply to this Section.

4.2 SUMMARY

1. This Section specifies administrative and procedural requirements for handling and processing Contract Modifications.

2. Related Sections include the following:
    1. Division 1, Section 012100 "Allowances" for procedural requirements for handling and processing Allowances.
    2. Division 1, Section 012200 "Unit Prices" for administrative requirements for using Unit Prices.
    3. Division 1, Section 013115 “Project Management Communications” for administrative requirements for communications.
    4. Division 0, Section 007213, Article 3.1 "Acceptable Substitutions" for administrative procedures for handling Requests for Substitutions made after Contract award.
    5. Division 0, Section 007213, Article 4.0 "Changes in the Work" for Change Order requirements.

4.3 REQUESTS FOR INFORMATION

1. In the event that the Contractor or Subcontractor, at any tier, determines that some portion of the Drawings, Specifications, or other Contract Documents requires clarification or interpretation, the Contractor shall submit a “Request for Information” (RFI) in writing to the Designer. A RFI may only be submitted by the Contractor and shall only be submitted on the RFI forms provided by the Owner. The Contractor shall clearly and concisely set forth the issue for which clarification or interpretation is sought and why a response is needed. In the RFI, the Contractor shall set forth an interpretation or understanding of the requirement along with reasons why such an understanding was reached.

2. Responses to RFI shall be issued within ten (10) working days of receipt of the Request from the Contractor unless the Designer determines that a longer time is necessary to provide an adequate response. If a longer time is determined necessary by the Designer, the Designer will, within five (5) working days of receipt of the request, notify the Contractor of the anticipated response time. If the Contactor submits a RFI on a time sensitive activity on the current project schedule, the Contractor shall not be entitled to any time extension due to the time it takes the Designer to respond to the request provided that the Designer responds within the ten (10) working days set forth above.

3. Responses from the Designer will not change any requirement of the Contract Documents. In the event the Contractor believes that a response to a RFI will cause a change to the requirements of the Contract Document, the Contractor shall give written notice to the Designer requesting a Change Order for the work. Failure to give such written notice within ten (10) working days, shall waive the Contractor’s right to seek additional time or cost under Article 4, “Changes in the Work” of the General Conditions.

4.4 MINOR CHANGES IN THE WORK

1. Designer will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Amount or the Contract Time, on ”Designer’s Supplemental Instructions” (DSI).

4.5 PROPOSAL REQUESTS

1. The Designer or Owner Representative will issue a detailed description of proposed Changes in the Work that may require adjustment to the Contract Amount or the Contract Time. The proposed Change Description will be issued using the "Request for Proposal" (RFP) form. If necessary, the description will include supplemental or revised Drawings and Specifications.
    1. Proposal Requests issued by the Designer or Owner Representative are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
    2. Within ten (10) working days after receipt of Proposal Request, submit a proposal for the cost adjustments to the Contract Amount and the Contract Time necessary to execute the Change. The Contractor shall submit his proposal on the appropriate Change Order Detailed Breakdown form. Subcontractors may use the appropriate Change Order Detailed Breakdown form or submit their proposal on their letterhead provided the same level of detail is included. All proposals shall include:
        a. A detailed breakdown of costs per Article 4.1 of the General Conditions.
        b. If requesting additional time per Article 4.2 of the General Conditions, include an updated Contractor's Construction Schedule that indicates the effect of the Change including, but not limited to, changes in activity duration, start and finish times, and activity relationship.

4.6 CHANGE ORDER PROCEDURES

1. On Owner's approval of a Proposal Request, the Designer or Owner Representative will issue a Change Order for signatures of Owner and Contractor on the "Change Order" form.

PART 5 - PRODUCTS (Not Used)

PART 6 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 013100 – COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1. Drawings and general provisions of the Contract including General and Supplementary Conditions and other Division 1 Specification Sections apply to this Section.

1.2 SUMMARY

1. This Section includes administrative provisions for coordinating construction operations on Projects including, but not limited to, the following:
    1. Coordination Drawings.
    2. Administrative and supervisory personnel.
    3. Project meetings.
3. Each Contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific Contractor.
4. Related Sections include the following:
    1. Division 1, Section 013200 "Schedule-Bar Chart" for preparing and submitting Contractor's Construction Schedule.
    2. Articles 1.8.B and 1.8.C of Section 007213 "General Conditions" for coordinating meetings onsite.
    3. Article 5.4.H of Section 007213 "General Conditions" for coordinating Closeout of the Contract.

1.3 COORDINATION

1. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections, which depend on each other for proper installation, connection, and operation.
2. Coordination: Each Contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each Contractor shall coordinate its operations with operations included in different Sections that depend on each other for proper installation, connection, and operation.
    1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
    2. Coordinate installation of different components with other Contractors to ensure maximum accessibility for required maintenance, service, and repair.
    3. Make adequate provisions to accommodate items scheduled for later installation.
    4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components including mechanical and electrical.
3. Prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate Contractors if coordination of their Work is required.

4. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other Contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

   1. Preparation of Contractor's Construction Schedule.
   2. Preparation of the Schedule of Values.
   3. Installation and removal of temporary facilities and controls.
   4. Delivery and processing of submittals.
   5. Progress meetings.
   6. Preinstallation conferences.
   7. Startup and adjustment of systems.
   8. Project Closeout activities.

5. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

   1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.4 SUBMITTALS

1. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

2. Key Personnel Names: Within fifteen (15) work days of starting construction operations, submit a list of key personnel assignments including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

   1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 PROJECT MEETINGS

1. The Owner’s Construction Representative will schedule a Pre-Construction Meeting prior to beginning of construction. The date, time, and exact place of this meeting will be determined after Contract Award and notification of all interested parties. The Contractor shall arrange to have the Job Superintendent and all prime Subcontractors present at the meeting. During the Pre-Construction Meeting, the construction procedures and information necessary for submitting payment requests will be discussed and materials distributed along with any other pertinent information.

   1. Minutes: Designer will record and distribute meeting minutes.

2. Progress Meetings: The Owner’s Construction Representative will conduct Monthly Progress Meetings as stated in Articles 1.8.B and 1.8.C of Section 007213 “General Conditions”.

   1. Minutes: Designer will record and distribute to Contractor the meeting minutes.

3. Preinstallation Conferences: Contractor shall conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

    1. Attendees: Installer and representatives of Manufacturers and Fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Designer and Construction Representative of scheduled meeting dates.

    2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration including requirements for the following:.

        a. Contract Documents

        b. Options

        c. Related RFIs

        d. Related Change Orders

        e. Purchases

        f. Deliveries

        g. Submittals

        h. Review of mockups

        i. Possible conflicts

        j. Compatibility problems

        k. Time schedules

        l. Weather limitations

        m. Manufacturer's written recommendations

        n. Warranty requirements

        o. Compatibility of materials

        p. Acceptability of substrates

        q. Temporary facilities and controls

        r. Space and access limitations

        s. Regulations of authorities having jurisdiction

        t. Testing and inspecting requirements

        u. Installation procedures

        v. Coordination with other Work

        w. Required performance results

        x. Protection of adjacent Work

        y. Protection of construction and personnel

    3. Contractor shall record significant conference discussions, agreements, and disagreements including required corrective measures and actions.

    4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

    5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

6. Project name
7. Name and address of Contractor
8. Name and address of Designer
9. RFI number including RFIs that were dropped and not submitted
10. RFI description
11. Date the RFI was submitted
12. Date Designer's response was received
13. Identification of related DSI or Proposal Request, as appropriate

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013115 - PROJECT MANAGEMENT COMMUNICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1. Drawings and general provisions of the Contract including General and Supplementary Conditions, Bid Form, and other Division 1 Specification Sections apply to this Section.

2. Division 1, Section 013300 - Submittals

3. Division 1, Section 012600 – Contract Modification Procedures

1.2 SUMMARY

1. Project Management Communications: The Contractor shall use the Internet web-based project management communications tool, E-Builder® ASP software, and protocols included in that software during this project. The use of project management communications as herein described does not replace or change any contractual responsibilities of the participants.
    1. Project management communications is available through E-Builder® as provided by "e-Builder®" in the form and manner required by the Owner.
    2. The project communications database is on-line and fully functional. User registration, electronic and computer equipment, and Internet connections are the responsibility of each project participant. The sharing of user accounts is prohibited

2. Support: E-Builder® will provide on-going support through on-line help files.

3. Copyrights and Ownership: Nothing in this specification or the subsequent communications supersedes the parties' obligations and rights for copyright or document ownership as established by the Contract Documents. The use of CAD files, processes or design information distributed in this system is intended only for the project specified herein.

4. Purpose: The intent of using E-Builder® is to improve project work efforts by promoting timely initial communications and responses. Secondly, to reduce the number of paper documents while providing improved record keeping by creation of electronic document files

5. Authorized Users: Access to the web site will be by individuals who are authorized users.
    1. Individuals shall complete the E-Builder New Company/User Request Form located at the following web site: https://oa.mo.gov/facilities/vendor-links/contractor-forms. Completed forms shall be emailed to the following email address: OA.FMDCE-BuilderSupport@oa.mo.gov.
    2. Authorized users will be contacted directly and assigned a temporary user password.
    3. Individuals shall be responsible for the proper use of their passwords and access to data as agents of the company in which they are employed.

6. Administrative Users: Administrative users have access and control of user licenses and all posted items. DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE! Improper or abusive language toward any party or repeated posting of items intended to deceive or disrupt the work of the project will not be tolerated and will result in deletion of the offensive items and revocation of user license at the sole discretion of the Administrative User(s).

7. Communications: The use of fax, email and courier communication for this project is discouraged in favor of using E-Builder® to send messages. Communication functions are as follows:
    1. Document Integrity and Revisions:
        a. Documents, comments, drawings and other records posted to the system shall remain for the project record. The authorship time and date shall be recorded for each document submitted to the system. Submitting a new document or record with a unique ID, authorship, and time stamp shall be the method used to make modifications or corrections.
        b. The system shall make it easy to identify revised or superseded documents and their predecessors.
        c. Server or Client-side software enhancements during the life of the project shall not alter or restrict the content of data published by the system. System upgrades shall not affect access to older documents or software.
    2. Document Security:
        a. The system shall provide a method for communication of documents. Documents shall allow security group assignment to respect the contractual party's communication except for Administrative Users. DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE!
    3. Document Integration:
        a. Documents of various types shall be logically related to one another and discoverable. For example, requests for information, daily field reports, supplemental sketches and photographs shall be capable of reference as related records.
    4. Reporting:
        a. The system shall be capable of generating reports for work in progress, and logs for each document type. Summary reports generated by the system shall be available for team members.
    5. Notifications and Distribution:
        a. Document distribution to project members shall be accomplished both within the extranet system and via email as appropriate. Project document distribution to parties outside of the project communication system shall be accomplished by secure email of outgoing documents and attachments, readable by a standard email client.
    6. Required Document Types:
        a. RFI, Request for Information.
        b. Submittals, including record numbering by drawing and specification section.
        c. Transmittals, including record of documents and materials delivered in hard copy.
        d. Meeting Minutes.
        e. Application for Payments (Draft or Pencil).
        f. Review Comments.
        g. Field Reports.

h. Construction Photographs.
i. Drawings.
j. Supplemental Sketches.
k. Schedules.
l. Specifications.
m. Request for Proposals
n. Designer's Supplemental Instructions
o. Punch Lists

8. Record Keeping: Except for paper documents, which require original signatures and large format documents (greater than 8½ x 11 inches), all other 8½ x 11 inches documents shall be submitted by transmission in electronic form to the E-Builder® web site by licensed users.

1. The Owner and his representatives, the Engineer and his consultants, and the Contractor and his Sub Contractors and suppliers at every tier shall respond to documents received in electronic form on the web site, and consider them as if received in paper document form.

2. The Owner and his representatives, the Engineer and his consultants, and the Contractor and his Sub Contractors and suppliers at every tier reserves the right to and shall reply or respond by transmissions in electronic form on the web site to documents actually received in paper document form.

3. The Owner and his representatives, the Engineer and his consultants, and the Contractor and his Sub Contractors and suppliers at every tier reserves the right to and shall copy any paper document into electronic form and make same available on the web site.

9. Minimum Equipment and Internet Connection: In addition to other requirements specified in this Section, the Owner and his representatives, the Engineer and his consultants, and the Contractor and his sub-contractors and suppliers at every tier required to have a user license(s) shall be responsible for the following:

1. Providing suitable computer systems for each licensed user at the users normal work location[1] with high-speed Internet access, i.e. DSL, local cable company's Internet connection, or T1 connection.
2. Each of the above referenced computer systems shall have the following minimum system[2] and software requirements:
   a. Desktop configuration (Laptop configurations are similar and should be equal to or exceed desktop system.)
      1) Operating System: Windows XP or newer
      2) Internet Browser: Internet Explorer 6.01SP2+ (Recommend IE7.0+)
      3) Minimum Recommend Connection Speed: 256K or above
      4) Processor Speed: 1 Gigahertz and above
      5) RAM: 512 mb
      6) Operating system and software shall be properly licensed.
      7) Internet Explorer version 7 (current version is a free distribution for download). This specification is not intended to restrict the host server

[1] The normal work location is the place where the user is assigned for more than one-half of his time working on this project.
[2] The minimum system herein will not be sufficient for many tasks and may not be able to process all documents and files stored in the E-Builder® Document's area.

or client computers provided that industry standard HTTP clients may access the published content.

8) Adobe Acrobat Reader (current version is a free distribution for download).
9) Users should have the standard Microsoft Office Suite (current version must be purchased) or the equivalent.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable.)

END OF SECTION 013115

SECTION 013200 – SCHEDULE – BAR CHART

PART 4 - GENERAL

4.1 RELATED DOCUMENTS

1. Drawings and general provisions of the Contract including General and Supplementary Conditions, Bid Form, and other Division 1 Specification Sections apply to this Section.

4.2 SUMMARY

1. This Section includes requirements for a Bar Chart Schedule for the project construction activities, schedule of submittals, and schedule for testing.

PART 5 - PRODUCTS – (Not Applicable)

PART 6 - EXECUTION

6.1 SUBMITTAL PROCEDURES

1. The Contractor shall submit to the Designer, within ten (10) working days following the Notice to Proceed, a Progress Schedule including Schedule of Values showing the rate of progress the Contractor agrees to maintain and the order in which he proposed to carry out the various phases of Work. No payments shall be made to the Contractor until the Progress Schedule has been approved by the Owner.
    1. The Schedule of Values must have the following line items included with the value of the item as indicated below:
        a. O&M's (Owner's Manual)
            1) $1,000,000.00 (One million) and under – 2% of the total contract amount
            2) Over $1,000,000.00 (One million) – 1% of the total contract amount
        b. Close Out Documents
            1) $1,000,000.00 (One million) and under – 2% of the total contract amount
            2) Over $1,000,000.00 (One million) – 1% of the total contract amount
        c. General Conditions
            1) No more than 10%
2. The Contractor shall submit an updated Schedule for presentation at each Monthly Progress Meeting. The Schedule shall be updated by the Contractor as necessary to reflect the current Schedule and its relationship to the original Schedule. The updated Schedule shall reflect any changes in the logic, sequence, durations, or completion date. Payments to the Contractor shall be suspended if the Progress Schedule is not adequately updated to reflect actual conditions.
3. The Contractor shall submit Progress Schedules to Subcontractors to permit coordinating their Progress Schedules to the general construction Work. The Contractor shall coordinate preparation and processing of Schedules and reports with performance of other construction activities.

6.2 CONSTRUCTION PROGRESS SCHEDULE – BAR CHART SCHEDULE

1. Bar-Chart Schedule: The Contractor shall prepare a comprehensive, fully developed, horizontal bar chart-type Contractor's Construction Schedule. The Contractor for general construction shall prepare the Construction Schedule for the entire Project. The Schedule shall show the percentage of work to be completed at any time, anticipated monthly payments by Owner, as well as significant dates (such as completion of excavation, concrete foundation work, underground lines, superstructure, rough-ins, enclosure, hanging of fixtures, etc.) which shall serve as check points to determine compliance with the approved Schedule.
    1. The Contractor shall provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week.
        a. If practical, use the same Schedule of Values breakdown for schedule time bars.
    2. The Contractor shall provide a base activity time bar showing duration for each construction activity. Each bar is to indicate start and completion dates for the activity. The Contractor is to place a contrasting bar below each original schedule activity time for indicating actual progress and planned remaining duration for the activity.
    3. The Contractor shall prepare the Schedule on a minimal number of separate sheets to readily show the data for the entire construction period.
    4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on schedule with other construction activities. Include minor elements involved in the overall sequence of the Work. Show each activity in proper sequence. Indicate graphically the sequences necessary for completion of related portions of the Work.
    5. Coordinate the Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittal Schedule, progress reports, payment requests, and other required schedules and reports.
    6. Indicate the Intent to Award and the Contract Substantial Completion dates on the schedule.
2. Phasing: Provide notations on the schedule to show how the sequence of the Work is affected by the following:
    1. Requirement for Phased completion
    2. Work by separate Contractors
    3. Work by the Owner
    4. Pre-purchased materials
    5. Coordination with existing construction
    6. Limitations of continued occupancies
    7. Un-interruptible services
    8. Partial Occupancy prior to Substantial Completion
    9. Site restrictions
    10. Provisions for future construction
    11. Seasonal variations
    12. Environmental control
3. Work Stages: Use crosshatched bars to indicate important stages of construction for each major portion of the Work. Such stages include, but are not necessarily limited to, the following:
    1. Subcontract awards

2. Submittals
3. Purchases
4. Mockups
5. Fabrication
6. Sample testing
7. Deliveries
8. Installation
9. Testing
10. Adjusting
11. Curing
12. Startup and placement into final use and operation

4. Area Separations: Provide a separate time bar to identify each major area of construction for each major portion of the Work. For the purposes of this Article, a "major area" is a story of construction, a separate building, or a similar significant construction element.
    1. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
        a. Structural completion.
        b. Permanent space enclosure
        c. Completion of mechanical installation
        d. Completion of the electrical portion of the Work
        e. Substantial Completion

6.3 SCHEDULE OF SUBMITTALS

1. Upon acceptance of the Construction Progress Schedule, prepare and submit a complete schedule of submittals. Coordinate the submittal schedule with Section 013300 SUBMITTALS, the approved Construction Progress Schedule, list of subcontracts, Schedule of Values and the list of products.

2. Prepare the schedule in chronological order. Provide the following information
    1. Scheduled date for the first submittal
    2. Related Section number
    3. Submittal category
    4. Name of the Subcontractor
    5. Description of the part of the Work covered
    6. Scheduled date for resubmittal
    7. Scheduled date for the Designer's final release or approval

3. Distribution: Following the Designer's response to the initial submittal schedule, print and distribute copies to the Designer, Owner, subcontractors, and other parties required to comply with submittal dates indicated.
    1. Post copies in the Project meeting room.

2. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned part of the Work and are no longer involved in construction activities.

4. Schedule Updating: Revise the schedule after each meeting or other activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

6.4 SCHEDULE OF INSPECTIONS AND TESTS

1. Prepare a schedule of inspections, tests, and similar services required by the Contract Documents. Submit the schedule with (15) days of the date established for commencement of the Contract Work. The Contractor is to notify the testing agency at least (5) working days in advance of the required tests unless otherwise specified.

2. Form: This schedule shall be in tabular form and shall include, but not be limited to, the following:

    1. Specification Section number
    2. Description of the test
    3. Identification of applicable standards
    4. Identification of test methods
    5. Number of tests required
    6. Time schedule or time span for tests
    7. Entity responsible for performing tests
    8. Requirements for taking samples
    9. Unique characteristics of each service

3. Distribution: Distribute the schedule to the Owner, Architect, and each party involved in performance of portions of the Work where inspections and tests are required.

END OF SECTION 013200

SECTION 013300 – SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1. Drawings and general provisions of the Contract including General and Supplementary Conditions, Bid Form, and other Division 1 Specification Sections apply to this Section.

2. Division 1, Section 013115 "Project Management Communications" for administrative requirements for communications.

1.2 SUMMARY

1. This Section includes administrative and procedural requirements for submittals required for performance of the Work including the following:
    1. Shop Drawings
    2. Product Data
    3. Samples
    4. Quality Assurance Submittals
    5. Construction Photographs
    6. Operating and Maintenance Manuals
    7. Warranties

2. Administrative Submittals: Refer to General and Supplementary Conditions other applicable Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:
    1. Construction Progress Schedule including Schedule of Values
    2. Performance and Payment Bonds
    3. Insurance Certificates
    4. Applications for Payment
    5. Certified Payroll Reports
    6. Partial and Final Receipt of Payment and Release Forms
    7. Affidavit – Compliance with Prevailing Wage Law
    8. Record Drawings
    9. Notifications, Permits, etc.

3. The Contractor is obliged and responsible to check all shop drawings and schedules to assure compliance with contract plans and specifications. The Contractor is responsible for the content of the shop drawings and coordination with other contract work. Shop drawings and schedules shall indicate, in detail, all parts of an Item or Work including erection and setting instructions and integration with the Work of other trades.

4. The Contractor shall at all times make a copy, of all approved submittals, available on site to the Construction Representative.

1.3 SUBMITTAL PROCEDURES

1. The Contractor shall comply with the General and Supplementary Conditions and other applicable sections of the Contract Documents. The Contractor shall submit, with such promptness as to cause no delay in his work or in that of any other contractors, all required submittals indicated in Part 3.1 of this section and elsewhere in the Contract Documents. Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
    1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
    2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
        a. The Designer reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.

2. Each drawing and/or series of drawings submitted must be accompanied by a letter of transmittal giving a list of the titles and numbers of the drawings. Each series shall be numbered consecutively for ready reference and each drawing shall be marked with the following information:
    1. Date of Submission
    2. Name of Project
    3. Location
    4. Section Number of Specification
    5. State Project Number
    6. Name of Submitting Contractor
    7. Name of Subcontractor
    8. Indicate if Item is submitted as specified or as a substitution

1.4 SHOP DRAWINGS

1. Comply with the General Conditions, Article 3.2.

2. The Contractor shall submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.

3. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings including the following information:
    1. Dimensions
    2. Identification of products and materials included by sheet and detail number
    3. Compliance with specified standards
    4. Notation of coordination requirements
    5. Notation of dimensions established by field measurement

6. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8½"x11" but no larger than 24"x36".

1.5 PRODUCT DATA

1. The Contractor shall comply with the General Conditions, Article 3.2.

2. The Contractor shall collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.

    1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information including the following information:

        a. Manufacturer's printed recommendations

        b. Compliance with Trade Association standards

        c. Compliance with recognized Testing Agency standards

        d. Application of Testing Agency labels and seals

        e. Notation of dimensions verified by field measurement

        f. Notation of coordination requirements

    2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

1.6 SAMPLES

1. The Contractor shall comply with the General Conditions, Article 3.2.

2. The Contractor shall submit full-size, fully fabricated samples, cured and finished as specified, and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.

    1. The Contractor shall mount or display samples in the manner to facilitate review of qualities indicated. Prepare samples to match the Designer's sample including the following:

        a. Specification Section number and reference

        b. Generic description of the Sample

        c. Sample source

        d. Product name or name of the Manufacturer

        e. Compliance with recognized standards

        f. Availability and delivery time

    2. The Contractor shall submit samples for review of size, kind, color, pattern, and texture. Submit samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

        a. Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least three (3) multiple units that show approximate limits of the variations.

b. Refer to other Specification Sections for requirements for samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

c. Refer to other Sections for samples to be returned to the Contractor for incorporation in the Work. Such samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of sample submittals.

d. Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Contractor and shall be removed from the site prior to Substantial Completion.

3. Field samples are full-size examples erected onsite to illustrate finishes, coatings, or finish materials and to establish the Project standard.

a. The Contractor shall comply with submittal requirements to the fullest extent possible. The Contractor shall process transmittal forms to provide a record of activity.

1.7 QUALITY ASSURANCE DOCUMENTS

1. The Contractor shall comply with the General Conditions, Article 3.2

2. The Contractor shall submit quality control submittals including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.

3. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the Manufacturer certifying compliance with specified requirements.

1. Signature: Certification shall be signed by an officer of the Manufacturer or other individual authorized to contractually bind the Company.

4. Inspection and Test Reports: The Contractor shall submit the required inspection and test reports from independent testing agencies as specified in this Section and in other Sections of the Contract Documents.

5. Construction Photographs: The Contractor shall submit record construction photographs as specified in this Section and in other Sections of the Contract Documents.

1. The Contractor shall submit digital photographs. The Construction Administrator shall determine the quantity and naming convention at the preconstruction meeting.

2. The Contractor shall identify each photograph with project name, location, number, date, time, and orientation.

3. The Contractor shall submit progress photographs monthly unless specified otherwise. Photographs shall be taken one (1) week prior to submitting.

4. The Contractor shall take four (4) site photographs from differing directions and a minimum of five (5) interior photographs indicating the relative progress of the Work.

1.8 OPERATING AND MAINTENANCE MANUALS AND WARRANTIES

1. The Contractor shall submit all required manufacturer's operating instructions, maintenance/service manuals, and warranties in accordance with the General Conditions, Article 3.5, and Supplementary Conditions along with this and other Sections of the Contract Documents.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 REQUIRED SUBMITTALS

Contractor shall submit the following information for materials and equipment to be provided under this contract.

SPEC SECTION	TITLE	CATEGORY
012100	Schedule of Values (SOV)	Construction Schedule
013100-1.4B	List of Key Personnel Names	List of Subcontractors
013200-3.1A	Construction Progress Schedule	Construction Schedule
013200-3.4A	Schedule of Inspections	Construction Schedule
017900-1.3A	Instruction Program, Attendance Record, Evaluations	Product Data
033000-1.4A	Foundation Design, drawing, and Calculations	Shop Drawings
033000-1.4B	Anchor Bolt Design, drawing, and Calculations	Shop Drawings
033000-1.4C	Concrete Design Mix	Product Data
033000-1.4D	Concrete Test Reports	Test Report
033000-3.4A7	Concrete Admixtures	Product Data
033000-3.4D	Concrete Delivery Tickets	Certification
033000-3.4G	Cement Certified Test Report	Test Report
033000-3.6F	Concrete Testing Data	Test Report
260000-3.1I	Cable Testing	Test Report
260000-3.3B	Electrical Acceptance Tests	Test Report
263200-1.4B	Backup Generator Assembly	Product Data
263200-3.2D	Backup Generator Assembly	Product Data
310000-1.4A1	Crushed Limestone Material	Product Data
310000-1.4A2	Geotextile Fabric	Product Data
310000-3.1B	Herbicide	Product Data
323113-3.1A	Fencing Material Data	Product Data
329000-2.4	Certification of Seed	Certification
338116-1.5	Tower Design, Calculations, and Drawings	Shop Drawings
338116-3.1E	Tower Lighting System	Shop Drawings
338130-1.9C	Shelter Bill of Materials	Product Data
338130-3.3A	Shelter Factory Testing	Test Report
338130-3.3B	Shelter Electrical Tests	Test Report
338243-3.2A	Ground Grid Testing Report	Test Report
338320-1.3B	Antenna Installation Documentation	Product Data
338320-3.3A	Antenna System Testing and Alignment Report - Personnel and Equipment	Test Report
338320-3.3C	Antenna System Testing and Alignment Report	Test Report

END OF SECTION 013300

SECTION 013513.25 – SITE SECURITY AND HEALTH REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions, Bid Form, and other Division 1 Specification Sections apply to this Section.

1.2 SUBMITTALS

A. List of required submittals:

1. Materials Safety Data Sheets for all hazardous materials to be brought onsite.

2. Schedule of proposed shutdowns, if applicable.

3. A list of the names of all employees who will submit fingerprints for a background check, and the signed privacy documents identified below for each employee.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 ACCESS TO THE SITE

A. The Contractor shall arrange with Facility Representatives to establish procedures for the controlled entry of workers and materials into the work areas at the Facility.

B. The Contractor shall establish regular working hours with Facility Representatives. The Contractor must report changes in working hours or overtime to Facility Representatives and obtain approval twenty-four (24) hours ahead of time. The Contractor shall report emergency overtime to Facility Representatives as soon as it is evident that overtime is needed. The Contractor must obtain approval from Facility Representatives for all work performed after dark.

C. The Contractor shall provide the name and phone number of the Contractor's employee or agent who is in charge onsite; this individual must be able to be contacted in case of emergency. The Contractor must be able to furnish names and address of all employees upon request.

D. All construction personnel shall visibly display issued identification cards.

3.2 FIRE PROTECTION, SAFETY, AND HEALTH CONTROLS

A. The Contractor shall take all necessary precautions to guard against and eliminate possible fire hazards.

1. Onsite burning is prohibited.

2. The Contractor shall store all flammable or hazardous materials in proper containers located outside the buildings or offsite, if possible.

3. The Contractor shall provide and maintain, in good order, during construction fire extinguishers as required by the National Fire Protection Association. In areas of

flammable liquids, asphalt, or electrical hazards, 15-pound carbon dioxide or 20-pound dry chemical extinguishers shall be provided.

B. The Contractor shall not obstruct streets or walks without permission from the Owner's Construction Representative and Facility Representatives.

C. The Contractor's personnel shall not exceed the speed limit of 15 mph while at the Facility unless otherwise posted.

D. The Contractor shall take all necessary, reasonable measures to reduce air and water pollution by any material or equipment used during construction. The Contractor shall keep volatile wastes in covered containers, and shall not dispose of volatile wastes or oils in storm or sanitary drains.

E. The Contractor shall keep the project site neat, orderly, and in a safe condition at all times. The Contractor shall immediately remove all hazardous waste, and shall not allow rubbish to accumulate. The Contractor shall provide onsite containers for collection of rubbish and shall dispose of it at frequent intervals during the progress of the Work.

F. Fire exits, alarm systems, and sprinkler systems shall remain fully operational at all times, unless written approval is received from the Owner's Construction Representative and the appropriate Facility Representative at least twenty-four (24) hours in advance. The Contractor shall submit a written time schedule for any proposed shutdowns.

G. For all hazardous materials brought onsite, Material Safety Data Sheets shall be on site and readily available upon request at least a day before delivery.

H. Alcoholic beverages or illegal substances shall not be brought upon the Facility premises. The Contractor's workers shall not be under the influence of any intoxicating substances while on the Facility premises.

3.3 MSHP SECURITY CLEARANCE REQUIREMENTS

A. Contractor Background Screening Policy: As a normal business activity, the Missouri State Highway Patrol (MSHP) may contract with external companies to perform various duties for the Missouri State Highway Patrol. Any personnel working for a contractor, and who has access to criminal justice information is required to pass a background check prior to beginning work on the contract. A contractor's proposed candidate may also be required to undergo a MSHP approved drug screening. This background check requirement will be included as part of all PAQs or solicitations for bids. The contract/PAQ award is contingent upon the proposed candidate background checks being completed.

B. This background check will include, but not be limited to, state of residency and national fingerprint-based record checks. If the proposed candidate lives outside the United States, the contractor will submit similar documentation from their respective country. Qualification to work on contract will be based upon the following criteria:

1. A felony conviction or guilty plea will be an automatic disapproval of the candidate.

2. Any conviction whether misdemeanor or felony, involving violence, crimes against children, and all sexual crimes regardless of timeframe will be an automatic disapproval of the candidate.

3. Candidates will be disqualified if it is confirmed there are outstanding arrest warrants for the candidate.

4. Any other misdemeanor convictions and guilty pleas may be considered for automatic disapproval. The State CSO (CJIS Security Officer) has final authority regarding if the nature or severity of the misdemeanor offense(s) does or does not warrant a disqualification.

C. For misdemeanors, consideration will be given to the relationship between the information obtained in the background check and the responsibilities of the position. Time and severity of crime may also be considered as factors in a disqualification. Candidates may submit a written request for waiver through their contracting company if they have been disapproved and wish to contest the decision. The request will need to explain the circumstances of the crime and justification for a waiver.

D. Contractors will be required to undergo a background check at a minimum once every five years. If there is a significant gap between contracts, candidates may be required to undergo a background check before working under a new contract.

E. The CSO or their designee will maintain a list of contractors who have been approved to work at the MSHP.

F. If a candidate goes through a background check with one contractor and then goes to work at a different contractor, the candidate will not be required to undergo a separate background check unless the timeframe exceeds five-year limit.

G. The CSO for the MSHP has the right to approve or disapprove any candidate and has the right to revoke a candidate's approval at any time.

H. The FBI CJIS Security Policy requires the MSHP to conduct background checks on all contractors needing MSHP access.

I. Contractors working on-site and/or need escorted access are required to provide name, date of birth and social security number to enable the MSHP to run a name based background check prior to their arrival on-site.

J. Contractors working on-site with unescorted access and/or need access to our network are required to submit fingerprints. Required fields for print cards are as follows:

1. ORI: MOMHP0070
2. OCA: CONTRACTOR
3. Employer and Address: COMPANY NAME AND ADDRESS
4. Reason Fingerprinted: CONTRACTOR

K. Contractors may submit fingerprints either at the MSHP General Headquarters, Annex Building, front office located at 1510 East Elm Street, Jefferson City, MO 65109, or may go to their local law enforcement agency to obtain a "copy" of their fingerprints (ten print or digital). There is a processing fee of $33.25 per applicant. We accept check or money orders made payable to the "Criminal Record System Fund". Credit card and debit cards only accepted at our location, no cash please. Fingerprints with processing fee can be mailed to the address below:

Missouri State Highway Patrol
Criminal Justice Information Services Division
Attn: Accounting, Annex Bldg.
1510 East Elm Street
Post Office Box 9500

L. Once background checks are completed, results will be returned via encrypted email to the requestor. Processing time varies. Please contact the Security Audit and Compliance Unit for questions at 573-526-6153 x2658.

3.4 DISRUPTION OF UTILITIES

A. The Contractor shall give a minimum of seventy-two (72) hours written notice to the Construction Representative and the Facility Representative before disconnecting electric, gas, water, fire protection, or sewer service to any building.

B. The Contractor shall give a minimum of seventy-two (72) hours written notice to the Construction Representative and Facility Representative before closing any access drives, and shall make temporary access available, if possible. The Contractor shall not obstruct streets, walks, or parking.

END OF SECTION 013513.25

SECTION 015000 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

3.5 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and SupplementaryConditions, Bid Form, and other Division 1 Specification Sections apply to this Section.

3.6 SUMMARY

A. This Section includes requirements for construction facilities and temporary controls including temporary utilities, support facilities, security, and protection.

B. Temporary utilities include, but are not limited to, the following:

1. Water service and distribution
2. Temporary electric power and light
3. Temporary heat
4. Ventilation
5. Telephone service
6. Sanitary facilities, including drinking water
7. Storm and sanitary sewer

C. Support facilities include, but are not limited to, the following:

1. Field offices and storage sheds
2. Temporary roads, paving and permanent asphalt repair
3. Dewatering facilities and drains
4. Temporary enclosures
5. Hoists and temporary elevator use
6. Temporary project identification signs and bulletin boards
7. Waste disposal services
8. Rodent and pest control
9. Construction aids and miscellaneous services and facilities

D. Security and protection facilities include, but are not limited to, to following:

1. Temporary fire protection
2. Barricades, warning signs, and lights
3. Sidewalk bridge or enclosure fence for the site
4. Environmental protection

3.7 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations including, but not limited to, the following:

1. Building code requirements
2. Health and safety regulations
3. Utility company regulations
4. Police, fire department, and rescue squad rules
5. Environmental protection regulations

B. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations". ANSI A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities".

1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code".

C. Inspections: Arrange for authorities having jurisdiction and/or the Engineer of Record to inspect and test each temporary utility before use. Obtain required certifications and permits.

3.8 PROJECT CONDITIONS

A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of permanent service.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist onsite.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. If acceptable to the Engineer, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.

B. Water: Provide potable water approved by local health authorities.

C. Temporary Open-Mesh Fencing: Provide 0.120" (3mm) thick, galvanized 2" (50mm) chain-link fabric fencing 6' (2m) high with galvanized barbed-wire top strand and galvanized steel pipe posts, 1½" (38mm) ID for line posts and 2½" (64mm) ID for corner posts. Permanent fencing specifications are in Section 323113.

D. Asphalt: Provide cold patch asphalt repair to restore Springfield parking lot to pre-construction condition per Unit Price No. 1.

2.2 EQUIPMENT

A. General: Provide new equipment. If acceptable to the Engineer, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.

B. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110 to 120V plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connectionof power tools and equipment.

C. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage rating.

D. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures were exposed to breakage. Provide exterior fixture were exposed to moisture.

E. Temporary Toilet Units: Provide self-contained, single-occupant toilet units of the chemical, aerated re-circulation, or combustion type. Provide units properly vented and fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

F. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers, or a combination of extinguishers of NFPA-recommended classes for the exposures.

1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each Facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. Temporary Toilets: Install self-contained toilet units. Use of pit-type privies will not be permitted. Comply with regulations and health codes for the type, number, location, operation, and maintenance of fixtures and facilities. Install where facilities will best serve the Project's needs.

1. Shield toilets to ensure privacy.
2. Provide separate facilities for male and female personnel.
3. Provide toilet tissue materials for each facility.

3.3 SUPPORT FACILITIES INSTALLATION

A. Storage Facilities: The Contractor shall provide his ownsecurity. Specific locations for storage and craning operations will be discussed at the Pre-Bid Meeting and the Pre-Construction Meeting.

B. Construction Parking: Parking at the site will be provided in the areas designated at the Pre-Construction Meeting.

C. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than seven (7) days during normal weather or three (3) days when the temperature is expected to rise above 80°F (27°C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonable predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for SafeguardingConstruction, Alterations, and Demolition Operations".

1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one (1) extinguisher on each floor at or near each usable stairwell.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire- protection facilities, stairways, and other access routes for fighting fires. Prohibitsmoking in hazardous fire-exposure areas.
4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

B. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting including flashing red or amber lights.

C. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

1. Storage: Where materials and equipment must be stored and are of value or attractive fortheft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

D. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.5 OPERATION, TERMINATION AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Termination and Removal: Unless the Engineer requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.

END OF SECTION 015000

SECTION 017400 – CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions, Bid Form, and other Division 1 Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for cleaning during the Project.

B. Environmental Requirements: Conduct cleaning and waste-disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and anti-pollution regulations.

1. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.

2. Burning or burying of debris, rubbish, or other waste material on the premises is not permitted.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by the manufacturer or fabricator for the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 PROGRESS CLEANING

A. General

1. Retain all stored items in an orderly arrangement allowing maximum access, not impending drainage or traffic, and providing the required protection of materials.

2. Do not allow the accumulation of scrap, debris, waste material, and other items not required for construction of this Work.

3. At least twice each month, and more often if necessary, completely remove all scrap, debris, and waste material from the jobsite.

4. Provide adequate storage for all items awaiting removal from the jobsite, observing all requirements for fire protection and protection of the ecology.

B. Site

1. Daily, inspect the site and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.

2. Weekly, inspect all arrangements of materials stored onsite. Re-stack, tidy, or otherwise service all material arrangements.

3. Always maintain the site in a neat and orderly condition.

C. Structures

1. Contractor shall follow Appendix 1 Terracon Lead Remediation Bid Documents for MSHP Troop D and Service Center Carthage & Springfield Missouri regarding dismantled tower sections & procedures for grade setup/cleaning.

2. All Tower Structural Steel disposal shall be in accordance Appendix 1 Terracon Lead Remediation Bid Documents for MSHP Troop D and Service Center Carthage & Springfield Missouri.

3. Daily, inspect the structures and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.

4. Weekly, sweep all interior spaces clean. "Clean" for the purposes of this paragraph, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and handheld broom.

5. In preparation for installation of succeeding materials, clean the structures or pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using all equipment and materials required to achieve the required cleanliness.

3.2 FINAL CLEANING

A. General: Provide final cleaning operations when indicated. Employ experienced workersor professional cleaners for final cleaning. Clean each surface or unit of Work to the condition expected from a commercial building cleaning and maintenance program.Comply with manufacturer's instructions.

B. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for the entire Project or a portion of the Project.

1. Clean the Project Site, yard and grounds, in areas disturbed by construction activities including landscape development areas, of rubbish, waste material, litter, and foreign substances.

2. Sweep paved areas broom clean. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

3. Remove petrochemical spills, stains, and other foreign deposits.

4. Remove tools, construction equipment, machinery, and surplus material from the site.

5. Broom clean concrete floors in unoccupied spaces.

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6. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

7. Leave the Project clean and ready for occupancy.

C. Removal of Protection: Remove temporary protection and facilities installed during construction to protect previously completed installations during the remainder of the construction period.

D. Compliances: Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from the site and dispose of lawfully.

1. Where extra materials of value remain after Final Acceptance by the Owner, theybecome the Owner's property.

END OF SECTION 017400

SECTION 017900 - DEMONSTRATION AND TRAINING

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 administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

B. Attendance Record: For each training module, submit list of participants and length of instruction time.

C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name and address of videographer.
c. Name of Architect.
d. Name of Construction Manager.
e. Name of Contractor.
f. Date of video recording.

2. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
3. At completion of training, submit complete training manual(s) for Owner's use in PDF electronic file format on compact disc.

1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative experienced in operation and maintenance procedures and training.

C. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Coordination". Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

a. System, subsystem, and equipment descriptions.
b. Performance and design criteria if Contractor is delegated design responsibility.
c. Operating standards.
d. Regulatory requirements.

e. Equipment function.
f. Operating characteristics.
g. Limiting conditions.
h. Performance curves.

2. Documentation: Review the following items in detail:

a. Emergency manuals.
b. Operations manuals.
c. Maintenance manuals.
d. Project record documents.
e. Identification systems.
f. Warranties and bonds.
g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

a. Instructions on meaning of warnings, trouble indications, and error messages.
b. Instructions on stopping.
c. Shutdown instructions for each type of emergency.
d. Operating instructions for conditions outside of normal operating limits.
e. Sequences for electric or electronic systems.
f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.

b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 007213 "General Conditions".

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Contractor with names and positions of participants.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner with at least seven days' advance notice.

C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

D. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.

1. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:

a. Name of Contractor/Installer.
b. Business address.
c. Business phone number.
d. Point of contact.
e. E-mail address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.

a. Produce segments to present a single significant piece of equipment per segment.
b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.

F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 017900

SECTION 018000 – PERFORMANCE REQUIREMENTS

PART 1 - GENERAL

1.1 DEFINITIONS

A. The terms and definitions listed below apply:

1. "Approved" or "approval" as used herein shall mean approved by the Engineer except where another specific authority is designated.
2. "Material" or "materials" as used herein to denote items furnished by the Contractor or by the Owner means machinery, equipment, components, products,or any other item incorporated into the project.
3. "NMT" as used herein means “not more than” or “not greater than.”
4. "NLT" as used herein means “not less than” or “not smaller than.”
5. "Or equal" or “or approved equal” as used herein means that a Contractor may furnish an Engineer approved "equal" item.
6. “Owner” as used herein shall mean the owner or the owner’s representative.
7. “Plans”, as used herein, shall mean the construction documents and work description drawings and the Materials Schedule.
8. "Provide or providing" as used herein shall mean furnish and install or furnishingand installing, including all labor and materials to construct or install an item complete and ready for use.
9. Where "provide", "install", "furnish", "repair", or words of similar import are used,it shall be understood that reference to the Contractor is intended unless clearly indicated otherwise.
10. "Section" as used herein means all written text designated by a section number andincludes all subsections under the referenced designation.
11. “WD” or Work Description as used herein and, on the plans, means drawings depicting the existing arrangement and denoting work to be done. Generally, if applicable, a companion drawing will be included showing the final arrangement.
12. “Owner-Furnished Products” as used herein means Owner-Furnished Products, which will be provided by the Owner and furnished to the Contractor for installation.

1.2 GENERAL CONDITIONS

A. Underground Utility Locates: The Contractor shall be responsible for locating all pipelines, buried communication or electric lines or other buried property. All damage claims resulting from damage to these facilities will be the responsibility of the Contractor. Beforedoing any work over, under or near railroad, or telephone, telegraph, power, sewer or pipelines, the Contractor shall make, at his own expense, such arrangement for properly securing and protecting them during the progress and until completion of the work in question as shall be satisfactory to the owners thereof.

B. Site Regulations: The Contractor shall be responsible for full compliance with all applicable regulations of OSHA relating to safety of the public and workers. These shall include, but not be limited to, ANSI C2, OSHA 29CFR.1910.269, 29CFR.1910.138,

29CFR.1926.300 AND 29 CFR.1926.651. Safety is of the utmost importance and the

Contractor shall exercise all necessary precautions to provide complete safety to personnel,associated properties, persons, livestock and other facilities surrounding the site area.

The Contractor shall implement all necessary procedures to keep in full compliance with OSHA requirements relating to equipment, working conditions, sanitation procedures, worker's dress, hard hats and other applicable items. The Contractor shall provide the necessary safety equipment, guards and associated grounds to effect complete safety to allpersonnel.

C. Environmental Protection: The Contractor shall take all necessary measures to preserve the landscape on or adjacent to the work site. Shop, office, and yard areas shall be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent. Upon completion, the area shall be restored as required so that all surfaces drain and are left in a condition that will facilitate natural re-vegetation, provide for proper drainage, and prevent erosion.

No chemicals, herbicides, fuels or oils will be stored within the floodplain of any stream or river or within 300m (1,000 ft.) of the immediate drainage area of any pond or in areas where there is the probability that conditions could lead to entry to subterranean hydrologyresources by these materials. There will be no flushing or filling of herbicide or other chemical tanks within the above restricted areas. There will be no equipment repairs whichcould result in spills of fuel, oil, chemical or herbicides within the above noted restricted areas. Any equipment leaking any of the above contaminants will be immediately removedand/or repaired. To the extent practicable, vegetation at stream banks will be preserved soas to minimize soil erosion and sedimentation in streams and waterways.

The Contractor shall be solely responsible for compliance with all applicable local, state and federal environmental regulations. Compliance shall include storm water control andpermits, hazardous material handling, hazardous waste handling and disposal, etc.

Non-hazardous debris, trash, etc., shall be controlled to prevent off-site littering. The entire site shall be cleaned regularly of materials resulting from demolition and construction operations to maintain a good appearance. The debris shall be disposed of regularly.

Disposal shall be made at approved locations or by approved haulers. The Contractor shalladvise of the proposed method of disposal. Tower structures and associated metal materials to be scrapped shall be disposed of at a metal recycling facility.

Hazardous materials and materials or equipment which could produce hazardous waste products shall be identified to the Owner and Construction Representative. Contractor shallfurnish a Material Schedule and associated Material Safety Data Sheets (MSDS) for each item prior. The Contractor shall provide a Material Management Plan describing how all hazardous materials are handled, stored and used, and the method of waste disposal used. Hazardous materials and waste shall be handled only by persons appropriately trained andsupervised. Hazardous waste shall be disposed of in in a legal manner.

MSDS shall be available on-site for any hazardous materials brought onto the site. The Contractor's personnel shall be adequately trained in the use of the MSDS information. TheContractor shall describe to the Owner and Construction Representative of the

training provided to employees with respect to MSDS information, Worker's Right to Know and DOT regulations regarding hazardous material transportation.

The Contractor shall be responsible for the required notification, cleanup and disposal of oil and chemical spills. The Contractor shall notify local, state and/or federal authorities asrequired by regulations. The Owner and Construction Representative shall also be notifiedas soon as possible, notification shall include a description of the spill, location of the spill,time of occurrence and list of authorities notified.

Storm water runoff during construction shall be controlled by erection of fabric silt fence barriers and other measures in accordance with the drawings and documents for this project. These measures will be initially installed by the Contractor. Control barriers in general shall be placed in all ditches and along the down slope perimeter of disturbed areasand any other areas required to accomplish the goal of mitigating storm water runoff or asdirected by the Construction Representative. Erosion control measures (both addition andremoval), etc. and all related work and costs shall be considered incidental to the work andshall be included in the project. No separate or specific payment will be made.

D. Alcoholic Beverages and Drugs: The Contractor is advised that the presence of and/or consumption of alcoholic beverages and/or illegal drugs on the project site is strictly prohibited. This includes all general and subcontractors.

E. Archaeological: All items having apparent cultural, historical or archeological interest which are discovered in the course of any activities of the Contractor shall be carefully preserved. The Contractor shall leave any archeological find undisturbed and shall report the find immediately to the Construction Representative in charge of the project. No artifacts shall be removed from any archeological or historical site. Construction may continue beyond the limits of the discovered site, if possible. If not possible, construction shall not be restarted until permission is obtained from the proper governing body. The Contractor will not be granted extra compensation for the delay.

F. Site Security: The Contractor shall coordinate schedules with the Owner and Construction Representative to assure site access. The Contractor shall schedule multisite projects to minimize travel.

Station gates shall not be left open, or closed and unlocked, at any time unless guarded bycompetent personnel. Securing of station and farm fence gates and gaps prior to departingthe site are the responsibility of the Contractor.

Existing farm fence gates shall not be compromised or removed unless approved by the Owner. As a condition for removal the Owner may require that an approved guard be posted, approved temporary fencing be installed, or that the existing fence be restored to an approved level prior to departure.

G. Electrical Clearance: The Contractor shall maintain adequate working clearances from anyenergized high voltage lines, busses and other facilities throughout the construction period.If necessary, barriers or markers shall be temporarily installed.

H. Access By Owner/Engineer

1. Site: The Contractor shall arrange the construction equipment and materials such thataccess to the site is not blocked. This is especially important for an existing site duringnon-working periods to allow access to facilities for operation, maintenance, etc.

2. Fenced Areas: The Contractor shall assure that the gate locks and/or other security provisions allow normal and ready access to the Owner and his authorized representatives. This can be accomplished by use of a chain and double locks or the use of the Owner's lock if allowed by the Owner.

3. Work Areas: During work at a site the Contractor shall maintain work areas suitable for the Owner's and/or Engineer's personnel to access during working and non-working periods. The Contractor shall cooperate with the Owner in scheduling and sharing working space during periods of simultaneous construction. During non- working hours, all open pits, trenches, etc., and all vulnerable stored materials shall be barricaded with temporary 4' tall safety orange polymer construction fencing. Construction fencing to be supported every 10' with 66" temporary metal T-Posts, driven 18" minimum below grade. Secure safety construction fencing to top and bottom of each T-Post as minimum.

4. Inspection: The Contractor shall make available to the Owner's and/or Engineer's personnel any necessary tools, ladders, man-lifts, bucket trucks, etc., with operators to closely inspect any work at any time prior to final acceptance of the project

I. Miscellaneous: The Contractor shall provide all necessary pumps, drains, ditches and othermeans for removing water from the site of the work in a satisfactory manner. No direct payment will be made for the work specified herein, but compensation for the work and allexpense incidental thereto will be considered as having been included in the prices stipulated for the respective items involved. It is entirely possible that the site location willnot absorb or contain all the excavated material or water removed from the excavation. TheContractor shall make all arrangements and be responsible for the satisfactory disposal of all excavated materials and/or water from pumping or well-point dewatering at his own expense. The Contractor shall be responsible for any damage or loss due to his failure to satisfactorily dispose of such excavated materials and/or water.

1.3 SPECIAL CONDITIONS

A. Shelter Protection: Existing or installed shelters and other facilities, as deemed necessaryby the Construction Representative, shall be protected by the Contractor with plywood of suitable thickness, barriers or other approved methods, during erection of the tower and accessories or dismantling of an existing tower.

B. Grounding: The Contractor shall ground all equipment used for the tower erection and modifications. The Contractor shall complete and test the grounding system prior to installation of the tower. The tower base section shall be grounded prior to erection of subsequent sections.

1.4 LOCAL CONDITIONS

A. Access to the Work and Haul Routes: Access includes ingress and egress to the work overapproved routes established by the Owner. The Contractor shall conduct operations in a manner that minimizes damages on lands and on adjoining lands during performance. TheContractor shall minimize disturbance to access roads and shall suitably clear and clean highways and roads if excess mud droppings are discharged thereon.

B. Contractor's Investigations: Delivery of the materials to the site shall be the Contractor's responsibility. This includes any investigations of the condition and availability of public and private roads and clearances, restrictions, bridge load limits, bond requirements, and other limitations that may affect transportation and ingress and egress

at the jobsite that theContractor deems prudent and/or necessary to assure delivery. No claim for damages or extension of time shall be made based on unavailability of transportation facilities or limitations thereon.

C. Haul Routes: Hauling over public highways, roads, and bridges shall be performed in accordance with applicable local regulations and shall minimize interference with local traffic. Where haul routes cross public highways or roads, the Contractor shall provide barricades, flag persons, and other necessary precautions.

D. Equipment and Material Removal: All Contractor-owned equipment and materials shall be removed from the Owner's property within fourteen (14) calendar days after completion of the work at that site and acceptance by the Owner. Access for removal shall be coordinated with the Owner. Any Owner costs for returning to the site after the allotted time period shall be at the Contractor's expense.

E. Damage to Existing Property: The Contractor shall be financially responsible for any damage to existing structures, work, materials, or equipment because of the Contractor's operations and shall repair or replace any damaged structures, work, materials, or equipment to the satisfaction of, and at no additional cost to, the Owner. The Contractor shall protect all existing structures and property from damage and shall provide shielding,bracing, shoring, and other work necessary for such protection. The Contractor shall be responsible for all damage to streets, roads, curbs, sidewalks, highways, shoulders, ditches,embankments, culverts, bridges, or other public or private property, which may be causedby transporting equipment, materials, or personnel to or from work site. The Contractor shall make satisfactory and acceptable arrangements with the Owner and with the agency having jurisdiction over the damaged property concerning its repair or replacement.

1.5 PROTECTION AND OPERATION OF EXISTING FACILITIES

A. General: The Contractor shall locate existing facilities, including underground facilities, and plan the excavation and other work so as to not damage any existing facilities or significantly impede emergency or maintenance operations at the site. The Contractor shallprovide any necessary protective installations needed for protection of facilities or operation of the facility.

B. Method of Cable Location: The location of buried conduit, pipe, cable, ground mat, and other buried items shall be determined by the Contractor prior to performing any excavation at existing installations. Proper methods shall be used for protecting existing installations during excavation and backfilling operations and when installing equipment and materials.

When locating cable, wires shall not beloosened or removed from the terminals and signals shall not be induced into the control or communications circuit. The station shall always remain operational, and the methods used for cable location shall not interfere with operation of the station. Excavationwillnot be allowed until cable location(s) has been marked on the ground.

C. Protective Installations: Protective installations shall protect existing facilities and permit operation of existing equipment and facilities while construction work is in progress.

Trenches shall be filled or protected (orange safety fence) at the end of each workday to provide safe nighttime access for emergency maintenance. All protective installations shall be removed after they have served their purpose. Materials furnished by the Contractor to provide protection shall remain the Contractor's property.

All openings made in or under a fence and/or barricade (permanent and temporary) shall be secured by the Contractor and approved by the Engineer prior to the end of each workdayor termination of work at the site.

D. Geologic Investigations: The Contractor shall be responsible for determining the nature of materials to be excavated, the difficulties of making and maintaining required excavations,and performing other work affected by geology and ground water elevations at the work site.

E. Storage and Work Facilities: Any required dry storage and work facilities shall be providedby the Contactor. The Owner's shelters or facilities shall not be used for storage of materials or as a workshop or lunchroom.

1.6 WORK REQUIREMENTS

A. General: Reference to American National Standards Institute (ANSI) standards, American Society for Testing and Materials (ASTM) standards, and other standard specifications andcodes shall be to the latest editions or revisions in effect on the contract award date, including any amendments or supplements. If requirements in a referenced specification, standard, or code conflict with these specifications, these specifications shall govern. If materials are not specified by ANSI, ASTM, or other standards or codes, then materials furnished shall be of Engineer approved standard commercial quality.

B. Obtaining Other Specifications: Specifications, standards, and codes published by associations or other standardizing agencies may be obtained directly from those agencies.A listing of contact information for those agencies may be obtained from the Engineer.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 018000

SECTION 022319.13 – LEAD BASED PAINT ABATEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Exterior lead based paint (LBP) abatement using encapsulation, enclosure, removal of LBP substrate, or interim controls do not require the use of full containment.
   2. Chemical paint removers shall be used for all lead-based paint removal unless noted otherwise
   3. Use mechanical and/or abrasive blast abatement only when chemical and hand scrapping is not effective or when specified to be used.
   4. Mechanical and abrasive blast abatement shall be limited to the following area when approved.
      1. Steel, Metal, Concrete, Stone and Some Brick Surfaces
         a. Mechanical abrasion devices equipped with a shrouded head and HEPA vacuum.

B. The Contractor and his/her employees and subcontractors shall handle all lead contaminated debris or waste in a manner which prevents exposure to workers, occupants, others, and the environment. Waste containers shall not be dropped, thrown, ripped, or handled in any manner which may cause any lead exposure. Storage of waste shall be in a fully covered and locked container located in an area that is well lighted, secured and controlled. At no time will the Contractor be allowed to store more than 6000 KG of a hazardous waste. NOTE: All costs associated with all hazardous and non-hazardous waste handling, security, transport, and disposal shall be paid for by the Contractor

1.2 SUBMITTALS

A. Section 013300 – Submittals: requirements for submittals

1.3 QUALITY ASSURANCE

A. Conform to applicable code for exterior LBP removal.

B. Follow the requirements and findings of the testing report found in Appendix

C. Use adequate numbers of skilled workmen who are thoroughly trained, licensed and experienced in the necessary skills, crafts, and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section. Conform to applicable code for procedures when hazardous or contaminated materials are discovered

1.4 SEQUENCING

A. Section 011000 – Summary of Work for requirements for sequencing.

1.5 SCHEDULING

A. Section 013200 – Schedules – Bar Chart

B. Schedule:

1. Perform abatement, removal and disposal work so as not to interfere with Owner's operations.

1.6 PROJECT CONDITIONS

A. Protection
   1. Do not close or obstruct streets, walks and other public facilities occupied and used by Owner and public without prior written permission from Owner and other authorities having jurisdiction.
   2. Maintain in service and protect from damage existing facilities, utilities, and equipment indicated to remain or adjacent to work areas.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The following non-inclusive list of materials, as well as others as may be necessary, will be considered for use on abatement work area containments:
   1. Polyethylene sheeting - 6-mil thick for covering non-removable items, floors, walls, ceilings, for construction barriers and wrapping objects too large to place into waste disposal bags. Opaque polyethylene shall be used for barriers on public side of enclosures. Nylon, polyester, or fiberglass reinforced polyethylene sheeting shall be used where required for outdoor barriers. Fire retardant polyethylene shall be used where the potential for fire exists.
   2. Plywood - 1/2" thick, for Security and containment barrier. CDX plywood shall be used.
   3. Work clothing - As a minimum, disposable coveralls (Tyvek, Saranex, etc.) with attached hoods; latex, rubber, and/or leather gloves; and boots or boot covers. All clothing shall be impervious to air and water. If using chemical strippers, work clothing shall be chemical resistant, or as recommended by chemical stripper manufacturer.
   4. Respiratory protection equipment - Disposable single use respirators are not acceptable. A half-mask air-purifying respirator equipped with HEPA cartridges shall be utilized to provide the minimally allowed amount of protection. If these respirators do not provide adequate protection, as determined by 29 CFR 1926.62, 29 CFR 1910.134 the Contractor shall provide powered air-purifying respirators or supplied air systems. Supplied air systems shall supply Grade D air conforming to 29 CFR 1910.134.
   5. Signs and labels - Provide notification signs which are visible from all angles of approach to the WORK AREA, which include the phrase "Caution Lead Hazard, Keep Out, No Smoking or Eating", in bold lettering at least two inches high. Also provide illuminated signage which is visible from all angles of approach to the dwelling units, which complies with applicable OSHA regulations and reads "Warning - Lead Work Area - Poison - No Smoking or Eating." Construction area caution and warning signs and barrier tape indicating "Authorized Personnel Only" without reference to lead-based paint are also required to restrict access to authorized personnel only.
   6. Duct tape, adhesive, and fasteners for polyethylene, plywood, disposal bags, and drums.
   7. Filters - HEPA filters and pre-filters for ventilation units, vacuums, and water filtration.
   8. Wet wash solution - Solution containing a 5 percent solution of TSP or a non-TSP lead removal detergent (e.g. LEDIZOLV or equivalent), mixed according to manufacturer's recommendations.

9. Waste disposal bags - 6-mil thick polyethylene bags labeled with a minimum two inch high letters stating "Caution Lead Hazard" shall be used for the disposal of all applicable waste.
10. Steel drums - 55 gallon size which are resistant to chemicals for disposal and storage of liquids.
11. Disposal Container - Roll-off dumpsters which are lined with a minimum of two layers of 6-mil polyethylene sheeting. Dumpster shall have solid and lockable top.
12. Fiber drums - 55 gallon size for disposal of sharp and pointed objects.
13. Towels - Disposable towels for drying after personal decontamination.
14. Soap - Adequate supplies of soap for showering and personal decontamination shall be immediately available at all times during the project.

B. Chemical paint remover (stripper) shall be an alkaline solvent-based material or other chemical compound for removal of lead-based from a variety of substrates. (Methylene chloride agents are not permitted.)
1. Chemical paint remover shall be a type that does not produce toxic fumes or contain flammable solvents.
2. Chemical paint removers shall be in accordance with or equal to the following chemical removers, provided the chemical remover meets all the requirements of the Specification and other sections of the project manual.
   a. “Peel Away" by Dumond Chemical
   b. "Grip n' Strip" by American Building Restoration Chemical
   c. "Re-Entry VPS Solvent - 2070T" by Environment Solvents Corporation
   d. "Certane 401" by Certech Corporation
   e. "Back to Nature II" by Dynacroft Industries
   f. "Control Solvent Gel Paint and Coatings Stripper" by Grayling Industries, Inc.
   g. “Enviro Strip #F' by Prosoko Inc.
   h. "Safe-T Lead Strip" by International Protective Coatings
   i. "SuperTech Type A Alkaline Paste Stripper" by SuperTech Products, Inc.
   j. Other equal chemical removers

2.2 EQUIPMENT

A. The following non-inclusive list of equipment shall be considered for use on abatement work area containments:
1. Electrical power - Ground wire equipped extension cords without splices.
2. HEPA vacuum(s) - The Contractor shall provide HEPA vacuums for personal decontamination, clean up, and for abatement project site clean up during and after abatement.
3. Ladders and scaffolding - A sufficient number of OSHA approved and properly used and maintained ladders, scaffolds, platforms, and walkways for use during preparation, removal, inspections, and cleanup shall be provided by the Contractor.
4. Lighting - The Contractor shall supply a sufficient number of portable lighting units to provide adequate illumination (in compliance with all OSHA requirements) at all locations within the work areas.
5. Carts - Constructed of opaque materials with a secure fitting lid used for transporting filled disposal bags from Load Out to temporary disposal storage facilities.
6. Cleanup equipment - The Contractor shall provide an adequate number of mops, rags, shovels, buckets, brushes, vehicle mounted broom and/or vacuum devices, spray washers, etc. to clean up soil, lead debris, exterior dusts, and water as removal and cleaning proceeds. At least one wet/dry HEPA-filtered vacuum

cleaner shall be supplied. Vacuums not HEPA-filtered and brooms which are not used in conjunction with wet misting are not permitted on-site.

7. Water sprayer - A water sprayer/mister (i.e., hand pump garden type, truck mounted sprayer, etc.) to wet all dust and/or debris that is generated by the abatement or associated work.
8. Other abatement equipment - All other tools, equipment, and accessories as may be necessary to complete the requirements of the project, or as specified in these documents.

B. Hand tools as appropriate for scraping for use in removal of paint in conjunction with chemical paint remover, heat gun or lead cleaning agent. Tools shall be as recommended by the manufacturer of the chemical paint remover or as applicable.

C. Heat gun (flameless) as appropriate to use in conjunction with scraping tools as applicable and as recommended by heat gun manufacturer. Heat guns must not exceed 1000°F. Use of propane torches or other flame-type devices is strictly prohibited.

D. Only mechanical abrasion or paint removal devices equipped with a shrouded head and attached to a HEPA vacuum or filtration unit will be considered. Equipment used shall be appropriate for the task as recommended by the equipment manufacturer. Equipment shall include sanders, needle guns, planers, and other mechanical abrasive equipment.

E. Vacuum abrasive blasting as appropriate for the task and as recommended by the manufacturer.

F. Additional worker protection (in addition to that specified in other sections of the Specification) for specialized paint removal methods.

1. Provide eye protection for use with chemical paint removers and all mechanical equipment removers (i.e., abrasive, sanders, needle guns, etc.).
2. Provide eye washing facilities when using chemical removers.
3. Other abatement equipment and accessories: All tools, equipment and accessories as may be necessary to complete the requirements of the project in a proper and professional workmanlike manner.

G. Provide rubber gloves resistant to the chemical used and chemical resistive disposable coveralls, hood and boot covers.

PART 3 - EXECUTION

3.1 CONTAINMENT BARRIERS AND COVERING OF WORK AREAS

A. Seal off the perimeter of the work area to completely isolate abatement areas and to contain all airborne lead contamination created by abatement work. Cover all surfaces of the abatement work area not scheduled to be abated to protect them from contamination, prevent contaminant migration, to facilitate more efficient clean-up, and to protect the finishes from the LBP abatement work activities. The work area shall be prepared and maintained in the following manner to begin and complete lead-based paint abatement work. The required preparations are presented in the approximate order in which they shall be completed on the lead-based paint abatement project. These preparations and actions shall be used as appropriate and specified for the particular abatement project. Examine existing structures and pavements indicated to be demolished before demolition.

3.2 EXTERIOR WORK AREAS

A. Work area containment set-up for the abatement of exterior building items such as gable ends, soffits, porch ceilings, porch columns, railings, stair rails, fascia boards, siding, windows, and doors or other exterior components shall, at a minimum, consist of 2 layers of 6-mil polyethylene sheeting (poly) placed on the ground at least ten (10) feet in all directions of the abatement area. The dwelling unit side (inside) of the ground poly shall extend at least 18" up the foundation wall. The outside ends of the ground poly shall be turned up at the edge 6" and securely supported with wood stakes to help prevent debris from being spread beyond the poly and the work area. The poly shall be secured at 6 foot on center minimum to prevent it from moving or blowing; additional attachment shall be added as necessary to prevent movement. Seams shall be overlapped a minimum of 12", glued, and taped continuous. Containment area and ground poly shall be able to withstand wind gusts of up to 40 MPH. Provide, erect, and maintain temporary barriers and security devices.

B. No containment walls shall be required for the abatement of the exterior items unless wind conditions disperse debris beyond the polyethylene sheeting on the ground. If the wind disperses paint debris, the abatement shall immediately stop until the wind reduces in velocity, as approved by the Project Representative. Protect existing landscaping materials, appurtenances, structures and utilities which are not to be demolished. The Contractor shall HEPA vacuum all ground areas to remove all visual debris that is dispersed beyond the 6-mil polyethylene ground cover. The Contractor shall clean by HEPA vacuum at the end of each day and at other times as necessary during abatement to prevent paint chips and debris from being spread beyond the ground cover sheeting.

C. Barrier tape shall be placed three (3) feet beyond exterior ground poly, outside all exterior abatement areas on all sides to prevent entry into the abatement area. OSHA lead abatement signs and other federal, state, or local warning signs shall be mounted on the barrier tape or on separate stakes at the barrier tape line.

3.3 CHEMICAL PAINT REMOVAL

A. Protect the surrounding surfaces per section 3.2.

B. Application: Spray or hand trowel the chemical paint remover paste according to the manufacturer's specifications to 1/8" to 1/4" thick, dependent upon age, thickness and type of paint being removed. If spray applied, material should be applied with recommended spray equipment approved by the manufacturer to ensure proper application of product. Spray application is contingent upon Project Representative's approval.

1. During spray application, no more than two workers (one person applying and one helper) shall be allowed in the work area.

C. Cover chemical paint remover with paper, cloth or other material as recommended by the chemical manufacturer to prevent drying. Cloth shall be smoothed to remove all air. Remaining air bubbles shall be pierced with a knife and flattened.

1. Work area shall be properly heated or cooled to meet temperature requirements outlined in the manufacturer's specifications. Heating and cooling procedures shall be consistent with these specifications, subject to the approval of the Project Representative and within all applicable codes, ordinances and regulations.
2. Work area shall be completely secured and monitored during the application of the caustic paste, dwell time and removal of the paste to prevent accidental exposure.
3. Allow chemical to stay on the paint to be removed the proper "dwell" time, as recommended by the manufacturer. Contractor shall run a series of test areas to

determine the optimal amount of time for the chemical to stay on a particular wall or component for most effective removal.

4. Cloth shall be removed by sliding putty knife, if possible, into paste around the edges of the cloth away from the surface in one piece. Do not rely on the adhering tension between the cloth and paste. Remove as much residue as possible with a tool before cleanup procedure. DO NOT ALLOW RESIDUE OF PASTE TO DRY. If necessary, lightly spray the remaining residue with water to keep moist.
5. Never remove material with personnel below or in a manner that would allow the caustic to fall on, splatter, or contact personnel in the vicinity of the removal. Take all necessary steps to minimize the fall distance of the paste/paint.
6. Repeat application as necessary for complete removal of paint. Scraping may be used to assist if wet scraping is used. At no time shall dry scraping be allowed.
7. Once removal of paint from the abated surface is complete, cleanup procedures shall then follow and include wash down of surface and neutralization per manufacturer's specifications. Apply caustic paste neutralizer (if required by manufacturer) in accordance with manufacturer's recommendations. Wash neutralizer off with water per manufacturer's instructions.

   Apply second application of neutralizer over surface and allow to dry. After three hours or more or as recommended by manufacturer, wash neutralizer off with clean rinse water and allow surface to dry.

   Contractor shall use pH paper to determine if neutralization is adequate. A dry surface showing a pH of between 6 and 8 after the proper drying-out period is generally ready to be recoated. A pH over 8 should be treated to another application of neutralizer and left to dry before retesting. It is most important that the surface properly dry out and that all residue is removed before recoating.
8. Once the neutralizing process is complete, the surface shall undergo normal cleanup procedures of HEPA vacuuming, lead sequestering detergent wash, and repeated HEPA vacuuming.
9. All accumulated debris resulting from removal of caustic paste shall be treated as hazardous and shall be properly stored and disposed of according to EPA, DOT, MoDNR, and all other applicable Federal, state and local regulations..

3.4 EQUIPMENT USED FOR LEAD BASED PAINT REMOVAL

A. Hand tools shall be used manually in a manner recommended by the manufacturer. Common lead-based paint abatement tools include putty knives, chisels, and paint scrapers.

B. Vacuum abrasive blasters shall be operated in accordance with the recommendations of their manufacturer. Blaster shall be equipped with a shroud which shall have direct contact with the surface being abated. Blaster shall be attached to a HEPA vacuum system. Provide temporary shoring and bracing to transfer loads of existing construction to remain from construction being removed.
   1. Maintain vacuum system by emptying debris collected and draining filters as recommended by the manufacturer.
   2. All debris removed from the vacuum system shall be considered hazardous waste unless it is tested and characterized differently.
   3. Complete work on a test area to determine proper blasting pressure and application time.

3.5 CLEANUP

A. Cleanup work area, at a minimum, daily and more often during the day if surface dust is present. Daily cleanup shall consist of removal of all debris from the work area and HEPA vacuuming and wet wiping. Cleanup shall be completed at the end of each work shift.

B. Dispose of contaminated debris, consumable goods, cleaning materials, solutions or equipment in accordance with applicable Federal, state and local regulations.

C. Durable equipment such as power and hand tools, generators, etc. shall be thoroughly cleaned before removal from the project area.

D. If chemical removers are used:
   1. Collect caustic paste cloth (if used) with paste/paint along with remaining residue and put into 6-mil polyethylene bags and dispose of in compliance with all applicable Federal, state and local regulations and these Specifications.
   2. Mist surface lightly with water spray. With a nylon scrub brush, agitate surface to loosen all residue. Thoroughly scrub surface being sure to get all crevices, grooves, cracks, etc. free of all residue.
   3. Lightly spray clean water on surface removing remaining residue. A hand pump pressure sprayer may be utilized to facilitate debris removal. The use of a wet vacuum to assist in cleanup is suggested. Make certain that the entire surface is clean of any paste/paint residue. Allow to dry thoroughly before applying new finish.

3.6 REPAIR SURFACE

A. Repair and repaint any and all damaged surfaces caused by the abatement process. Repair work shall match adjacent surfaces that are identical. All repair work shall be conducted at the Contractors sole expense, with no additional cost to the Owner.

3.7 DISPOSAL OF WASTE MATERIALS

A. All materials, whether hazardous or non-hazardous, shall be handled, secured and disposed of in accordance with all laws and the provisions of this Section and any and all other applicable federal, state, county or local regulations and guidelines. It shall be the sole responsibility of the Contractor to assure complete compliance with the more stringent of all laws and regulations relating to any and all hazardous and nonhazardous waste storage, handling, security, and disposal. Until hazardous waste characterization analytical results are available, all waste materials (including water) shall be handled, stored, and secured as hazardous wastes, and stored separately from all other wastes. All wastes shall be separated and segregated into appropriate waste streams Separate all non- concrete materials from concrete rubble and stone rubble.

B. Disposal Requirements. The Contractor shall contact the Regional EPA, State, local and all other pertinent authorities to determine lead-based paint waste and/or debris disposal requirements. The requirements of the Resource Conservation and Recovery Act (RCRA) must be complied with, as well as all other applicable federal, state, county or local waste plan requirements. During or after the actual abatement, the Contractor shall not: leave debris in the yard or in near-by property; place debris into an unsecured container; incinerate debris; dump debris at any unauthorized location; place debris in any unauthorized dumpster; transport any waste or debris in non-licensed or permitted vehicles; or introduce lead contaminated (non-filtered) water onto soils, into storm sewers (shall not be poured down yard inlet or street drain) or sanitary sewers (shall not be

flushed down toilet or any other household, residential or commercial type drain system). The Contractor shall make all efforts to minimize the amount of hazardous waste produced (through accepted practices of waste separation/segregation, etc.). Additionally, the Contractor shall seek to identify and use a transport, storage, and disposal (TSD) facility that will incinerate, recycle, or reclaim all wastes, rather than having wastes sent to a landfill for whole disposal. All waste water, clean water, and wash water shall be so labeled. All waste water shall be labeled "filtered" (using 3 micron filter) or "non-filtered". All non-filtered waste water containers shall be labeled "hazardous waste" and with a date the Contractor began to collect contaminated water in that container. All filtered water must be hazardous waste characterization tested to confirm that it is or is not hazardous and disposed of accordingly.

C. EPA ID Numbers. Prior to abatement, the Contractor shall contact EPA to determine if EPA Hazardous Waste Identification numbers are required for any waste generated during the conduct of any and all work for this project. If required, the Contractor shall apply for an EPA identification number from the appropriate Regional EPA office, particularly if more than 100 kg of hazardous waste is expected to be generated from the abatement process during any calendar month. The Contractor has the responsibility to coordinate this action through the State, and secure any additional numbers as required. The Contractor shall comply with the strictest requirement for waste generation resulting from all other applicable state or local regulations.

D. Storage, Inspection and Record Keeping Requirements. All hazardous material shall be kept in a secured area and lockable container, that is inaccessible to all persons other than abatement personnel. All hazardous waste shall be labeled "Lead-Based Paint Abatement Hazardous Waste" and a date that the Contractor began to collect waste in that container. All hazardous and non-hazardous waste shall be kept in separate containers. All hazardous waste shall be stored, handled, transported, and disposed of in a manner to meet the more stringent of all federal, state, and local requirements. The Contractor shall, on at least a weekly basis, inspect all waste containers to ensure that the containers and the container integrity are sound and continue to be appropriate for the wastes stored in the containers. The Contractor shall keep a journal which records the results of all container inspections conducted and includes the dates and times of the inspection, as well as the name of the individual(s) conducting the inspections.

3.8 REGULATIONS

A. The Contractor will be required to comply with most stringent of all requirements which apply to waste shipment, disposal, or other items related to lead or lead-based paint.

3.9 TRANSPORTATION

A. If the Contractor is not a RCRA/DOT/EPA/MoDNR certified Hazardous Waste Transporter, the Contractor shall retain the services of a certified, permitted and licensed transporter to move the waste. The Contractor shall require the certified permitted and licensed hazardous waste transport firm to follow DOT, EPA and any/all other federal, state, and local applicable regulations. The Contractor shall be responsible for all actions of the waste hauler as pertaining to waste handling, removal, transport, and disposal under this Section and all EPA, DOT, MoDNR and all other applicable regulations.

B. The Contractor will comply with the requirements of this specification, as well as all applicable EPA, MoDNR and DOT regulations for disposal containers. The Contractor shall contact the Federal, State and local authorities to determine their criteria for containers. In the case of any conflict in regulations or this specification, the more stringent requirements shall apply. All waste containers shall be labeled with the

appropriate name or designation of contents and date which materials were placed first into the container.

1. The location of waste containers on-site shall be coordinated subject to Project Representative's approval.
2. The waste containers shall be solid, enclosed and lockable containers lined with at least two layers of 6-mil polyethylene sheeting. All containers shall be locked and secured at all times, except when loading or unloading.

3.10 EMERGENCIES

A. Contractor shall complete the following tasks in the event of an emergency:
   1. Contact local fire, police, hospitals or local emergency response teams and inform those agencies of the type of hazardous activity at the project site and ask for assistance in the event of an accident;
   2. Have an immediate means of communication with a regulatory agency in the event of an emergency;
   3. Keep a list of locations and phone numbers of regulatory and emergency response agencies (i.e., police, fire, EPA, health department, hospital, emergency response team, etc.) on -site;
   4. Train all employees to deal with types of accidents to be encountered at the project site, including hazardous material accidents. Provide documentation to the Project Representative that employees have been trained in job site safety and emergency response;
   5. Have a person on-site at all times, who is the emergency coordinator to ensure that emergency procedures are carried out in the event an emergency arises;
   6. Keep and maintain a "right to know" manual at the project site containing MSDS for all materials used on-site that is in an easily accessible location which is known to all employees;
   7. Keep and maintain suitable first aid kits at the project site and work locations; and,
   8. Maintain adequate water supply to adequately decontaminate workers, allow for clean-up, and to allow for a minimum of fifteen minutes of uninterrupted water flow for the purpose of eye irrigation.

3.11 DISPOSAL PACKING

A. The Contractor shall place lead-based paint fragments, dust, waste, and debris produced as a result of any abatement activity in 6-mil polyethylene (plastic) bags that are air-tight and puncture-resistant. Specific items shall be packaged in the following manner:
   1. Cleaning Materials. The Contractor shall place all disposable cleaning materials such as sponges, mop heads, filters, rags, disposable clothing, etc. in 6 - mil polyethylene bags and properly seal them, if after testing, those materials are determined to be hazardous. All disposal bags shall have proper labeling on them.
   2. Contaminated Debris. In particular, the Contractor shall separate, at a minimum, label and containerize the following:
      a. All paint or paint fragments removed by mechanical abrasion, vacuum blasting, surface preparation, or by any other abrasive abatement method;
      b. All paint, paint fragments, solvents or other debris removed by chemical strippers (paint removers);
      c. Contaminated (i.e., used, already worn) body suits;
      d. HEPA vacuum contents, filters, respirator cartridges (paint chips, dust, or other abatement debris on plastic should always be HEPA vacuumed prior to picking up the plastic); and,

e. Any other waste or debris generated as a result of any activity on a lead abatement project. Note: All hazardous wastes or materials shall be kept completely separate from all nonhazardous materials.

f. Polyethylene Sheeting. The Contractor shall clean surfaces and equipment and containerize large debris. Prior to removing any 6-mil polyethylene sheeting, the Contractor shall lightly mist the sheeting in order to keep any non-visible dust down and fold the 6-mil polyethylene sheeting inward to contain any non-visible dust and to form tight bundles to containerize for disposal. The Contractor shall place all plastic sheeting in 6-mil thick polyethylene bags which are properly labeled and sealed.

3. Caustic debris. Materials that are caustic/corrosive which may "eat" or deteriorate plastic disposal bags shall be placed into metal or other appropriate disposal drums. Contractor shall complete the following tasks in the event of an emergency:

3.12 WASTE REMOVAL

A. Vehicles. The Contractor shall ensure that all hazardous and non-hazardous waste is transported in a placarded, permitted, licensed, covered and properly secured vehicles to the proper landfill, so as to meet all federal, state, and local requirements.

B. Container Handling. The Contractor shall carefully place the containers into the truck or dumpster used for disposal. The Contractor or his employees shall not throw or drop containers or handle them in any manner which will cause or potentially cause damage to the container or an exposure to employees, others, or the environment.

C. Dust or Debris. The Contractor shall ensure that the removal of all hazardous and/or nonhazardous lead-based paint abatement items be adequately covered, containerized, bagged, or enclosed, so as to assure that no dust or debris is released.

D. Liquid Wastes. The Contractor shall contain and properly dispose of all liquid waste, including lead-contaminated wash water. The Contractor shall contact the local Publicly Owned Treatment Works (POTW) department to discuss the disposal alternatives of waste water generated during the project and dispose of it in accordance with all applicable federal, state, and local requirements.

E. Containers. The Contractor shall HEPA vacuum and shall wet wipe all waste containers to ensure that there is no residual or visual contamination present, prior to removing the containers from the work area. All waste containers shall be labeled and placarded in accordance with all applicable state, local and federal regulations.

F. Solvents. The Contractor shall place solvent residues and residues from chemical strippers in drums made out of materials that cannot be dissolved or corroded by the chemicals. Solvents will be tested to determine if they are hazardous (toxic, corrosive, ignitable, or reactive). Solvents, caustic and acid waste must be segregated and not stored in the same containers.

G. Water Filtration. The Contractor shall filter all wash/rinse or other contaminated water with a filter capable of removing particles of at least 3 micron size. Other larger micron size filters may be used, prior to final 3 micron filtration. Dispose of filters as hazardous waste, unless testing indicates otherwise. Should the results of the hazardous waste characterization analysis indicate that filtered water has a lead concentration which meets or exceeds 5.0 parts per million (PPM), or other POTW disposal criteria, the Contractor shall continue to filter all liquids until analysis indicates lead concentrations less than 5.0 PPM, or the applicable POTW requirements. Contact local fire, police, hospitals or local emergency response teams and inform.

3.13 FINAL TESTING

A. Contractor shall provide testing of soils adjacent to work area upon completion of work indicating that no contamination has occurred.

END OF SECTION 022319.13

SECTION 031000 – CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions, and other Division Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for Concrete Forming for the project construction activities.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 FORMS

A. Forms shall be so designed and constructed that they may be removed without injuring theconcrete.

B. The material to be used in the forms for exposed surfaces shall be sized and dressed lumberor metal in which all bolt and rivet heads are countersunk. In either case, a plain smooth surface of the desired contour must be obtained. Undressed lumber may be used for backingor other unexposed surfaces, except inside faces of conduits.

C. The forms shall be built true to line and braced in a substantial and unyielding manner. They shall be mortar tight, and, if necessary, to close cracks due to shrinkage, shall be thoroughly soaked in water. Forms for re-entrant angles shall be filleted, and for corners shall be chamfered. Dimensions affecting the construction of subsequent portions of the work shall be carefully checked after the forms are erected and before any concrete is placed. The interior surfaces of the forms shall be adequately oiled with a non-staining mineral oil, form-parting agent or wetted prior to concrete placement to ensure the non-adhesion of mortar.

D. Form lumber that is reused shall be free from bulge or warp and shall be thoroughly cleaned. The forms shall be inspected immediately preceding the placing of concrete, anybulging or warping shall be remedied and all dirt, sawdust, shaving, or other debris withinthe form shall be removed.

E. No wooden device of any kind used to separate forms shall be permitted to remain in the finished work.

F. Temporary openings shall be placed at the bottom of the column and wall forms and at other points where necessary to facilitate cleaning and inspection immediately before depositing concrete.

3.2 UNFORMED CONCRETE

A. Unformed concrete shall be placed against undisturbed earth. Excavation for such concreteshall be made to neat lines as shown on the drawings and in conformance with the Specification Sections. Any excess excavation shall be filled with concrete by and at the expense of the Contractor.

B. The earth excavation to be in contact with the concrete shall, if dry, be thoroughly wetted prior to placing concrete to minimize any water absorption by the earth from the concrete.Alternately, or if the soil is subject to swelling, a thin (2 mil) plastic film may be used to provide a moisture barrier while allowing the concrete to conform to the irregular shape ofthe walls.

3.3 REMOVAL OF FORMS

A. Forms shall remain undisturbed until the concrete has gained sufficient strength to retain its shape and avoid damage during removal. In no case shall forms be removed in less than24-hours after placement.

END OF SECTION 031000

SECTION 032000 – CONCRETE REINFORCING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions, and other Division Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for Concrete Reinforcing for the project construction activities.

PART 2 - PRODUCTS

(NotApplicable)

PART 3 - EXECUTION

3.1 STEEL REINFORCEMENT

A. Reinforcing steel shall be manufactured from new billet steel, Grade 60, and shall conformto ASTM Standard A-615. Wire mesh shall conform to ASTM Standard A-185. All reinforcement shall be unpainted, uncoated, clean and free of rust or scale before being placed.

3.2 PLACING REINFORCEMENT

A. Reinforcing steel bends shall be accurately and neatly formed without heating and securedwith wire ties according to the approved foundation drawings, ACI 315 and ACI 318. Rebar cages or assemblies shall be wire tied, no welding, brazing or heating is permitted with the exception of tack welding interior bracing members required to make reinforcingcages more rigid for installation. Reinforcement assemblies or cages with unauthorized welds shall be removed and replaced.

B. All reinforcement, when placed, shall be free from mill scale, lose or thick rust, dirt, paint, oil, or grease and shall present a clean surface. All reinforcing shall be placed in accordance with ACI 301 and ACI 315 and in the exact position shown on the plans and shall be held firmly in position by means of approved metal spacers and supports by wiring to the forms,and by wiring the bars together at intersections with approved wire ties so that the reinforcement will not be displaced during the depositing and compacting of the concrete.Wire mesh splices shall be overlapped at least one full mesh. The placing and fastening of reinforcement in each section of the work shall be approved by the Engineer before any concrete is deposited in the section.

C. The elevation of the top of the steel cage shall be checked before and after the concrete is placed. If the upward or downward displacement of the rebar cage exceeds two inches (2 In.), the drilled shaft will be considered defective. No additional shafts shall be constructeduntil the Contractor has modified the rebar cage support system. Care shall be taken not to disturb the reinforcement after the concrete has taken its initial set.

D. Rebar sleds and bottom supports shall be used to ensure adequate clearance is maintainedbetween the rebar cage and the forms or earth.

E. Splices of reinforcing bars shall be class b (per ACI 318) unless shown otherwise. Splices shall be staggered. Full development length shall be provided across joints.

END OF SECTION 032000

SECTION 033000 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions, and other Division Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for Cast-In-Place Concrete for the project constructionactivities, schedule of submittals, and schedule for testing.

1.3 REQUIREMENTS

A. Furnish and install all cast-in-place concrete, reinforcing and accessories, as specified herein and as shown on the drawings.

B. Foundations shall be as listed in the specifications or shown on the plans.

1.4 SUBMITTALS

A. Foundation Design: The Contractor shall submit complete foundation design, drawing(s)and calculations for review and approval by Engineer. The foundation design shall be signedand sealed by the Designer of record, who has responsible charge of the foundation design,and is licensed as a registered Professional Designer in the state in which the project is located.

B. Anchor Bolts: The Contractor shall follow placed as shown on the plans.

C. Concrete Design Mix: No later than 30 days prior to pouring concrete the Contractor shallsubmit the proposed concrete mix and advise of the source of the proposed concrete. Information, including source, characteristics, sieve analysis and ASTM compliance for each component shall be submitted. The mix shall include weights per cubic yard of each component, including admixtures, as well as the design yield and projected slump, air content, and compressive strength at 7 and 28 days. Terracon shall perform actual concrete tests and submit test reports for the proposed mix design to verify compliance with the specifications.

D. Concrete Test Reports: Certified Test Reports stating the compressive strength of the concrete and all cylinder data shall be emailed directly to the Engineer from the testing laboratory within two working days of the test.

E. Final Documentation: Terracon, no later than thirty (30) days following completion of the foundation(s), submit a record of the design data, drawings, and log of construction and concrete test reports.

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Materials shall conform to the respective publications and other requirements specified herein.

B. Cement: cement shall conform to ASTM C150, TYPE I or TYPE IA. Cement may be bagged or bulk. Cement shall be used from only one mill throughout project.

C. Fine aggregate: fine aggregate shall conform to ASTM c33-08 and shall be uniformly graded, clean, sharp, washed material or crushed sand, free from organic impurities.

D. Course aggregate: course aggregate shall conform to ASTM c33-08 and shall be natural washed gravel or washed crushed rock having hard, strong, durable pieces, free form adherent coatings, the maximum size of coarse aggregate shall be 3/4" in accordance with the requirements of ASTM C33-08; gradation size NO. 67.

E. Water: water used in the concrete mix shall be potable, clean, and free from oils, acids, salts, chlorides, alkali, sugar, vegetable, or other injurious substances.

F. The concrete shall contain an air-entraining admixture complying with the requirements of ASTM C-260 and ACI 212.1R and a water-reducing admixture complying with the requirements of ASTM C-494 and ACI 212.1R. Admixtures shall be purchase and batched in liquid solution. The use of calcium chloride or an admixture containing calcium chloride is prohibited.

G. Admixtures shall be of the same manufacturer to assure compatibility.

PART 3 - EXECUTION

3.1 GENERAL - INSERTS, EMBEDDED COMPONENTS AND OPENINGS:

A. Contractor shall check all civil, architectural, structural, and electrical drawings for openings, sleeves, anchor bolts, inserts and other items to be built into the concrete work.

B. Coordinate the work of other sections in forming and setting openings, recesses, slots, chases, anchors, inserts and other items to be embedded.

C. Embedded items shall be set accurately in location, alignment, elevation, and plumbness. Locate and measure from established surveyed reference benchmarks.

D. Embedded items shall be anchored into place as required to prevent movement during concrete placement and consolidation. Components forming a part of a complete assembly shall be aligned before anchoring. Provide temporary bracing, anchorage, and templates as required to maintain the setting and alignment.

3.2 SELF-SUPPORTING TOWER FOUNDATION(S)

A. Tower foundation(s) shall be of the spread base/top pier type as designed by the Tower Engineer. The site-specific design recommendations as determined by the geotechnical report (Appendix 2) shall be utilized for designing and constructing the tower foundations.

3.3 SHELTER FOUNDATION

A. The Shelter foundation(s) shall be in accordance with the plans and these specifications.

3.4 CONCRETE

A. Tower Foundation: Concrete for placement for spread and pier footing:

1. Cement: NLT 611 pounds per cubic yard (Lb/CY) of Type IA, or Type I with air-entraining admixture
2. Fly Ash Substitution: NMT 10 Pct by weight of cement and in accordance withFHWA-NH1-10-016
3. Water-Cement Ratio: NMT 0.44
4. Compressive Strength at 28 days:
   A. Carthage, MO Location: NLT 4,500 psi
   B. Springfield, MO Location: NLT 4,500 psi
5. Air Content: 5.5% +/- 1% (tested per ASTM C231)
6. Slump: 3 - 4 In. (tested per ASTM C143)

Admixture(s), as approved by the Engineer, for increased workability and performance

B. Transit Mix Concrete: All transit mix or ready-mix concrete shall be prepared and deliveredin accordance with ASTM C94 and the characteristics specified herein.

All materials used in the preparation of transit mix concrete shall be as specified herein. The Contractor shall arrange for the Terracon representative or his representative to have free access to themix plant for sampling or testing materials at all times when work is being performed for this project.

The mixer shall be loaded in accordance with the manufacturer's capacity rating. The mixing speed of the revolving drum type mixer shall not be less than four rpm nor greater than a speed resulting in a peripheral velocity of the drum of 225-feet per minute when thedrum is loaded at normal rated capacity, the number of revolutions of the drum at mixing speed shall not be less than 50 or more than 100 after all materials and water have been charged into the drum. All revolutions after 100 shall be at agitating speed.

During periods of hot weather, temperature over 80 Deg F, the concrete shall be delivered, and discharge shall be completed within thirty minutes (30 Min.) after loading the water into the mixer and before the mixing drum makes 300 revolutions. The time may be increased to one hour during other months of the year. When a truck mixer is used for thecomplete mixing of the concrete, the mixing operation shall begin within 30 minutes afterthe cement has been added to the aggregates.

Where transit mixers are required to travel over 30 miles, the mixing water shall not be added to the batch until reaching the job site. The batch shall be mixed at least eight (8) minutes prior to depositing. Water shall be accurately measured.

Retempering of partially set concrete or increasing the water portion to compensate for long mixing times is not permitted. The mixer contents shall be completely discharged prior to new materials being added.

C. Transit-Mixed Concrete – Field Protocol: A delivery ticket shall be prepared for each loadof transit-mixed concrete. A copy of each delivery ticket shall be handed to the Terracon representative by the truck's operator at the time of delivery. Tickets shall indicate the mix identification, the number of yards delivered, the quantities of each

material in the batch, the outdoor temperature in the shade, the time the cement was added, the amount of water that can still be added while remaining within the Concrete/Water ratio, and the numerical sequence ofthe delivery. An individual report including the following minimum information shall be provided to the Engineer for each transit-mixed concrete truck upon arrival at the job site.

1. Truck number
2. Concrete quantity
3. Plant air entrainment
4. Arrival time
5. Testing time
6. Slump
7. Concrete temperature
8. Weather conditions (temperature, etc.)
9. Air entrainment as delivered
10. Quantities for all other added materials

D. Job Mixed Concrete: Job-Mixed concrete will not be allowed unless specifically approvedby the Engineer.

E. Portland Cement: Portland cement for air-entrainment shall be used for all transit mix and job mixed concrete. The cement shall conform to ASTM C150, Type IA. Alternatively, Type I cement may be used with air-entrainment admixture chemicals conforming to ANSI/ASTM C226 in order to provide concrete equivalent to that made with Type IA cement. Use of Type 5 cement would be considered in areas with high alkali soil or water.

1. Source: Cement produced by the same mill shall be used throughout the project unless otherwise approved by the Engineer. Cement from different mills shall not be used in the same foundation under any circumstances.

F. Inspection and Tests: The Contractor shall submit for each shipment of cement a copy of the Certified Mill Test Reports or a Certified Test Report conducted showing that the cement has been tested and conforms to ASTM C150, Type IA. The tests shall conform to applicable ASTM Standards. Thecost of making such tests shall be paid by Owner. Admixtures: Admixtures, other than air-entraining admixtures, shall not be used without express approval of the Engineer. Admixtures for fluidization, water reduction, retardation, or acceleration, etc., shall conform to ANSI/ASTM C494. Admixtures, when approved by the Engineer, shall be compatible with the cement and all other admixtures shall be used in strict accordance with the manufacturer's instructions and with no reduction in the cementproportion.

G. Membrane Curing Compound: Membrane Curing compound shall meet ASTM C-309, Type 1, Class B and shall be an acrylic-based curing and sealing compound; minimum 18 percent solids, non-yellowing with unit moisture loss 0.55Kg/M^2 maximum. Application shall be in strict accordance with the manufacturer's instructions.

H. Prior to placing concrete, forms and reinforcement shall be thoroughly inspected. All wood chips, dirt, etc., as well as all temporary bracing, ties, and cleats removed, and all openings for utilities properly boxed, all forms shall be properly secured in their correct position and made tight. All reinforcing and embedded items shall be secured in their proper locations. All old and dry concrete and dirt shall be cleaned and all standing water and other foreign matter removed.

I. Placing concrete shall be in accordance with ACI 301 and ACI 304 and shall be carried out at such a rate that the concrete previously placed is still plastic and integrated with the freshly place concrete. Concreting, once started, shall be carried on as a continuous operation until the section is completed. No cold joints shall be allowed.

J. Construction joints: use keyways, continue reinforcement through joint.

K. Expansion joints: for exterior work, shall be placed per design drawings and/or at approved locations. Provide smooth dowels across joint which permit 1" horizontal movement and no vertical shear movement.

L. Isolation joints: provide between slabs and vertical elements such as columns and structural walls.

M. Control joints: provide sawn or tooled joints or removable insert strips; depth equal to 1/4 slab thickness. Spacing shall be as required and approved.

N. Placing Concrete for Spread/Pier Foundations:

Concrete shall be placed in the excavation on the same day, as soon as possible after completion of excavation, cleaning, dewatering, and placement of the reinforcing steel. The top portion of the piers exposed above adjacent grade shall be formed.
Concrete shall be placed in a continuous process. The total elapsed time from the beginningof concrete placement in the pier to the completion of the placement shall not exceed 30 minutes times the required number of truckloads..

No claims for payment for extra concrete required due to over excavation or cave-in of pierwalls will be allowed.

O. Placing Concrete for Other Foundations: Before beginning placement of concrete, the surfaces of the forms, reinforcing steel, and concrete previously placed, shall be thoroughlycleaned of hardened concrete or foreign materials.

At the time of placement, the concrete shall be of such consistency that results in a very slight accumulation of water at the top of a layer several feet in thickness, but with no segregation or accumulation of laitance, and:

1. All aggregates will float uniformly throughout the mass, without settling or segregation.
2. When dropped directly from the discharge chute of the mixer, it will flatten out at the center of the pile but will stand up at the edges, the pile spreading from internal expansion and not by flowing.
3. It will flow sluggishly when tamped or spaded.
4. It can be readily puddled into the corners and angles of forms and around reinforcement steel.

If, the concrete contains excessive water or fails to meet the specified slump, such concreteshall not be used in this project and shall be discharged as waste material at the Contractor'sexpense. Chutes used forconveying concrete shall be mortar tight. Concrete shall be so deposited that the aggregates are not separated, dropping concrete any considerable distance, depositing large quantitiesat any point and running or working it along the forms, or any other practice tending to cause segregation of the ingredients will not be allowed. The concrete shall be compactedby continuous tamping, spading,

slicing, or vibrating. Care shall be taken to fill every partof the forms, to work the coarser aggregate back from the face, and to force the concrete under and around the reinforcement without displacement of rebar. The concrete shall be deposited in continuous horizontal layers and, unless approved otherwise by the Engineer, concrete in foundations shall be deposited continuously for each monolithic section of thework.

The placing of concrete under water may not be performed.

P. Consolidation: All concrete shall be thoroughly consolidated and compacted by vibration, spading, rodding, or forking during the operation of placing and depositing in accordance with ACI 309. The concrete shall be worked around reinforcement, embedded items, and into the corners of the forms so as to eliminate all air and stone pockets.

1. The vibrator(s) shall operate with a minimum frequency of 4500 impulses per minute and with sufficient intensity to visibly affect a mass of one-inch slump concrete overa radius of not less than 18-inches. A sufficient number of vibrators shall be on hand such that timely and proper consolidation is given to each concurrent concrete placement job.
2. The vibrator(s) shall be applied only to the concrete mixture, not to reinforcing steel or forms or layers of concrete that have hardened to the degree that the concrete is notplastic under vibration.
3. The vibrator(s) shall be manipulated to thoroughly consolidate the concrete around the reinforcement steel and embedded fixtures and into the corners and angles of forms.
4. Vibration shall be applied at the point of deposit and in the area of freshly deposited concrete at points uniformly spaced and not farther apart than twice the radius over which the vibration is visibly effective. The vibrators shall be inserted and withdrawnout of the concrete slowly. The vibration shall be of sufficient duration and intensity to thoroughly consolidate the concrete but shall not be continued to cause segregationor the formation of localized grout.
5. Vibrators shall not be used to flow concrete in the forms over distances so great as tocause segregation or be used to transport concrete in the forms.
6. Vibration shall be supplemented by spading to ensure smooth and dense concrete along form surfaces and in corners and locations impossible to reach with vibrators.

Q. Placing in Cold Weather: Cold weather concreting shall comply with ACI 306R. No Calcium chloride, chemical or other foreign matter shall be added to the concrete for the purpose of preventing freezing without the written approval of the Engineer.

No concrete shall be placed without the specific permission of the Engineer when the air temperature is at or below thirty-five degrees Fahrenheit (35 Deg F). No concrete shall beplaced against iced, or frozen soil or if the air temperature is at or expected to be below twenty-two degrees Fahrenheit (22 Deg F).

If concreting in freezing weather is permitted by the Engineer, care shall be taken to preventthe use of any frozen material. In addition to adequate provision for protecting the concreteagainst chilling or freezing, the Contractor shall be required to heat the water and aggregateso that when deposited in the forms, the concrete will have a temperature of not less thanfifty degrees Fahrenheit (50 Deg F) nor more than eighty degrees Fahrenheit (80 Deg F). The concrete shall be adequately protected with blankets, heaters (except that fossil fuelheaters shall not be used) and other means so as

to maintain the surrounding air temperatureNLT fifty degrees Fahrenheit (50 Deg F) for a minimum of seven (7) days after it has beenplaced. The work shall be done entirely at the Contractor's risk.

R. Placing in Hot Weather: Hot weather concreting shall be in accordance with the recommendations of ACI 305R.

Concrete shall not be placed if the ambient air temperature exceeds one hundred degreesFahrenheit (100 Deg F).

During hot weather the aggregate piles and mixing water shall be cooled as required, and/orcrushed ice may be used to supplement the quantity of mixing water, to provide a mixed concrete temperature of not greater than ninety degrees Fahrenheit (90 Deg F) at the time of placement.

A water-reducing retarder, approved by the Engineer, may be required to be added to the concrete mix when the placement temperature of the concrete exceeds seventy-five degreesFahrenheit (75 Deg F).

Prior to placement, the forms, contact soil, etc., shall be cooled and wetted by spraying, misting or other approved means.

The Contractor shall install temporary sunshades and/or wind breaks to prevent drying of the concrete during finishing and curing. Finished concrete shall be covered, fogged, misted and/or sprayed as necessary to maintain a suitable moist curing environment and asurrounding air temperature of not greater than one hundred degrees Fahrenheit (100 DegF) for a period of 7-days following placement.

S. Construction Joints: Construction joints shall be located as shown on the plans and at otherpoints as may be necessary during construction, provided that the location and nature of additional joints shall be approved by the Engineer. In general, joints shall be located at pointsof minimum shear, shall be perpendicular to the principal lines of stress, and shall have suitable keys having areas of approximately one-third of the area of the joints.

In resuming work, the surface of the concrete previously placed shall be thoroughly cleanedof dirt, scum, laitance, or other soft material, and shall be roughened. The surface shall thenbe thoroughly washed with clean water, after which concreting may proceed after being approved by the Engineer.

Epoxy bonding compound shall be applied to construction joints when specified and, if required, at other locations designated by the Engineer. Surfaces to receive epoxy shall be cleaned and prepared as outlined above. Mechanical abrasion, sandblasting or acid etching,and thorough rinsing may be required to create rough surfaces. The epoxy shall be mixed in strict accordance with the manufacturer's directions and all epoxy mixed material shallbe used within a maximum period of 30-minutes. The epoxy shall not be mixed prior to the time concrete is on hand for the finished pour. The epoxy mixture shall be applied by trowel. The patch perimeter shall be undercut, when possible, to avoid feathering.

T. Finishing Formed Surfaces: All surfaces exposed to view shall be free from conspicuous lines, affects, or other irregularities caused by defects in the forms. If, for any reason, thisrequirement is not met, or if there are any conspicuous honeycombs, the Engineer may require the correction of the defects by rubbing with Carborundum bricks and water until a satisfactory finish is obtained. Surfaces shall be finished to a smooth hard finish by float, if not otherwise specified.

Immediately after removing the forms, all wires or other exposed metal shall be cut back from the concrete surface, and the depressions thus made, and all honeycomb and other defects shall be pointed with mortar and then rubbed smooth. If the Engineer deems any honeycomb or other defect to require such treatment, the defective concrete shall be cut out to a depth sufficient to expose the reinforcement and to afford a key for the concrete replacing that cutout and the cutout repaired with epoxy bonded concrete.

The top surfaces of all foundations shall be accurately finished to the specified elevation.

Care shall be exercised to prevent depressions that will hold water on all level surfaces

U. Repairing Defective Concrete: Surface defects in formed concrete shall be repaired to thesatisfaction of the Engineer. Minor irregularities, less than one inch (1 In.) in depth, shall berepaired within 24 hours of form removal.

Concrete that is porous, honeycombed, or otherwise defective to a depth in excess of one-inch (1 In.) shall be replaced within 48 hours after the forms have been removed. The defective portion shall be cut out and removed to sound concrete. Edges shall be square cut to avoid feathering. Cut surfaces shall be coated with epoxy bonding compound before theconcrete is placed.

Concrete repair work shall not interfere with the curing of surrounding concrete. Mortar and concrete used in repair work shall be cured per these entire specifications and shall befinished to match adjacent surfaces.

V. Curing: Concrete shall be protected from loss of moisture for not less than seven (7) daysafter the concrete is placed. Curing protection shall be applied to the exposed (above-grade)portion of the foundation as soon as the concrete is firm enough to do so without damage to the concrete or finish. Methods for curing and protection of concrete shall be consistentwith the provisions of ACI 301.

Curing protection shall be by application of wet burlap and polyethylene film or by application of two (2) coats of a specified curing compound to the above-grade portion ofthe piers.

Concrete shall not be permitted to freeze for at least seven (7) days following placement. When necessary, heating, covering, insulating, or housing the concrete work, in compliance with ACI 306, Chapter 7, shall be provided and be adequate to maintain the required temperature without injury due to concentration of heat.

The Engineer may require the frequent wetting of the concrete and the use of additional means to protect it from the direct rays of the sun.

3.5 ANCHOR BOLT INSTALLATION

A. Anchor bolt installation shall be as specified in these Specification Sections. Anchor boltsshall be thoroughly cleaned before placement and shall be handled carefully and braced such that the rebar cage shape and anchor bolt location are maintained. Anchor bolt assemblies for the tower foundations shall be installed plumb and within the tolerance forhorizontal location shown on the drawings. Reinforcement and anchor bolts shall be installed and secured to prevent shifting during concrete placement.

B. Remediation for Incorrect Location of Anchor Bolts: Any deviations greater than the specified tolerances in the location of any anchor bolts from the locations shown on the

drawings shall be remedied at the Contractor's expense in a manner acceptable to the Engineer. Remediation may include the Contractor's payment of the cost for modification ofthe tower design, refabrication of tower members, and any related cost(s) associated with rectifying the discrepancy.

3.6 TESTING OF CONCRETE

A. The Owner provided Special Inspector shall be:

Matt Jung
4765 W. Junction St.
Springfield, MO 65802
Phone: (417) 864 5100
Fax: (417) 864 0871
Matt.Jung@terracon.com

B. The Contractor shall be responsible for scheduling of all testing. The Contractor shall be required to notify the Terracon representative a minimum of 48 hours prior to all placement of concrete.

C. Transit-Mix concrete shall be tested by Terracon representative and test results shall be provided to the Engineer. All testing of the concrete shall be performed by ACI Certified individuals.

D. Prior to placement, the Terracon representative shall measure and record the ambient air and concrete air and concrete temperature, perform slump test in accordance with ASTM Standard C- 143, and air-entrainment test in accordance with ASTM Standard C231 to determine compliance with the specifications for all required concrete. Placement may be done only if these test results are within specification limits.

E. During placement, the Terracon representative shall take test samples from the concrete as it is being placed. Test cylinders shall be prepared in conformance with ASTM C172 and ANSI/ASTM C31. A minimum of three (3) test cylinders for each transit mix truck or each batch or each 10 cubic yards of job mixed concrete shall be made. Test cylinders shall be held on site, in the same environment as the foundation, for NLT 24 hours. Following the24 hour period, the cylinders shall be carefully transported to the testing laboratory.

F. Data regarding the source of concrete, placement location of the batch and other batch datashall be recorded on the cylinder. Data, in a suitably organized report, shall be provided by the testing laboratory to the Engineer showing the foundation designation, the date of the pour, truck number, temperature and time of day when the pour was made, concrete temperature, slump, and percent air-entrainment. The Terracon representative shall be fully responsiblefor sampling, data recording and care of test cylinders. Tests made without the specified recorded data will be considered unusable.

G. One (1) cylinder shall be tested at 7-days to verify the initial strength prior to placement ofstructures or equipment upon the concrete. One (1) cylinder shall be tested at 28-days. Thethird cylinder shall be held for backup testing for 90 days or until released by the Engineer.

3.7 BACKFILLING

A. Backfill shall be carefully placed to avoid any damage to or movement of the foundations. Backfill shall be thoroughly tamped with a mechanical tamper in conformance to the requirements of Section 310000 - Earthwork.

B. Any subsequent settling shall be refilled and tamped to provide even drainage or removedand refilled if required by the Engineer. Should refilling be required after the surfacing is installed, the surfacing material shall be completely removed, the settled area refilled and compacted, and clean surfacing material reinstalled.

END OF SECTION 033000

SECTION 260000 – ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and SupplementaryConditions, Bid Form, and other Division Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section includes Electrical requirements for the project construction activities, andschedule for testing.

1.3 DEFINITIONS

A. The following definitions shall apply to these specifications:

1. Cable: Cable, cables, wire, wires, or conductor.

2. Low Voltage Power Cable: Cable rated 600 volts or less used for power loads, including receptacle outlets, motors, heating, ventilation, and lighting, and cable usedfor controlling heating, ventilation, and lighting equipment.

3. Control Cable: Cable used for control, alarm, metering, relaying, supervisory, annunciator, and Owner identified low-current control circuits and any circuits not identified as power circuits.

4. Yard: All station areas, except shelter interiors.

5. Yard Cable: Any cable with any portion of its length located in the yard.

6. Indoor Cable: Any cable with its entire length indoors.

7. NEC: National Electrical Code NFPA 70.

8. NESC: National Electrical Safety Code, ANSI C 2.

9. WC Plus a Specified Number: Wire and cable NEMA Publication having specified WC number.

PART 2 - PRODUCTS

2.1 ELECTRICAL RACEWAY MATERIALS

A. Materials for the electrical raceway installation shall conform to the following:

1. Concrete: Concrete material shall be as specified in Section 033000 - Cast-In-Place Concrete.

2. Rigid Plastic: Rigid Plastic conduit and conduit fittings shall be PVC Schedule 40 andshall comply with NEMA TC2 and Federal Specification WC1904 on Semi-Rigid Plastic Conduit and Fittings. Joint cement shall be as recommended by the manufacturer.

3. Type P&C Plastic: Type P&C Plastic conduit and conduit fittings shall be of the direct burial type, and shall comply with NEMA TC6. Joint cement shall be as recommended by the manufacturer.

4. Rigid Conduit: All metallic conduit shall be heavy wall, rigid galvanized steel and shall bear the Underwriter's label of approval and shall be manufactured according to American Standards Association Specifications.

   Minimum size of conduit shall be ¾-inch. In no case will the use of 1-1/4-inch conduit be permitted. When this size is recommended by the NEC, the Contractor shall substitute 1-1/2-inch conduit and associated fittings. All rigid conduit fittings shall be of the malleable type, Appleton, or approval equal. All rigid conduit fittings used outdoors shall be equipped with neoprene rubber gaskets.

5. Flexible Conduit: Flexible conduit shall be liquid-tight flexible metal conduit, UA, gray color. Fittings shall be insulated, liquid-tight type, with sealing O-rings and retainer.

6. Conduit Clamps: Conduit clamps and hardware shall be galvanized or stainless steel. These clamps shall also be of the type that do not require steel drilling.

7. Miscellaneous Items: Wire, bolts, nuts, screws and related items shall be galvanized steel or stainless steel.

8. Galvanized Metal Paint: Paint for treating metal surfaces which have not been galvanized or which have had the galvanized surface disturbed shall be #810-C Zincilate, or equal.

9. Reinforcing Steel: Reinforcing steel shall comply with the drawings and Section 032000 – Concrete Reinforcing.

10. Sand: Sand shall be clean river sand.

11. Junction Boxes: Junction boxes shall be of the size and type specified on the drawings. Junction boxes shall be NEMA 4 continuous hinge gasketed covers and back panels. Junction boxes shall be factory painted with a finish coat of ANSI Standard Sky Gray No. 70 (Munsell No. 5.0BG7.0/0.4), unless specified otherwise.

12. Conduit Fittings: Conduit fittings which are installed for the entrance of conduit through the top of cabinets, junction boxes, etc., shall be watertight hub type. Entrance fittings on the side of cabinets, junction boxes, etc., shall be the watertight hub type or be furnished with a watertight gasket.

13. Conduit Bushings: Conduit bushings for all metallic conduit risers shall be of the insulated grounding type.

14. Conduit Sealer: Conduit sealer shall be of a non-hardening weatherproof type Permagum or Scotchfil.

15. Marking Tape: Marking tape shall be a durable 6-inch-wide yellow plastic tape.

16. Cable Pulling Lines: These shall be 3/8-inch wide, pre-lubricated, woven polyester tape, printed with sequential footage markings and with a tensile strength of 1,800 pounds..

2.2 CABLE AND CONDUCTOR MATERIALS

A. General: All cable shall be in accordance with the NEC and NEMA WC publications as specified. Cables shall be round, except for two-conductor cable with parallel conductors.Conductors shall be Class B or Class C copper and have American Wire Gauge (AWG) designation.

Cable manufactured more than two years prior to the Contract award date is not acceptable.Cable jackets shall be stamped with the date of manufacture.

B. Lighting Cable: Lighting cable shall be 12 AWG, or 10 AWG single-conductor cable as indicated on the plans. Lighting cables shall have colored or identified insulation as follows:

Table EL-1 Lighting Cable Color Code

3 Phase		1 Phase	
Phase A	Black	L1	Black
Phase B	Red	L2	Red
Phase C	Blue	Neutral	White
Neutral	White	Ground	Green
Ground	Green		

C. Low Voltage Power Cable: Indoor power cable for circuits rated at 600 volts or less shallbe NEC Type THHN, shall be UL approved, and shall bear UL label "THHN" on outer surface per NEC.

Power cable for circuits rated at 600 volts or less and installed in the yard shall be single conductor or multiconductor, non-shielded NEC type USE and shall be UL approved and bear UL label "USE" on outer surface per NEC.

D. Control Cable: Unless otherwise indicated, cables for all control, alarm, and relaying circuits, except control circuits for heating, ventilating, and lighting shall be 600 volts insulated, multiconductor type and suitable for installation in trays, direct burial, and general use. Individual conductors shall be insulated with ethylene-propylene rubber insulation and color coded in accordance with ICEA Method I (S-66-524), NEMA WC-7,Table K-1, as shown in Table EL-2/Control Cable Color Code. Insulation thickness shallbe at least 30 mils. The cable shall have a binder tape and overall jacket. The overall jacketshall be polyethylene. Jacket thickness shall be in accordance with Table EL-3/Jacket Thickness.

E. Internal Wiring: All wiring shall be conservatively selected for the electrical environmentalconditions of the installations. Unless otherwise specified, all electrical conductors shall beClass B, stranded copper, 14 AWG or larger. Oil resistant wiring with proper temperatureapplication shall be used throughout. MI cable is not acceptable. Internal control wiring shall be stranded copper conductor with NEC Type SIS, filled cross-linked polyethylene insulation rated at 600 volts and designed for a maximum conductor temperature of 90^0C and shall meet the vertical flame test requirements per ICEA S-1981.

Pre-insulated ring type wiring terminal connectors with metal reinforced sleeves or slotted spring spade terminal connectors shall be provided on all control conductor terminals. Allpower connectors shall be ring type.

Each terminal block, conductor, relay, breaker, fuse block, auxiliary device, and

terminal shall be permanently labeled to coincide with the identification indicated on the drawings.

All terminals provided for termination of external circuits shall be identified by inscribingcircuit designations on the terminal block marking strips.

All other wiring terminations shall be identified either by legible marking on the device terminals or by printing on wire sleeves. Terminal and conductor identification shall be bya permanent method unaffected by heat or solvents, and not easily dislodged.

The arrangement of the connections on terminal blocks shall be subject to review and approved by the Engineer.

Table EL-2 Control Cable Color Code

Conductor		Conductor	
No.	Color	No.	Color
1	Black	12	Black/White Stripe
2	White	13	Red/White Stripe
3	Red	14	Green/White Stripe
4	Green	15	Blue/White Stripe
5	Orange	16	Black/Red Stripe
6	Blue	17	White/Red Stripe
7	White/Black Stripe	18	Orange/Red Stripe
8	Red/Black Stripe	19	Blue/Red Stripe
9	Green/Black Stripe	20	Red/Green Stripe
10	Orange/Black Stripe	21	Orange/Green Stripe
11	Blue/Black Stripe		

Table EL-3 Jacket Thickness

Conductor Size		Jacket Thickness		
(AWG)	(mm^2)	Number of Conductors	(mils)	(millimeters)
12	3.31	4, 5	.045	1.14
12	3.31	6 through 12	.060	1.52
10	5.26	4 through 9	.060	1.52
10	5.26	12	.080	2.03

PART 3 - EXECUTION

3.1 ELECTRICAL SERVICE

A. General: The Contractor shall, if shown on the plans, furnish the materials and install thefacilities necessary to provide the electrical service from the point of supply to the Radio Shelter. The facilities shall comply with all provisions of the NEC, NESC and RUS or thesupplying power utility. Only qualified and experienced personnel shall be allowed to makeconnections and cable terminations.

B. Underground Secondary Service: Secondary service cable(s) shall be installed in conduitas shown on the plans. The conduit shall be installed carefully, avoiding the entry of wateror foreign material into the conduit system. Any burrs or sharp edges shall be removed. Conduit risers to poles shall extend NLT eighteen inches (18 In.) above finish grade at thepole.

The cable shall be handled carefully to avoid damage, and shall not be dragged across

the ground, fences, or sharp projections. Bending shall not exceed the manufacturer's recommendation, generally twelve (12) times the diameter or the cable, nor shall bends be permitted within six inches (6 In.) of the base or termination. Cable cuts shall be sealed immediately and remain sealed until termination. The seal shall be watertight and adequateto remain effective during installation handling.

Cables shall be labeled with a permanent tag, such as engraved plastic or stamped metal, and attached with a permanent fastener, such as black nylon Ty-wrap or metal wire. The tag label shall include the cable number, if shown on the plans, and destination description.

Secondary cable connections located below grade or in secondary pedestals shall be madewith pre-insulated secondary connector blocks.

All transformer secondary phase terminal connections shall be completely insulated. If thesecondary phase terminals are threaded studs, the connection must be made with a pre- insulated secondary transformer connection block. If the transformer secondary phase terminals are insulated cable leads, connection must be made with a pre-insulated secondary connector block or with a secondary prefabricated splice when the transformer leads continue directly to the service. If a transformer has secondary spades, the spades must be taped or otherwise insulated. Boots used for insulation must be taped so that theycannot be readily slipped off.

Secondary connections and insulation must have accommodations for all future and existing services and as shown on the plans.

When required, pedestals shall be installed for splicing or tapping the secondary cables. Pedestal stakes shall be driven vertically into the bottom of the trench before cables are placed and shall be located as shown on the staking sheets. Pedestal posts and supporting stakes shall be in place before the cable is installed. All pedestals should be approximatelyat the same height above finish grade.

C. Equipment Pads: Equipment pads shall be installed on undisturbed or properly compactedearth per section 310000, but not over the trench. The area shall be cleared of all debris and excavated to the specified depth. Gravel or sand may be added to the site and thoroughly compacted for leveling. The pad shall be installed level at the specified elevation.

D. Transformers: Transformers shall be of the type, size and rating specified in the design drawings. Transformers furnished shall be in accordance with the latest revision of applicable ANSI Standards (i.e., C57.12.00, C57.12.25, etc.) and be designed and constructed to be low-loss and high quality. All transformers shall be loss, impedance andimpulse tested. An Instruction Book, including shipping, storage and operating instructions, renewal parts list, complete drawings, certified test report, stating all ANSI and above test results, and warranty shall be furnished to the Owner.

Transformers shall be handled carefully to avoid damage to the unit or finish and shall be positioned in accordance with the plans.

E. Equipment Enclosures: Equipment enclosures shall be of the type, size and application specified. Excavations for below-grade enclosures shall be made with as little disturbanceof the surrounding area as practical. Enclosures shall be installed with sidewalls plumb. When enclosures are of fiber, plastic, or other semi-flexible material, backfilling shall be done with covers in place and with careful tamping to avoid distortion of the enclosure. When installation is complete, the cover of the enclosure

shall not be lower than and not more than two inches (2 In.) higher than the finish grade. Soil in the immediate vicinity shall be tamped and sloped away from the enclosure.

F. Utility Safety Signs: Utility safety signs, in accordance with ANSI Z535.2, shall be installed as shown on the plans.

G. Grounding: All neutral conductors, grounding electrodes, sacrificial anodes and groundable parts of the equipment shall be interconnected. All interconnections shall be made as shown on the plans. A copper-clad steel ground rod, 3/4-inch x 10 Ft., shall be installed at all equipment locations as shown on the plans and at all cable splices and taps.All pad-mounted equipment, including transformers, shall be grounded in such a manner that two separate grounding paths exist between the enclosure and the grounding rod(s).

H. Cable Location Markers: Permanent cable location markers shall be installed as shown onthe staking sheets or plans.

I. Cable Testing: Following completion of the installation, all cables shall be tested, and thewritten results provided to the Engineer. Continuity tests shall be made to assure that all connections are made, and the proper phasing is established. High potential tests shall be made on each length of cable and with terminations in place but disconnected from othercable sections or equipment. A DC test voltage shall be applied, per the cable manufactures instructions, at the cable manufacturer's specified acceptance test voltage, for not less than15 minutes.

3.2 ELECTRICAL CABLES AND RACEWAY SYSTEMS

A. General: The Contractor shall furnish and install the underground raceways, pull boxes, enclosures, and related items as shown in the drawings, or specified herein. Excavation andcompacted backfilling necessary to complete the work is included in this section.

Raceways shall be furnished in quantities sufficient for a complete installation as indicatedon the drawings and in these specifications. The raceway system shall include conduit, flexible conduit, wireway, cabinets and boxes, enclosures and all materials and devices required to install, support, secure and provide a complete system for support and protection of electrical conductors.

Conduit accessories shall include conduit fittings, bushed elbows, nipples, chase nipples, connectors, reducers, outlet bodies, outlet body extension, steel boxes, caps, locknuts, bushings, pull boxes, junction boxes, junction box extensions, sealing varnish, threaded joint compound, expansion couplings, liquid-tight conduit fittings, materials for sealing theends of conduits terminating at outdoor equipment, and all other incidentals required to complete the conduit system, and to fasten, clamp, attach, and support conduit in place.

B. Conduit and Raceway Installation: The Contractor shall install all conduits and make all conduit connections to equipment. Conduit shall be installed complete with necessary fittings and supports. Bends shall be gradual and smooth to permit the pulling of insulatedelectrical wires and cables without undue stress or damage to the insulated electrical wiresand cable sheath, or to the conduit. Conduit runs and bends shall be entirely free from kinks, indentations, or flattened surfaces. Unless otherwise indicated, metal conduit bendsmade in the field shall have not less than the minimum radii in accordance with the NationalElectrical Code, or as otherwise shown on the drawings, and shall be bent cold to prevent damage to the protective coating.

Conduit trenches shall be excavated to the correct slope and shall be excavated at least

3- inches deeper than the bottom of the bottom layer of conduit and to a width allowing a 3- inches minimum sand cover.

After preparing the trench, sand shall be placed and tamped in the trench to provide a uniform bearing for the conduit(s). The conduit(s) shall then be installed, and sand shall beplaced over the conduit(s) and thoroughly tamped. If additional rows of conduits are required, they shall be covered with sand and thoroughly tamped until 3" separation between the layers of conduits is achieved.

The top row of conduits shall be covered to a depth of 3-inches with sand. Where specifiedon the drawings, the conduits shall be covered with concrete. The remaining depth of the trench may be backfilled with excavated material taking care to remove unusually large stones and other hard objects from the fill. The backfill shall be tamped per Section 310000 - Earthwork.

The inside edges of all conduit and nipples shall be reamed before installation. Expansioncouplings shall be installed at each conduit riser, as shown on the drawings.

Burrs and sharp corners at the end of each piece of metal conduit shall be removed.

Male threads of rigid metal conduit joints shall be coated with a suitable graphite or zinc sealing material before making joints and shall be tightened securely to prevent the entrance of moisture or any other foreign material.

For steel conduit, the completed joints, terminations, wrench marks, and all other places where the zinc covering is damaged shall be completely covered with protective varnish toprovide protection from corrosion. All embedded joints in nonmetallic conduit shall be tightened securely and permanently sealed to prevent the entrance of any foreign material.

Bushings and chase nipples, or bell ends shall be installed on the ends of conduit to protectthe insulation or sheath of the wires or cables from abrasion. Locknuts and bondnuts shallbe installed on metal conduit to provide tight ground connections between conduit and boxes, panel boards, and cabinets.

Ends of conduits terminating at outdoor boxes, panel boards, or cabinets shall be sealed with a conduit sealer to prevent air circulation from the conduit into such boxes, panel boards, or cabinets.

Unless otherwise directed, the exposed conduit runs shall be straight and shall be parallel with each other and with the centerlines of the structure where they are located. Unless otherwise specified or directed, exposed conduits shall be rigidly supported at intervals ofnot more than 5 feet. Installation of exposed conduit shall include, where required, the drilling of holes in bottom and top enclosures or plates and inside enclosures of control and station service and other electrical equipment. All exposed conduits shall be tightened securely and shall be supported rigidly in place, and all connections to outdoor boxes shallbe watertight.

Metal conduit extending into the earth shall be installed in accordance with the drawings. Metal conduit shall not be direct buried in the earth. Below grade metal conduit shall be encased with not less than 3 inches of concrete. Conduit shall be supported for encasementby metal wire hangers attached to temporary supports laid across the conduit trench. Afterthe concrete encasement has hardened, the supports and those parts of the wire hangers notencased in concrete shall be removed.

Metal conduit connecting to PVC conduit shall utilize the manufacturer's recommended PVC-to metal adaptor and joining cement. The joint shall be encased in concrete.

Concrete used for encasing metal conduit shall contain no additives that contain chlorides.The concrete shall be mixed with pure, clean potable water.

A minimum separation of 3-inches shall be maintained between multiple conduits enclosedin the same concrete encasement, but not assembled as a duct bank.

Bending of plastic-coated conduit shall be made in accordance with the manufacturer's recommendations. Where the manufacturer warns of possible damage to conduit or plasticcoating when bending the larger sizes of plastic-coated conduit, factory bends shall be used.

In addition to the above requirements, nonmetallic conduit shall be installed in accordancewith the applicable requirements of NEMA Publication NO. TC2, including Appendix A.

Handholes, pull boxes or junction boxes shall be installed as specified or as shown on the drawings.

The procedure for installation of conduits into existing handholes or walls shall be to coredrill holes through the existing concrete, install the conduit and seal the space between theconduit and the wall with grout.

The Contractor upon completion of all conduit and raceway installations shall pull a properly sized foam-backed carrier through the entire length of all underground conduits to ensure the full cross sectioned area of the conduit run is free from obstructions. A 3/8-inch pull tape shall be installed in each run after it is checked with the carrier. The ends ofthe tape shall be secured in an accessible location at each end of the run.

C. Insulated Conductors and Cables

1. General: Provide all insulated conductors and cables required as specified under thematerial schedule and drawings.

   Installation shall be defined to include placement, splicing, and terminating conductors; coiling and taping of spare conductors; and identification, testing, and verification of each circuit, cable, and conductor.

2. Cable and Conductor Installation:

   a. General: The Contractor shall install all cables in accordance with the drawings, the requirements of these specifications, and NESC and NEC requirements where applicable. Installation shall include placement, splicing, terminating conductors,coiling and taping of spare conductors, and identification, testing, and verificationof each circuit, cable, and conductor. Installation of cable in existing trays shall also include removal and replacement of existing cable tray covers. All runs, connections, soldering, taping, and tagging of insulated conductors shall be madesubject to approval of the Engineer. After all insulated conductors are installed and all equipment, devices, and fixtures have been connected, acceptance tests shall be conducted in accordance with these specifications.

The Contractor shall complete the installation, including connecting to and extending existing circuits where required. No combination of AC and DC circuitsor current transformer and potential transformer circuits shall be carried in the same multiconductor cable. Sufficient length shall be left at the end of cable to make connections conveniently to equipment, fixtures, and devices. Spare singleconductors at each end of a multiconductor cable shall be retained in a length equalto that of the longest single conductor of the multiconductor cable. All conductorsin current transformer cable shall be retained in sufficient length to reach the farthest terminal used to select current transformer ratios. At the termination of each multiconductor cable, the conductors shall be formed into neat packs and laced or tied. All circuits not installed in conduit and consisting of two or more single conductors shall be tied together at ten (10) foot intervals by self-locking cable ties.

b. Conduit Preparation: Cable shall not be pulled into conduits until the conduit runshave been cleaned and are free from obstructions and sharp corners. A clean, dry,tight-fitting rag shall be drawn through the conduit immediately before installing the insulated conductors. Cable shall be installed so that there will not be cuts or abrasions in the insulation or protective covering or kinks in cable.

c. Cable Pulling: The Contractor shall install all cable without exceeding the maximum allowable pulling tensions and sidewall pressures as recommended by the cable manufacturer.

   Gradual and uniform pulling stresses only will be permitted on cable. Where a lubricant is needed as an aid to pulling cable, only cable lubricants recommendedby the cable manufacturer and approved by the Engineer shall be used. Any cable damaged during installation shall be removed and replaced with equivalent cable at the Contractor's expense.

d. Splices: No splices shall be made in cable unless authorized by the Engineer. Wheresplices are authorized, they shall be permitted only at boxes, outlets, panel boards,cabinets, cable trenches, and cable trays. All splices or joints shall be covered withinsulation equal to that on the insulated conductors.

   Joints and splices for copper conductors, where authorized, may be the soldered-type or the crimp or compression-type. Connectors for joining two wires 6 AWGand smaller shall be equal to Buchanan pressure splice cap connector or 3M Scotchlock spring connectors.

   Connectors for splicing conductors in multiconductor cable shall be of the two-way type equal to T&B compression or T&B STA-KON connectors. Conductors8 AWG and smaller size wires and cables shall be spliced or joined so as to be mechanically and electrically secure before being soldered.

e. Terminations: Solderless-type lugs and connectors shall be used for joining or connecting cables to terminal blocks or devices. All terminations of wire 8 AWG and smaller shall be made with pre-insulated pressure-crimp-type terminal connectors with ring tongues equal to AMP Plasti-Grip terminals manufactured byTE Connectivity.

All connectors shall be suitable for use on the particular conductor on which theconnector is used.

f. Power Cable Tags: All wires, cables, and individual conductors of multiconductorpower cables shall be neatly tagged at each end with fiber tags attached by cords. The fiber tags shall be three–quarter (3/4) inch diameter, shall be not less than one-sixteenth (1/16) inch thick, and shall have a three-thirty-second (3/32) inch diameter hole drilled or punched with the center approximately three-sixteenth (3/16) inch from the edge. The tags shall be clearly marked with the cable designation or conductor designation as applicable. The designations shall be as indicated on wiring diagrams, shall be lettered with black, waterproof ink, and shallbe covered with a coat of clear varnish or shellac.

g. Control Cable Markers: Individual conductors of multiconductor control cables shall be marked at each end with slip-on marking sleeves. The lettering shall be black on white background and shall be in accordance with the designations shownon wiring diagrams or cable sheets. The marking sleeves shall be equal to the RNF-100 heat shrink tubing as manufactured by the RAYCHEM Corporation.

h. Cable Support: All cable installed in a vertical plane or in an inclined plane shall be supported by means of approved cable grips, including hooks, and installed with slack spans between supports. All cable entering equipment shall be securely clamped by means of approved commercial cable clamps. When cables are installed in sleeves under equipment, the openings shall be blocked with foam rubber material approved by the Engineer. Where cables pass through sleeves or blockouts, urethane foam may be used in lieu of clamps or woven grips for supporting cables or in lieu of foam rubber for blocking openings.

Panel board and switchboard wiring shall be permanently supported and clampedto prevent loosening or shifting.

3.3 ELECTRICAL TESTS

A. The Contractor shall retain the services of a testing firm approved by the Engineer. The Contractor shall be responsible for scheduling and all costs of the testing. The Contractor shall be required to notify the testing firm a minimum of 48 hours prior to all testing activities.

B. Acceptance Tests: All insulated conductors shall be electrically tested after placement. Allcircuits, including lighting circuits, shall be tested with the circuit complete except for connections to equipment. All splices and terminal connector attachments shall be complete prior to testing.

In addition to the tests performed after cable placement is complete, continuity tests and insulation tests shall be performed on all supervisory and communication cable before andafter each splice is made.

Any circuit failing to test satisfactorily shall be replaced or repaired and then

retested.All equipment and labor required for testing shall be furnished by the

Contractor.

All insulated conductors shall be tested for continuity and conductor identification.

C. Continuity Tests: Continuity tests shall include all tests necessary to confirm that each conductor is continuous throughout its entire length.

D. Identification Tests: Identification tests shall include all tests necessary to confirm that theconductor being investigated originates and terminates at the locations designated in the cable sheets or indicated on the drawings.

E. Short-Circuit Tests: Short-circuit tests shall include all tests necessary to confirm that no conductor of a multi-conductor cable is short circuited to another conductor in that cable.

END OF SECTION 260000

SECTION 263200 – BACKUP GENERATOR ASSEMBLY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions, Bid Form, and other Division Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section includes Electrical requirements for a Backup Generator Assembly for the project construction activities, schedule of submittals, and schedule for operation.

1.3 REQUIREMENTS

A. The standby power system shall be sized as shown in the drawings and shall be a complete standby powersystem. The system shall be installed as shown in the drawings. The system shall include the generator set, automatic transfer switch (ATS), specified options, accessories and necessary materials as specified herein, shown on the plans, or as required to provide a completely operational system.

1.4 CONTRACTOR DRAWINGS AND DATA SUBMITTALS

A. General: All drawings and data shall be submitted in accordance with these specifications.

B. Final Drawings: Submit the following for final documentation:

1. General dimensioned outline drawings with weight of major components.

2. Listing of components showing manufacturer and model numbers with optionsexplicitly shown.

3. Block diagram of power and control functions with interface to other systems.

4. Wiring diagram(s) showing all power and control connections between the components and to the interface equipment.

5. Installation, Operation and Service instructions for each component and the overallstandby power system.

6. Warranty information and registration for all applicable components.

1.5 WARRANTY VALIDATION, REGISTRATION AND TRAINING

A. The Contractor shall provide an authorized representative of the generator set manufacturerto inspect the installation, provide operational training to the Owner, witness trial operation, and perform all other duties as needed to validate the warranty. The original written validation shall be provided to the Owner. The Contractor shall complete or provideto the Owner all warranty registration forms and manufacturer instructions as may be necessary to validate the manufacturer's warranty.

PART 2 - PRODUCTS

2.1 GENERATOR ASSEMBLY

A. The generator set shall be as shown in the drawings. It shall be suitable for the intended applications and shall be complete with manufacturer provided heavy-duty fabricated steel base with lifting points and anti-vibration pads to ensure vibration isolation. The mounting arrangement shall have complete OSHA guarding. The set shall comply with common industry quality standards including NEMA MG1-33, ISO8528, and NFPA 110.

1. Engine: Contractor shall reference Drawings and Data Submittals.

2. Generator: Contractor shall reference Drawings and Data Submittals.

3. Automatic Transfer Switch: The automatic transfer switch (ATS) shall provide manual and automatic switching of the AC power supply between the NORMAL utility supply and EMERGENCY engine generator supply. The ATS shall provide open (delayed) transition, two-pole switching with a solid neutral connection within the ATS cabinet. Contractor shall reference Drawings and Data Submittals.

PART 3 - EXECUTION

3.1 GENERATOR INSTALLATION

A. The generator foundation shall be sized as shown in the drawings. Conduits shall be installed for power and control cablesper the manufacturer's instructions. The generator shall be mounted to the foundation as specified by the manufacturer.

3.2 AUTOMATIC TRANSFER SWITCH OPERATION

A. The ATS shall generally operate as follows:

1. When the normal power source voltage drops below an adjustable, pre-set voltagefor an adjustable, pre-set time (within a range of NLT 1 – 60 seconds), initiate generator set starting.

2. Following an adjustable, pre-set time (within a range of NLT 1 – 300 seconds), when the generator voltage and frequency has stabilized, the ATS will transfer theload to the generator. The emergency source voltage and frequency sensing shall be inhibited for approximately four seconds following transfer.

3. Following the return of normal power source voltage and frequency, or failure of the generator voltage, and after an adjustable, pre-set time (within a range of NLT1 – 30 minutes), the ATS will transfer the load to the normal power source and after an adjustable, pre-set time (within a range of NLT 1 – 5 minutes), initiate generator set stopping.

B. The ATS shall also control exercising of the generator set at operator preset intervals, adjustable to seven or fourteen (7 or 14) days, by initiating generator set starting and stopping, without load transfer. The normal exercise run time shall be an adjustable, pre-set time (within a range of NLT 10 – 60 minutes).

C. The ATS shall be provided in a wall mount NEMA 3R cabinet having a hinged access doorand adequate conduit and cable access and wiring space. The ATS shall be wall mounted at location shown on plans per manufacturer requirements.

D. The Contractor shall test and confirm that the ATS and generator operate as listed above.

END OF SECTION 263200

SECTION 310000 – EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions, Bid Form, and other Division Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for Earthwork for the project construction activities, schedule of submittals, and schedule for testing.

1.3 REQUIREMENTS

A. Site preparation is to be performed by the Contractor as stated under the Specification Sections and shown on the plans. The Contractor shall perform the necessary work as needed to install the facilities as shown on the plans and complete the sitework to the finalcondition (grade slopes, surfacing rock, drives, etc.). If specific grade lines are not shownon the plans, the Contractor shall grade the pad for positive drainage away from the towersand shelters, and toward the perimeter of the respective pad, and positive drainage away from the pad and toward the perimeter of the site.

B. Testing: Selective Site Consultants shall retain the services of Terracon Consultants, Inc. for testing services.The Engineer (Selective Site Consultants) shall be responsible for scheduling of all testing. The Contractor shall be required to notify the Engineer representative a minimum of four business days prior to the commencement of any activities that require testing for the tower installations at Springfield, MO and Carthage, MO.

1.4 SUBMITTALS

A. The following submittals are required:

1. Crushed limestone paving material sample and gradation report
2. Product information and data, as applicable, for Geotextile fabric

PART 2 - PRODUCTS (not applicable)

PART 3 - EXECUTION

3.1 CLEARING AND GRUBBING

A. The Contractor shall remove from the construction area and other designated areas of thesite all timber, brush, loose and exposed rocks and stones over two-inches (2-In.) in size, debris and other obstacles that may interfere with the erection, operation and maintenanceof the station. All tree stumps and root systems within the area to be cut and filled shall beremoved. Tree stumps outside the cut and fill areas may be left flush with the ground, except as otherwise noted on the drawings. The entire site, excluding the station pad(s) and drive area(s), shall be left undisturbed, be graded smooth, suitable for mowing, or leftas described on the plans.

B. The cut surface of all sprouts and stumps shall be thoroughly wetted with undiluted herbicide for the control of unwanted woody plants and vines, immediately after cutting. The application shall be by package dispenser, hand sprayer, or brush to the extent that the solution is beginning to run off the cut surfaces.

The storage, transportation, application, and disposal of chemical solutions shall be in strict accordance with the manufacturer's instructions and applicable regulations. The solution shall contain a red or blue dye material in sufficient quantity to identify treatment.Applications shall not be made when rain is expected within 12 hours or when applicationmight allow mixing with storm water runoff. Herbicides may not be used within fifteen inches (15 In.) of running water, lakes or ponds.

C. All brush, branches, trees and refuse shall be removed from the site.

D. The Contractor shall also clean up and level the areas along the station boundary, old fencelines, if fences are removed, and/or along existing ditches so that these areas can be mowed. The Contractor shall properly dispose of fencing materials removed unless otherwise designated on the plans. Holes from post removal shall be promptly filled and compacted.

E. The Contractor shall perform a final clean up all construction debris, litter, etc., and dispose of these materials off-site.

F. Silt Fence

1. Description. This work shall consist of furnishing, installing, maintaining, and removing of a silt fence to control sediment along slopes and other designated areas. The quantity of silt fence shown on the plans may be increased or decreased, as directed by the engineer. The engineer may also modify the location as necessary to improve the effectiveness of the silt fence. Variations in quantity and location will not be considered as a change in work.

2. Material. When geotextile fabric is used, material shall be in accordance with Section 310519.

    a. Posts. Wood, steel or synthetic posts may be used. Posts shall be of sufficient length, but no less than 4 feet, to ensure adequate embedment while fully supporting the fence and shall have sufficient strength to resist damage during installation and to support applied loads while in service.

    b. Prefabricated Fence. Prefabricated fence systems may be used if the systems meet all of the above material requirements.

3. Construction and Maintenance Requirements.

    a. Fabric Fence. The contractor shall install silt fence as shown on the plans and at other locations directed by the engineer. Fence construction shall be adequate to handle the stress from hydraulic and sediment loading. Fabric at the bottom of the fence shall be buried a minimum of 6 inches to prevent flow under the barrier. The trench shall be backfilled, and the soil compacted over the fabric. Fabric splices with a minimum 2- foot overlay shall be located only at a support post. Any installation method acceptable to the engineer will be allowed as long as the effectiveness and intent of the silt fence is achieved.

    b. Post spacing shall not exceed 5 feet. Posts shall be driven a sufficient depth into the ground or placed on closer spacing as

necessary to ensure adequate resistance to applied loads.

c. The silt fence shall be fastened securely to the upslope side of the post. When wire support fence is used, the wire shall extend into the trench a minimum of 2 inches.

d. Maintenance. The contractor shall monitor the condition of all fences and repair or replace fences that are not functional as long as the fences are necessary to contain sediment runoff. Any deficiencies shall be corrected by the contractor. In addition, the contractor shall review the effectiveness of silt fences in areas where construction activities have changed the natural contour and drainage runoff. Where deficiencies exist, additional silt fences shall be installed as approved or directed by the engineer.

e. Sediment. The contractor shall remove and dispose of sediment in accordance with Section 310000, Part 3.5. Segments of silt fence that receive heavy sediment loading may require a secondary silt fence or installation of other controls to adequately contain sediment.

f. Removal. Silt fence shall be removed in accordance with Section 310000, Part 3.5 and as specified herein. The contractor shall remove and dispose of any excess silt accumulation along the fence, shall restore the area to match existing ground condition, and seeding in accordance with Section 329000 respectively.

3.2 EXCAVATION AND FILL PLACEMENT FOR PAD

A. General: The Contractor shall perform all loading, hauling, unloading, cutting, filling, compacting, ditching and grading necessary to bring the entire roadway and station pad areas to the proper sub grade level as shown on the plans to permit seeding and proper application of crushed rock paving.

B. Stripping Vegetation: The Contractor shall strip and dispose of surface vegetation, stumps,rocks, and other undesirable materials in the excavation area. Other designated trees, debris, etc. shall be removed during this work. Topsoil suitable for reuse shall not be removed during this process. Grass shall not be stripped from areas outside those shown on the drawing or needed to accomplish the site grading.

C. Stripping For Topsoil: The Contractor shall strip and stockpile topsoil of acceptable qualityfrom the areas shown on the plans to be graded or surfaced, to the extent required or to theextent such topsoil is available. Topsoil to be removed will vary in depth depending on siteconditions. Topsoil stockpiled for re-use on areas to be seeded shall be protected, shall notcontain a mixture of subsoil and shall be free from woody plants and roots over one-inch (1 In.) in diameter or 12-inches (12 In.) long, stones over two-inches (2 In.) in size, hard clods, construction debris and other deleterious matter. Topsoil shall not be stripped from areas outside those shown on the drawing or needed to accomplish the site grading.

D. Formation of Filled Area: Fill material shall be suitable for the application and shall be free of organic materials (such as leaves, grass, roots, etc.) debris, large stones and any other objectionable material that would cause interference with the compaction of the filled area. The fill material shall be dried or moistened to within three percent (3%) of the optimum moisture content prior to placement and compaction. The fill material shall be approved by the Engineer prior to placement on site.

The fill area shall be stripped of vegetation and topsoil. All depressions or holes below thegrade surface, whether caused by grubbing or otherwise, shall be backfilled with suitable material and compacted to grade surface before the start of construction of the filled area.Where fill is to be deposited, it shall be installed and thoroughly compacted in layers not exceeding six-inches (6 In.). All fills and embankments shall be compacted using sheep foot rollers or mechanical tampers. The sheep foot rolling shall be carried on over uniformlayers not exceeding the specified six-inches (6 In.) each layer until the soil density specified is obtained.

Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained because of rain, freezing weather, or other unsatisfactory conditions of the field. When inclement weather conditions are expected the Contractor shall drag, blade, or slopethe area to provide proper surface drainage prior to stopping work.

Wetting or drying of the material and manipulations when necessary to secure uniform moisture content throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work on all portions of the area thus affected shallbe delayed until the material has dried to the required moisture content. Sprinkling shall be done with approved equipment that will sufficiently distribute the water. Sufficient equipment to furnish the required water shall be available at all times.

During construction of the filled area, the Contractor shall route his equipment at all times,both when loaded and when empty, over the layers as they are placed and shall distribute the travel evenly over the entire width of the area. The equipment shall be operated in sucha manner that hardpan, cemented gravel, clay, or other chunky soil material will be brokenup into small particles and become incorporated with the other material in the layers.

In construction of filled areas, starting layers shall be placed in the deepest portion of the fill; as placement progresses, layers shall be constructed approximately parallel to the finished grade line.

Frozen material shall not be placed in the area nor shall the fill be placed upon frozen material.

The Contractor shall be responsible for the stability of all filled areas made under the contract and shall replace any portion that has become displaced.

There will be no separate measurement or payment for compacted embankment, and all costs incidental to placing in layers, compacting, disking, watering, mixing, sloping, and other necessary operations of the embankments will be included in the contract price. No payment or measurement for payment will be made for unsuitable materials removed, manipulated, and replaced in order to obtain the specified soil density. Any removal, manipulation, aeration, replacement, and recompaction of suitable materials necessary to obtain the required density shall be considered as incidental to the excavation and area operations, shall be performed by the Contractor at no additional cost.

E. Cut banks or slopes shall have all loose or protruding rocks barred loose or otherwise removed to line of finish grade.

All cut-and-fill slopes shall be uniformly dressed to the sloped, cross sections, and alignment shown on the plans or as directed by the Engineer.

F. Equipment: The Contractor may use any type of earth-moving and watering equipment

desired, provided the equipment is in a satisfactory condition and is of such capacity that the construction schedule can be maintained. The Contractor shall furnish, operate and maintain such equipment as is necessary to control uniform density, layers, section, and smoothness of grade.

G. Haul: No payment will be made separately or directly for haul on any part of the work. All hauling will be considered a necessary and incidental part of the work and its cost shall beconsidered by the Contractor and included in the contract unit price for the pay items of work involved.

H. Compaction: The Contractor shall compact all fill material, except topsoil to be seeded, toa density specified. Density tests shall be made on the soil to be used in the construction ofthe project to determine the standard density, the optimum moisture content and the moisture range required of the soil for satisfactory compaction. The field density and actualmoisture content of the compacted material shall be as prescribed previously herein. Fill and Backfill compaction density shall be:

1. NLT 95% for the station pad area

2. NLT 95% for the off-pad trench backfill

I. Standard Density: The standard density as determined by the Standard Proctor compaction test shall be the density to which the field density is referred for comparison or percentage for each type of soil used in the work.

J. Optimum Moisture Content: The optimum moisture content shall be the moisture contentcorresponding to the standard density on the standard compaction curve.

K. Moisture Range, Standard: The moisture range shall be the limits of moisture content of the soil with the optimum as a reference.

L. Field Density: The field density shall be the density of the compacted material determinedby the field density test.

M. Moisture Content: The moisture content shall be the actual moisture content of the soil in the compacted material at the time of compaction.

N. Compaction Test Frequency: Third party compaction tests shall be reported to the Engineer by the testing laboratory and shall be performed as directed by the Engineer.

O. Borrow Areas: Selected backfill and area fill material shall be tested per ASTM D1557-91or D698 to determine the moisture-density relationship of the material when initially excavated. Not less than three initial tests shall be made. Additional tests as needed when the material changes or as determined necessary by the Engineer shall also be made.

P. Compacted Fill Supporting Concrete Structure Foundations: Density tests shall be made per ASTM D2167-94 or D2922-96 on areas that are to support slab or slab-and-pier type

concrete structure foundations. Not less than one (1) test per structure foundation or two (2) tests per one thousand square feet of area for each two lifts of fill shall be made.

Q. Compacted Fill Beneath Crushed Rock Surface Areas: Density tests shall be made per ASTM D2167-94 or D2922-96 beneath areas to be paved, as well as all areas and elevations of the site pad not included in subparagraph P. Compacted Fill Supporting Concrete Structure Foundations. Not less than two (2) tests per 5000 square feet of area

foreach twelve (12) inches of compacted fill and final sub grade shall be made.

R. Compacted Granular Stone Or Sand Supporting Concrete Foundations: Density tests shall be made on compacted granular stone or sand installed beneath concrete foundations. Notless than three (3) tests per foundation or two (2) tests per 2,500 square feet of area shall be made.

3.3 EXCAVATING, TRENCHING, AND BACKFILLING FOR FACILITIES

A. General: The Contractor shall excavate, trench and compact the backfill for foundations and footings, conduits and pipes, and other facilities as shown on the plans and in accordance with this section and the site-specific geotechnical soils report in Appendix D, if any, attached. Prior to any excavation, the plans shall be reviewed for potential underground facilities and the site shall be examined for any evidence of underground facilities. When required, the Contractor shall contact the state mandated location service to notify of the pending excavation.

B. Rock Excavation: The Contractor shall anticipate the possibility of encountering rock when excavating, refer to Section 012200, Unit Prices. If rock is encountered the Contractor shall notify the Engineer, then drill sufficient 1-1/2 inch diameter pilot holes to a depth of five-feet (5 Ft.) to confirm extent and integrity of rock encountered.Large boulders or slabs shall not be considered solid rock for foundation purposes.
The Contractor shall then notify the Engineer of the pilot drill results (the extent, type and depth of rock encountered). The Contractor shall either excavate the rock or propose a modified foundation design. Upon the Engineer's direction, the Contractor shall then either excavate the rock or install the revised foundation.
Blasting will not be permitted.

C. Excavating and Trenching: The Contractor shall establish construction lines and control, then remove the materials required to establish the dimensions, elevations and lines as shown on the plans. Excavation for foundations and trenches shall be laterally extended toallow for formwork construction and removal, and proper backfill compaction and shall avoid undercutting existing foundations and over excavation for foundations to be cast against undisturbed material. Soft, muddy and undesirable materials shall be removed fromthe bottom of the excavation and backfill any over excavated areas under foundations withconcrete or Engineer approved material.
The Contractor shall transport, separate and stockpile unsuitable or excess materials from the work area and stockpile materials suitable for backfilling a sufficient distance away from edges of excavations to prevent overloading, slides and cave-ins.
The Contractor shall protect bearing surface(s) at the bottom of excavations from inundation or drying out during excavation process.
The Contractor shall remove and transport any excess unused excavated material from thesite unless directed otherwise by the Owner or Engineer.

D. Backfilling: The Contractor shall remove forms and clean excavations of debris before backfilling then furnish and place select structural backfill and fill materials in horizontal lifts not exceeding eight inches (8 In.) in thickness. Each lift shall be compacted with appropriate equipment, except only hand-guided compaction equipment shall be used within two-feet (2 Ft.) of existing or new foundations.
Backfill shall be compacted to NLT the density stated under these specifications, as

determined by ASTM D 698.

Crushed limestone or sand backfill (Class III) material shall be used for backfill when specified and may be used if requested and approved by the Engineer. These materials shallmeet the gradation limits shown in Table EA-1 and be placed in horizontal layers not exceeding six-inches (6 In.) in thickness with each lift compacted by NLT two (2) passes with a hand-guided vibratory compactor which applies an impact load of NLT 2.5 tons.

Table EA-1

SIEVE SIZE SQUARE OPENINGS	PERCENT PASSING BY WEIGHT
#4	95 – 100
#8	90 – 100
#16	65 – 97
#30	25 – 70
#50	5 – 35
#100	0 – 5

3.4 CRUSHED ROCK PAVING

A. General: The Contractor shall install crushed rock paving on the station pad and perimeter as well as drive and parking areas as described herein or shown on the drawings. Prior to installing the paving, the subsurface shall be sloped to provide complete drainage, smoothed, compacted, and proof rolled, with any "soft spots" repaired as described herein.

B. Geotextile Fabric: Geotextile fabric shall be installed under the rock paving in all areas tobe paved. The geotextile fabric shall be per Section 310519, installed with NLT one foot (1 Ft.) lap at each joint. Soil staples or other means shall be used as necessary to hold the fabric in place during installation of the crushed rock paving.

C. Paving of Station And Perimeter Areas: Following completion of all below grade work, the Contractor shall install crushed rock paving over the entire fenced area, except undisturbed previously surfaced areas unless shown on the plans, and to a distance of one foot (1 Ft.) outside of the fenced area. The paving shall consist of a layer of geotextile fabric, a base rock layer and a station rock layer.

D.

Following installation of the geotextile fabric, the Contractor shall place and compact a four-inch (4 In.) layer of crushed rock "base" material to a minimum 95 percent of standard maximum density using white crushed limestone rock with the following gradation

Sieve	PERCENT PASSING (BY WEIGHT)
1 In.	100
1/2 In.	60-90
#4	35-60
#8	---
#30	10-35
#200	---

Compaction of the base paving shall be made with a vibratory roller having sufficient weight and force to achieve the desired compaction. The final surface of the paving shall slope to provide surface water drainage.

Following installation, compaction, and Engineer approval of the base rock layer, the Contractor shall install a two-inch (2 In.) layer of station paving. The station paving material shall be clean, white crushed limestone rock with the following gradation:

Table EA-2

STANDARD SQUARE MESH SCREEN SIZE	PERCENT PASSING (BY WEIGHT)
1 In.	100
3/4 In.	90 – 100
3/8 In.	15 – 40
#4	0 – 5

Thin or degraded areas of crushed rock surfacing at existing sites shall be spread and incorporated into the sub grade earth, if practical; spread over the area to be paved and blended with the base rock paving material such that no significant void spaces are remaining or removed. The final paving shall provide a uniform appearance throughout the station.

3.5 CLEANUP AND RESTORATION

A. The Contractor shall clean up all construction debris, including excess soil and concrete, packing materials, trash, etc., and shall restore the site, including damaged or soiled crushed rock paving on the pad and drive, grassed areas, and any facility damage, prior tothe Owner's final inspection. Restoration materials and methods shall conform to these specifications.

B. The Contractor shall reseed all damaged areas not paved or covered with gravel. Seed per Section 329000.

END OF SECTION 310000

SECTION 310519 – GEOTEXTILES FOR EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions, Bid Form, and other Division Specification Sections apply to this Section.

1.2 SUMMARY

A. This specification covers geotextile for use in subsurface drainage, sediment control and erosion control, or as a permeable separator.

PART 2 - PRODUCTS

3.1 MATERIAL

A. Acceptance. Acceptance of the material will be based on the manufacturer's certification and upon the results of such tests as may be performed by the engineer.

B. Material. Geotextiles shall be in accordance with the physical and chemical requirements of AASHTO M 288 for the specified application, except as modified in this specification.

C. Subsurface Drainage Geotextile. Subsurface drainage geotextile shall be used in subsurface drainage as a filter to protect drainage media from clogging with fines from adjacent soil. Typical applications include the lining of drainage trenches and the wrapping of drainpipes.

1. The minimum permittivity shall be 1.0 sec 1.
2. The material shall be AASHTO Class 2.

D. Temporary Silt Fence Geotextile. Temporary silt fence geotextile shall be used in supported or non-supported sediment control fencing.

E. Permanent Erosion Control Geotextile. Permanent erosion control geotextile shall be used when the erosion control measure will not be removed, such as erosion control of slopes and channels when placed under a rock blanket, rock ditch liner, etc.

1. The minimum permittivity shall be 1.0 sec 1.
2. The material shall be either AASHTO Class 1 or Class 2.

F. Separation Geotextile. Separation geotextile shall be used as a separation material to prevent mixing of dissimilar material, and to control migration of backfill material through joints in structural elements.

1. The minimum permittivity shall be 1.0 sec 1.
2. The material shall be AASHTO Class 1.

END OF SECTION 310519

SECTION 316000 – SPECIAL FOUNDATIONS AND LOAD-BEARING ELEMENTS

PART 1 - GENERAL

1.3 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions, Bid Form, and other Division Specification Sections apply to this Section.

1.4 SUMMARY

A. This Section includes Electrical requirements for Special Foundations and Load-Bearing Elements for the project construction activities.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 PIER DRILLING (Not Applicable)

A. Blasting will NOT be permitted unless expressly allowed with written permission of the Engineer.

The Contractor shall have the Terracon representative on site to assess and keep written drilling logs of the soils being excavated from the tower foundation. This data shall immediately be provided to the Engineer after the foundation is excavated to verify that the removed soils are consistent with those encountered in the Geotechnical Engineering Report and those anticipated in the foundation designs. Verification shall be performed by the Designer of Record prior to proceeding further with the foundation construction. If it is determined that the soils are different, the Contractor shall provide proposed design alterations ensuring compliance with these specifications.

Temporary steel casings shall be used to hold the excavation open if the sides of the excavation are unstable and may be used at all locations. Casings, if used, shall be of steelconstruction and shall be of ample strength to withstand handling and installation stressesand shall be installed as the drilling proceeds or immediately after the auger is withdrawn to prevent sloughing and caving of the excavation walls.

Temporary steel casings shall also be used to reduce infiltration of ground water in wet locations. A pier excavation will be considered dry if the infiltration of ground water at thebottom is less than 1/4-inch rise per minute. The total height of water in the bottom of theexcavation may not exceed two inches (2 In.) at the time sufficient concrete has been placed to balance the water head.

Temporary casings shall be removed as the concrete is placed, aided by the use of a vibratory extractor. During extraction, the casing shall be kept plumb, and, for wet locations, the concrete head shall be maintained at a level to offset the water head outside the casing. A minimum concrete head of four-to-five-feet (4-5 Ft.) shall be maintained above the bottom of the casing during the casing extraction.

If the casings cannot be removed, the Contractor shall notify the Engineer and obtain prior approval for leaving the casings in the ground. If the casings are left, the void areas betweenthe casing and the excavation walls shall be filled with grout. The grout shall be placed andcompacted to fill the annular space. The casing will reduce skin friction, so the reduction in axial capacity of the pier must be considered by the Designer of Record to determine the adequacy of the pier.

B. Cleaning of Area for Foundation: The Contractor shall ensure that all soil be scraped from the sidewalls within rock strata to ensure bonding of concrete directly to the rock. The Contractor shall remove free water and loose material from the bottom of foundation. Cleaning by means of a rock auger only shall not be considered satisfactory. The top portion of the hole shall be formed, if necessary, to soil cave-in and sloughing.

3.1 EXCAVATION

A. All excavation shall be classified as earth excavation unless classified otherwise by the Engineer. Rock excavation, if required, will be distinguished from earth excavation as statedin the Earthwork Section. Excavation of all materials, including rock, shall be included. Additional payments shall not be considered for excavation of rock, wet materials below ground water, etc. Excavation shall include all materials excavated for any purpose and shall include all subsequent handling and disposal of such material including:

1. All sheeting, shoring, bracing and protection of adjacent property.

2. The diversion of surface water, pumping, draining or otherwise dewatering excavations.

3. Storage of excavated materials where necessary.

4. Backfilling, grading and subgrade preparation.

B. The use of explosive blasting for excavation is prohibited unless expressly approved by theEngineer. Blasting will not be permitted in the vicinity of existing facilities. Explosives whereapproved shall be done in a controlled manner to prevent shattering the rock formation of the foundation hole sidewall and/or base.

3.1 TOWER FOUNDATION MODIFICATIONS

A. The Contractor shall not modify existing tower foundations without the approval of the Engineer.

END OF SECTION 316000

SECTION 323113 – CHAIN LINK FENCE AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions, Bid Form, and other Division Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for Chain Link Fence and Gates for the project construction activities, schedule of submittals, and schedule for testing.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 FENCE INSTALLATION AND CONSTRUCTION

A. The Contractor shall install the fencing as described under these specifications and shownon the plans. The installation shall be complete with gates and other components as necessary to provide a complete, secure fence system. New installations shall be in accordance with the below requirements. Minor additions and improvements shall be in accordance with the specifications and as shown on the plans. All posts, braces, and otherframework members shall be of first quality, full weight, hot-dipped galvanized steel. All bands, wire ties, clips, rings, etc., for securing the fabric to the top rails, line posts, terminalpost and tension wires shall be galvanized steel sized as specified or of adequate strength for the purpose for which used. All material shall be standard mill tested with results reported to the Engineer. All material, including fabric, posts, gates, and associated fence hardware, shall be manufactured in the United States of America (USA). The Contractor shall provide substantiating data to prove that all materials were produced and manufactured in the USA.

B. Post Footings: Post footings shall be located as shown on the plans. The concrete shall beas specified in the Section Cast-In-Place Concrete. Concrete amounts shall not be less thanas shown on the drawings. Footings shall be placed such that the top of the footing is at orslightly above the top of the finish grade (crushed rock paving) and at the bottom of the fence fabric. The top portion shall be formed using removable forming tubes to avoid the formation of any “flare-out,” with good adherence to the post, and with tops smooth and sloped to provide drainage away from the post. Posts shall be set in a single, continuous pour footing, grouting or capping of the top portion will not be permitted.

C. Posts: All posts shall be steel and conform to the shape, minimum cross sectional size, height and steel type as specified herein. Tubular post material shall conform to ASTM A120, hot-dipped zinc coated pipe as shown below:

1. Line posts shall be 2-inch NPS, Schedule 40 pipe (2-3/8 In. O.D., 0.154In. thick) with a weight of 3.65 Lbs/Ft. and height as required to:

    - Be embedded 2-1/2 Ft. into the concrete footing,
    - Accommodate 6 Ft. height fabric, and
    - Accommodate placement of the extension arms.

2. Gate, terminal, corner and pull pipe posts shall be 3-1/2-inch NPS, Schedule 40 pipe(4 In. O.D., 0.226 In. thick) with a weight of 9.11 Lbs/Ft. and height as required to:

    - Be embedded 3-1/2 Ft. into the concrete footing,
    - Accommodate 6 Ft. height fabric, and
    - Accommodate placement of a corner extension arm or extend 1 Ft. additionalfor barbed wire attachments.

All posts shall be set plumb and to the depth shown on the drawings. Line posts shall be spaced evenly between section terminal posts and at not more than ten-feet (10 Ft.) on centers. Gateposts shall be spaced for proper operation of the latching assembly and shall be set such that the distance from the gate to the corner post shall be not less than ten-feet(10 Ft.), unless shown otherwise on the plans.

D. Fence Barbed Wire Extension Arms: Barbed wire extension arm fittings or "barb arms" shall be installed on all security fence posts. The fittings shall be installed to extend the arms upward at an angle of forty-five degrees (45 Deg.) and outward perpendicular to thefence line at line posts and at thirty-five degrees (35 Deg.) to the fence line at corner posts.There shall be provisions for three equally spaced lines of barbed wire on each arm. The uppermost wire shall be approximately one foot (1 Ft.) vertically above the top of the fabric.

The arms shall be one piece, #12-gauge minimum, pressed steel or malleable iron designedto be compatible with the top rail being furnished and to prevent entry of water into the post. The arm shall be capable of supporting a downward force of 300 pounds, minimum,at the end of the arms without permanent deformation. The arm shall be galvanized in accordance with ASTM A153, Class B1 and provided with a means of fastening to the post.

The arms shall be installed at a uniform height to allow slippage of the top rail, for expansion and contraction, without binding or distortion. Each arm shall have a galvanized "keeper" or "lock wire" installed to secure all barbed wires in case of breakage.

E. Top Caps: All posts and rods not requiring extension arms shall have galvanized domed top caps installed to prevent entry of water.

F. Top Rail: Top rails to be used with round or H-Column line posts shall be round steel pipeor tubing with a minimum size of 1-5/8 In. OD, shall have a minimum wall thickness of
0.140 In., and shall be galvanized in conformance with ASTM A120.

Top rail section lengths shall be a minimum of sixteen feet (16 Ft.). Couplings shall be ofthe outside sleeve type, not less than seven inches (7 In.) long, and of adequate strength

and shall be installed for each top rail splice. Top rail stretches exceeding eighty-two feet (82 Ft.) shall be provided with a spring expansion coupling for expansion and contraction. The spring shall be #6 gauge minimum.Heavy-duty end connectors and post bands shall be furnished for top rail connections to posts. The top rail shall pass through each extension arm or post top and form a continuousbrace from end to end of each stretch of fence. The top rail shall be fastened to terminal parts with a heavy pressed steel connector.

The top rail shall be installed with a coupling at each joint interconnection. Stretches exceeding eighty-two feet (82 Ft.) shall have a spring coupling for each full eighty-two feet(82 Ft.) of length.

G. Bracing: Post braces shall be installed at each gate; corner, pull and terminal post and shallconsist of a strut, the same size and shape as the top rail, and a tension rod with turnbuckleor truss tightener. The tension rod shall be galvanized steel with a diameter of NLT 3/8-In. The post brace, tension rod and all fittings and attachments shall be galvanized inaccordance with ASTM A153.

Bracing shall be installed in accordance with the manufacturer's recommendations and asrequired to permit proper stretching of the fabric and barbed wire without visible pulling of the posts. All fabric terminations shall be braced between the terminal post and adjacentline post.

H. Fabric: The fence fabric shall be a minimum of six feet (6 Ft.) high. The fabric shall consist of a No. 9 USSWG (minimum) steel wire woven into a two-inch (2 In.) square mesh with sides of the mesh pattern approximately 45 degrees to a vertical line. The breaking strength of the wire shall be 1200 pounds minimum. The top selvage shall be twisted and barbed, and the bottom selvage shall be knuckled.

The fabric shall be hot-dipped galvanized after weaving and be in accordance with ASTMA392, Class 2 (latest revision thereof). The weight of zinc coating shall be not less than 2.0oz/sq. ft. of uncoated wire surface as determined from the average of two or more specimens, and not less than 1.8 oz/sq. ft. of uncoated wire surface for any individual specimen. The weight of coating shall be determined in accordance with ASTM A90-81 on one or more pieces of wire removed from the fabric. These specimens may be of any length over twelve inches (12 in.) and shall include both bends and straight sections but shall not include either twists or knuckles.

The chain link fabric shall be installed level with the finish grade and the bottom of the fabric shall be at the finish grade elevation (top of the crushed rock paving).

The chain link fabric shall be stretched tight, be free of any irregularities and shall be securely fastened to the termination posts by means of a stretcher bar and steel bands placedapproximately fourteen inches (14 In.) apart. Stretcher bars shall be steel bars not less 1/4- In. x 3/4-In. galvanized in accordance with ASTM A153. They shall be approximately one-inch (1 In.) less than the fabric height. Attachment bands for stretcher bars, truss bars, etc.,shall be #11 gauge, one-inch (1 In.) wide (minimum) hot-dipped galvanized steel and shallbe secured with 3/8-In. galvanized carriage bolts and nuts with the nut inside the enclosedarea.

The fabric shall also be fastened to the top rail and line posts with No. 9 USSWG galvanized steel wire at intervals of approximately twenty-four inches (24 In.) to the top rail and fourteen inches (14 In.) to the line posts.

A bottom tension wire or bottom rail shall be installed for each stretch of fabric as shown

on the drawings. The tension wire shall be woven through or attached by hog ring clips to the bottom of the fabric and stretched tight. The tension wire shall be zinc-coated steel tension wire, Type II, Class 3 per ASTM A824. The coated diameter shall be 0.177 In. andthe breaking strength shall be NLT 1950 pounds. The zinc coating weight shall be NLT 2oz/sq. ft. The bottom rail, if required, shall be as specified in subparagraph F. Top Rail.

I. Barbed Wire: Barbed wire shall consist of two twisted strands of No. 12-1/2 USSWG steelwire with round, No. 14 USSWG, 4-point barbs at a maximum spacing of five-inches (5 In.) apart. The wire shall be galvanized after weaving in accordance with ASTM A121, Class 3.

Barbed wire shall be installed in continuous lengths for each stretch of fence. The wire shall be stretched to appear straight, but not overly tight, and secured to each extension armand terminal post.

J. Gate and Accessories: Gate(s) shall be of the length and type shown on the plans and shallbe installed to open in the direction shown on the plans. The gate frame and bracing members shall be two inches (2 In. O.D.) tubular steel members and double adjustable truss rods to affect a permanent rust proof, rigid assembly. The gate height shall provide approximately three inches (3 In.) clearance over the finish grade (top of paving) when installed with the top frame member at the fence top rail height. All members, fittings, andhardware shall be hot-dipped galvanized after fabrication. All gates shall be provided withthree barbed cross wires at the top. The gate frames shall be either welded or bolted at the corners and intermediate braces. Gate frames that are welded shall utilize projection- resistance type welding procedure. The use of standard type welding equipment and application of cold zinc treatment to the welds will not be accepted. Gate frames that are bolted shall utilize extra heavy duty pressed steel corner ells, bolted with a minimum of four (4) galvanized bolts and nuts per corner. Self-locking nuts shall be furnished, and boltsshall be end peened to prevent nut removal.

Gate latches shall be furnished in accordance with the details shown on the plans.

Double leaf gates shall have a slotted mushroom type malleable galvanized center catch topositively secure the drop bar (plunge rod) installed.

Automatic gate hold backs, which will automatically catch and latch the gate in the open position and must be manually released to allow closing, shall be provided for each leaf. The hold back post shall extend NLT two feet (2 Ft.) above finish grade and shall be provided with a domed top cap.

END OF SECTION 323113

SECTION 329000 – PLANTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions, Bid Form, and other Division Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section includes for seeding of all disturbed areas due to construction, work shall consist of furnishing and sowing seed as specified in the drawings and the following specifications. All disturbed areas shall be seeded except for sodded areas, surfaced areas, solid rock, and slopes consisting primarily of broken rock.

PART 2 - PRODUCTS

2.1 MATERIAL

A. The seed shall be grown and processed in the United States or Canada and shall comply with the requirements of the Missouri Seed Law. Certain lots of seed may be desirable for the advancement of a local ecotype when specified and will be the only seed permitted. The following percentages for purity and germination or pure live seed will be the minimum requirements in the acceptance of seed, unless otherwise permitted by the engineer.

Seed Requirements				
Non-native Grasses	**Scientific Name**	**Purity**	**Germination[a]**	**Pure Live Seed**
Kentucky Bluegrass	Poa pratensis	85	80	97
Perennial Ryegrass	Lolium perenne	98	85	97
Tall Fescue	Festuca arundinacea	97	85	97

a - Will not apply if unhulled or unscarified seed is specified

B. If the specified quantity is in pounds of seed, no reduction will be permitted in the specified quantity of seed if the purity or germination or both, are higher than the minimum required by the specifications. If the specified quantity is in pounds of pure live seed, the pure live seed quantity shall be determined from the actual percentage shown by the supplier for native grasses or by multiplying the actual percentages of purity times the actual percentage of germination, including hard seed for other seed.

2.2 CONSTRUCTION REQUIREMENTS

A. The seedbed shall be prepared in accordance with Sec 801. Seeding shall be done before the seedbed becomes eroded. Seed shall be uniformly applied at no less than the rates specified.

B. Disturbed areas outside of authorized construction limits shall be seeded at the contractor's expense.

2.3 ACCEPTANCE

A. Acceptance of permanent seeding will be made when seeded disturbed areas meet the requirements for final stabilization as defined in the current state operating permit for land disturbance. Inspection for acceptance will be made within 60 days after seeding, excluding seeding dates that fall between September 30 and March 1. Seeding that occurs between September 30 and March 1 will be inspected no earlier than May 1.

2.4 CERTIFICATION

A. The contractor shall certify the seed and seed mixture are in accordance with this section. The certification shall list the seed type, lot numbers, pure live seed, percent germination, and quantity used for each lot. In lieu of listing the lot specific information, the certification may include attached individual bag label analysis for all seed used.

END OF SECTION 329000

SECTION 338116 – LATTICE COMMUNICATION TOWERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions, Bid Form, and other Division Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for Lattice Communications Towers for the project construction activities, schedule of submittals, and schedule for testing.

1.3 GENERAL

A. The Contractor shall furnish and install the tower, and accessories in accordance with these specifications, the plans, and the requirements stated in these specifications.

1.4 DESIGN REQUIREMENTS (NOT APPLICABLE)

1.5 SUBMITTALS (NOT APPLICABLE)

1.6 HANDLING AND TRANSPORTING

A. Galvanized steel shall be transported and handled to avoid bending or damage. Bent piecesmay be used only if they are straightened without damage to the material or galvanizing. Material with damaged galvanizing shall be re-dipped unless the damage is local and can be repaired to the satisfaction of the Engineer in accordance with the Galvanizing Section. Damaged members shall be reviewed by the Engineer and replaced at the Engineer's discretion, at the cost of the Contractor.

B. During storage, prevent ground or surface water contact by placing steel on suitable timberblocking.

1.7 FIELD WELDING INSPECTION AND ACCEPTANCE (NOT APPLICABLE)

PART 2 - PRODUCTS

2.1 MATERIALS

A. Sabre – Basis of Design
   1. Springfield Missouri Self-Support Tower
   2. Carthage Missouri Self-Support Tower

B. Ehresmann Engineering, Inc
   1. Springfield Missouri Self-Support Tower
   2. Carthage Missouri Self-Support Tower

C. Valmont
   1. Springfield Missouri Self-Support Tower
   2. Carthage Missouri Self-Support Tower

2.2 FABRICATION

A. Sabre – Basis of Design Fabrication by Tower Manufacture
   1. Springfield Missouri Self-Support Tower
      a. Fabrication by Tower Manufacture

   2. Carthage Missouri Self-Support Tower
      a. Fabrication by Tower Manufacture

B. Ehresmann Engineering, Inc
   1. Springfield Missouri Self-Support Tower
      a. Fabrication by Tower Manufacture
   2. Carthage Missouri Self-Support Tower
      a. Fabrication by Tower Manufacture

C. Valmont
   1. Springfield Missouri Self-Support Tower
      a. Fabrication by Tower Manufacture
   2. Carthage Missouri Self-Support Tower
      a. Fabrication by Tower Manufacture

2.3 TOWER ACCESSORIES

A. Sabre – Basis of Design Fabrication by Tower Manufacture
   1. Springfield Missouri Self-Support Tower
      a. Provided by Tower Manufacture
   2. Carthage Missouri Self-Support Tower
      a. Provided by Tower Manufacture

B. Ehresmann Engineering, Inc
   1. Springfield Missouri Self-Support Tower
      a. Provided by Tower Manufacture
   2. Carthage Missouri Self-Support Tower
      a. Provided by Tower Manufacture

C. Valmont
   1. Springfield Missouri Self-Support Tower
      a. Provided by Tower Manufacture
   2. Carthage Missouri Self-Support Tower
      a. Provided by Tower Manufacture

PART 3 - EXECUTION

3.1 TOWER ERECTION AND ACCESSORIES INSTALLATION

A. General: The tower shall be erected, and accessories installed in accordance with the erection drawings and these specifications. Erection and installation shall be in accordancewith the applicable provisions of the AISC Load and Resistance Factor Design (Part 6, Specifications and Codes). Hardware, grounding cables and accessories, clamps and connectors and other materials required for a high-quality installation shall be furnished asneeded.

B. Tower: No steel shall be erected on a foundation until the grounding system is installed and the concrete has achieved its specified design strength as evidenced by laboratory

testreport.

The tower may be erected by assembling in sections on the ground and hoisting successivesections into place or may be built up in place by individual members, at the option of theContractor. If erected by assembling in sections, initial bolting shall be adequate for dead load, live load, and erection stresses, but shall not be so tight as to prevent aligning and fitting adjacent sections or members. Misalignment or misfit of adjacent sections or members attributable to the adopted method of erection shall be corrected by adjusting erection methods as necessary to eliminate trouble. Members and splice plates shall not beexcessively jacked, pulled or over tightened such that the member, joint or hardware is overly stressed.

Slings or devices used for lifting tower sections or members shall be of such material or shall be protected in such a way as to prevent damaging the galvanizing or overstressing members.

Tag lines shall be used when deemed needed and, in all cases, when in the vicinity of powerlines or substations to prevent damage to the tower and contact with the line. OSHA safetyclearances shall be maintained at all times.

C. Base Plate Grouting: Following leveling checks, the base plates shall be grouted if shown on the drawings, with a specified non-shrink grout, or approved equal, in accordance with the manufacturer's recommendations. The top surface of the concrete piers shall be prepared in strict accordance with the manufacturer's instructions. The non-shrink grout shall be placed in accordance with the manufacturer's instructions and, after a sufficient degree of set has occurred, the partially hardened grout shall be cut to achieve45-degree surface from the bottom edge of the base plate to the top surface of the concrete piers. After the finishing process is completed, two coats of approved curing compound shall be immediately applied tothe finished edges of the grout.

D. Bolting:

1. General: The erector shall establish a procedure to assure that only approved hardwareof the correct size is used at each connection.

   Bolts shall be torqued and locked within the shortest practicable time after all materials have been installed. Connections shall lay flat where they are bolted together. No gaps between butt flanges or connections are acceptable after the bolts are tensioned. Where incomplete bolting is a major contributing factor to damage prior to final acceptance, Contractor shall repair or replace the material, as directed by the Engineer.

2. Torquing of Bolts: Connection bolts shall be entered clear to the head. Bolts shall be tightened to the torque specified by the tower design, with minimum unlubricated torques as follows:

Table LCT-1

BOLT DIAMETER (INCH)	TORQUE (POUND-FEET)
1/2	35 – 45
5/8	70 – 100
3/4	125 – 165

Bolts larger than 3/4-inch diameter in shear/bearing-type connections shall be

tightened to the snug-tight condition. The snug-tight condition is defined as the tightness that exists when all plies in a joint are pulled into firm contact by the full effort of a man using an ordinary spud wrench. Bolts identified on the erection drawing as slip-critical and other connections requiring full pre-tensioning shall be tightened by the "turn-of-nut" method as per the "Specification for Structural Joints Using ASTM A325 or A490 Bolts," including the commentary given therewith, as approved by the Research Council on Structural Connections of the Engineering Foundation and endorsed by AISC, except as otherwise modified or supplemented herein.

3. Wrenches: The Contractor shall not use any wrench or impact wrench that may deform the nut or cut or flake the galvanizing.

E. Tower Lighting System: The **Procurement by Designated Brand is for International Tower Lighting, LLC (ITL) as a Single Feasible Source (SFS)** for the tower lighting system (NO SUBSTITUTIOINS) shall be mounted temporarily and installed permanently in compliance with FAA regulations, the site-specific FAA determination, and FCC ASR requirements as well as the manufacturer's instructions and recommendations. The erector may provide an acceptable temporary system for operationduring erection. The erector shall monitor the lighting system and provide all FAA notifications until the tower is accepted by the Owner.

The installer shall furnish and install any materials not provided by the tower accessories supplier including conduit and fittings, conduit support clamps, wiring, junction boxes, cable supports and hardware.

Beacon fixtures shall be leveled using integral leveling devices or stainless-steel shims.

All obstruction lighting fixtures, and conduit junction boxes shall be mounted so that they are easily accessible from climbing facilities for lamp replacement, cleaning and service by maintenance personnel. The components shall be mounted in locations approved by the Engineer and Owner.

The Contractor shall install permanent wiring in metallic conduit from the AC panel boardin the Radio Shelter to the tower lighting system Power Supply. All tower lighting cables, and wiring shall be installed as shown on the plans, as a continuous run from the Transmission Line Entry Panel, through the surge protection device to the flash head(s) and side lighting fixture(s). No cable splices will be allowed. Rigid Metallic Conduit (RMC) and weather tight Flexible Metal Conduit (FMC) shall be installed where specified.

Towers designed to accommodate a future top mounted cellular/PCS platform shall have asuitably sized (12 In. x 12 In. x 6 In. minimum) NEMA 3RX galvanized steel or stainless-steel enclosure mounted near the top beacon with an additional length beacon cable, NLTtwelve-feet (12 Ft.), sufficient to relocate the beacon coiled therein.

Towers designed to accommodate a future extension of height shall have a suitably sized (12 In. x 12 In. x 6 In. minimum) NEMA 3RX galvanized steel or stainless-steel enclosuremounted near the top beacon with an additional length beacon cable, NLT the tower extension height plus twelve feet (12 Ft.), sufficient to relocate the beacon coiled therein.

Where tower lighting conduit is specified, the system shall be made with threaded joints, be installed in compliance with the NEC and include cable support boxes at intervals not exceeding that recommended by the manufacturer to support the weight of the

lighting cable. Cable support boxes shall be securely mounted to the tower using a bolted connection and shall be located such that they are easily accessible to a tower climber. Thetower lighting conduit shall not be mounted such that it occupies or interferes with cable mounting positions on the transmission line ladder. All conduit fittings shall be suitable for the application and have captive hardware and tethered removable components.

F. Climbing Provisions: Step bolts shall be installed on the leg(s) designated or shown on theplans.

G. Lightning Rod(s): The lightning rod(s) shall be installed at the top corners of the tower asspecified or shown on the drawings or, if not specified or shown, in the best position to protect the lighting system beacon or, if none, other tower top facilities.

H. Transmission Line Ladder(s): The transmission line ladder(s) shall be installed at the location(s) specified or shown on the plans. The ladder(s) shall be rigidly attached to the tower in a straight line to avoid unnecessary bending of the transmission lines.

I. Transmission Line Bridge(s): The transmission line bridge(s) shall be installed at the location(s) specified or shown on the plans. The bridge(s) shall be free standing unlessshown attached to the tower and/or shelter.

J. Other Accessories: All other accessories and items needed for a complete installationshall be installed in accordance with the design and industry practice.

END OF SECTION 338116

SECTION 338130 – COMMUNICATIONS SHELTER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions, Bid Form, and other Division Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for Communications Shelter for the project constructionactivities, schedule of submittals, and schedule for testing.

1.3 GENERAL

A. The Contractor shall install a new prefabricated shelter(s) as specifiedand shown on the plans.

1.4 CONSTRUCTION TYPES

A. New Shelters: A new prefabricated concrete Communication Shelter for the Troop D Service Center site is to be installed as described in this Section, as shown on theplans and as specified. The Contractor shall install equipment and materials as specified and as shown on the drawings.

The shelter is to be installed on a concrete slab with perimeter foundation. Thefoundation shall be constructed as shown on the plans and shall be in conformance with the Cast-In-Place Concrete Section.

1.5 CODES AND STANDARDS (NOT APPLICABLE)

1.6 DEFINITIONS

A. The following definitions shall apply to these specifications:

1. Cable: Cable, cables, wire, wires, or conductor.
2. Low Voltage Power Cable: Cable rated 600 volts or less used for power loads, including receptacle outlets, motors, heating, ventilation, and lighting, and cable usedfor controlling heating, ventilation, and lighting equipment.
3. Control Cable: Cable used for control, alarm, metering, relaying, supervisory, annunciator, and Owner identified low-current control circuits and any circuits not identified as power circuits.
4. Yard: All station areas, except shelter interiors.
5. Yard Cable: Any cable with any portion of its length located in the yard.
6. Indoor Cable: Any cable with its entire length indoors.
7. NEC: National Electrical Code NFPA 70.
8. NESC: National Electrical Safety Code, ANSI C 2.
9. WC Plus a Specified Number: Wire and cable NEMA Publication having specifiedWC number.

1.7 CONCRETE SHELTER DESIGN (NOT APPLICABLE)

1.8 SUBMITTALS (refer to Section 013300 Submittals, Subsection 3.1.A)

1.9 SHELTER SHIPMENT

A. The shelter shall be shipped after it has passed tests and has been inspected for compliance to the specifications. All loose and removable items shall be properly identified, packed and shipped with the shelter.

B. It is the Contractor's responsibility to inspect the shelter for damages prior to unloading. The Contractor will furnish the labor, equipment and necessary materials to unload the shelter from the transport and set the shelter on its foundation. Any damage to the shelter shall be documented and reported to the Engineer.

C. A complete Bill of Material shall be submitted to the Engineer, at least three weeks prior to the scheduled arrival of the first shipment at the destination. The Bill of Material shall give an accurate definition of individual items constituting the contract. Bills of Material and/or Packing Lists shall also accompany the shipment.

D. Shipping notices shall be submitted to the Engineer at least three days prior to arrival of material at the job site. Notification shall be in accordance with the Engineer's instructions. Shipments shall be scheduled to arrive during periods when rain and falling snow is not anticipated. Shipping notice shall state routing and PRO numbers. Shipments by truck will be received only during normal working hours 8:00 A.M. through 5:00 P.M., Monday through Friday, excluding holidays, unless other specific arrangements are made prior to delivery. The Manufacturer shall be responsible for all demurrage charges for deliveries during hours other than those listed above. Shipments by truck also require notification 72 hours before arrival.

E. After shelter installation and before Owner acceptance, any damage to the shelter (excluding finishes) shall be documented and reported to the Engineer.

F. After shelter installation and before Owner acceptance, any damaged areas of painted surfaces shall be repaired by cleaning and spot priming as required and repainted with materials equal to the original paint system. Repair paint shall be applied to produce a finishequal to the original finish. The Contractor shall repair any damaged areas of the finish painted surfaces to the satisfaction of the Engineer.

PART 2 – PRODUCTS

2.1. CONCRETE SHELTER MANUFACTERERS

A. Shelter Manufacturers:

1. American Products (basis of design)
2. Fibrebond
3. Babour
4. Or approved equal

PART 3 - EXECUTION

3.1. CONCRETE SHELTER CONSTRUCTION (NOT APPLICABLE)

3.2. SHELTER ACCESSORIES CONSTRUCTION (NOT APPLICABLE)

3.3. TESTING

A. Factory Testing and Checkout: After assembly of the shelter, the Contractor shall performthe following tests, as applicable, to assure that proper functioning assemblies will be shipped to the construction site:

1. Wet spray test at joints, doors, etc., for water leaks.

2. Continuity and/or functional checks of all electrical devices and wiring installed by the Contractor, insofar as possible.

3. Check conduit and/or cable tray installation.

4. Check ac and dc panels to assure that all circuits are appropriately identified and operational.

5. Assure that all raceway covers are tightly secured in place.

6. Check to assure that lighting fixtures and photocell are firmly mounted and operational.

7. Verify operation of all equipment and systems (HVAC(s) and thermostat, lighting and photocell controller, ventilation system, etc.).

The Owner and/or designated representative(s) shall have the right to witness all tests and perform an inspection. The Contractor shall advise the Owner not less than fifteen (15) daysin advance of the factory test, then coordinate with the Owner and/or designated representative. Any deficiencies shall be noted by the Contractor and resolved with the Owner prior to shipment.

B. Electrical Tests:

1. Acceptance Tests: All insulated conductors shall be electrically tested after placement.All circuits, including lighting circuits, shall be tested with the circuit complete exceptfor connections to equipment. All splices and terminal connector attachments shall be complete prior to testing.

   In addition to the tests performed after cable placement is complete, continuity tests andinsulation tests shall be performed on all supervisory and communication cable before and after each splice is made.

   Any circuit failing to test satisfactorily shall be replaced or repaired and then retested.All equipment and labor required for testing shall be furnished by the Contractor.

   All insulated conductors shall be tested for continuity and conductor identification.

2. Continuity Tests: Continuity tests shall include all tests necessary to confirm that each conductor is continuous throughout its entire length.

3. Identification Tests: Identification tests shall include all tests necessary to confirm that the conductor being investigated originates and terminates at the locations designated in the cable sheets or indicated on the drawings.

4. Short-Circuit Tests: Short-circuit tests shall include all tests necessary to confirm that no conductor of a multi-conductor cable is short circuited to another conductor in that cable.

3.4. SHELTER INSTALLATION

A. The Contractor shall install the communication shelter as described in these specifications and on the drawings. The Contractor or Manufacturer will furnish the labor, equipment andnecessary materials to unload the shelter from the transport and set the shelter on its foundation. The shelter shall be installed in accordance with the Manufacturer's recommendations and the details on the plans by experienced, competent workers who are capable of performing the work without damage to the shelter or to adjacent facilities.

B. The Manufacturer shall deliver the shelter to a suitable unloading position near the foundation location at the site at which time the Owner and /or Owner's Representative willinspect the shelter.

C. Following inspection, if acceptable, the Contractor or Manufacturer will unload and set theshelter. The Contractor shall verify correct shelter orientation according to the plans and specifications prior to off-loading of the shelter. The Contractor or Manufacturer shall havea competent person on-site to direct the unloading and placement of the sections of multi- section shelters. Temporary cribbing, jacks, baseplates, supports, bracing, etc. for the shelterand/or equipment necessary to unload and set the shelter and equipment without damage shall be furnished by the Contractor.

D. The Contractor shall anchor the shelter to the foundation as recommended by the shelter manufacturer or as shown on the drawings.

E. The Contractor shall be responsible for the repair of the shelter due to any chipping, spalling,cracking, or other damage after unloading of the shelter from transport.

END OF SECTION 338130

SECTION 338243 – GROUNDING AND BONDING FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions, Bid Form, and other Division Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for Grounding and Bonding for the project constructionactivities, and a schedule for testing.

1.3 GENERAL

A. The station grounding system shall be as specified and shown on the plans and per Motorola R56. The station grounding system consisting of driven ground rods interconnected by buried grounding conductors; grounding conductor risers to structures, fence posts, and shelters; and other items as shown on the plans or required to form a comprehensive system. The work includes all excavation, backfill and compaction necessary to complete the system. The Contractor shall coordinate with the Engineer to allow examination of all below grade connections and facilities prior to backfilling.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Grounding System Conductor: The main ground grid conductor shall be #2 solid bare tinned copper wire. The perimeter ground grid conductor shall be # solid bare tinned copper wire.

B. Ground Rods: Ground rods shall be three-quarter inch (3/4 In.) diameter by ten-feet (10 Ft.) long copper-clad steel.

C. Procurement by Designated Brand: **Transtector Power Protection Equipment** (no substitutions).

PART 3 - EXECUTION

3.1 GRID CONDUCTOR INSTALLATION

A. Excavation or trenching for the installation of the ground grid conductors shall be made only as the grounding system installation can be completed during the workday. The grounding grid conductors shall be bedded in rock-free compacted earth as shown on the plans and in the Materials List and be installed with a minimum depth of twenty-four inches(24 In.); except, where insulated cables or conduits are to be placed in the same trench withground bus, the ground bus conductor must be buried a minimum of thirty-three inches (33In.) below the final sub grade level, or nine-inches (9 In.) below the bottom layer of cablesor conduits. Ground rods shall be driven near vertical with the top not less than twelve- inches (12 In.) below the final sub grade level. Should solid rock be encountered, the Contractor may request deviation by notifying the Owner or Owner's Representative in writing, advising of the area(s) where encountered, rock type and depth; the Owner or Owner's Representative may authorize a reduced depth in these areas. Grounding conductor risers shall be installed, and connections made to the tower, radio shelter, fence and other facilities at the locations shown on the plans or needed to provide a complete system.

B. Connections: Connections shall be of pressure and/or exothermic type as specified on theplans. Solder type connections shall not be used. Conductors, connectors and ground rodsshall be bright clean and dry at the point of connection. Conductor that is oil filled or greasyshall be cleaned with a solvent (rapid drying safety solvents which leave no residue are preferred). For extreme cases, cable ends shall be dipped into molten solder. Corroded material shall be cleaned free of major corrosion with a card cloth or wire brush. Wet material shall be dried out with a solvent that is quick drying, alcohol, or a hand torch. Conductors shall be cut with appropriate cable cutter tools to prevent deforming ends of cable. Insulated cable shall have insulation removed prior to cutting to prevent contaminating ends of conductors with insulating material. Driving sleeves shall be used to drive all rods; if damaged the ends shall be cut off square.

Exothermic Connections shall be installed strictly per manufacturer's instructions with manufacturer recommended tooling in good condition. Generally:

1. Use a jig of necessary size to support cables and mold assembly.
2. Insert conductor or conductors and/or rod into mold, position correctly and clamp to jig.
3. Mark conductors and check marks prior to igniting to be certain slippage has not occurred.
4. Insert necessary disks in accordance with manufacturer's instructions.
5. Dump welding material from plastic container (or containers simultaneously) into crucible being careful not to upset the steel disk. Tap bottom of plastic container to loosen all starting material and spread evenly over welding material. Place a small amount of starting material on top edge of mold under cover opening for easy ignition.
6. Close cover and ignite with flint igniter. Jerk igniter away quickly to prevent fouling.Should igniter become fouled, soak in household ammonia. Where holding down oncover is necessary, use a hammer or other long tool to keep hand away from flash ofigniting material.
7. Remove all slag from mold before making next weld.
8. Clean molds after each ignition. (Dirty and worn molds shall not be used.)

All underground connections shall be thoroughly coated with asphaltum (stiff plastic asphalt roofing cement) shortly after the exothermic connection is made (while it is still warm enough to melt the asphaltum to fill the conductor voids, but not so hot that it runs off).

Installation of Compression Type Connectors: Compression type connectors shall be installed strictly per manufacturer's instructions using manufacturers recommended tooling.

Installation of Bolted Type Connectors: Pressure type connectors shall be installed as shown on drawings. Bolts shall not be overly stressed or strained but shall be brought up evenly to the torque values listed.

C. Backfill: Trenches shall be closed (filled and compacted) as soon as practical after installation of the grid and approval of the Owner or Owner's Representative, for safety and to minimize the possibility of storm water inundation.

The backfill material shall usually be the material excavated; however, if conditions

require, may be low resistivity grounding fill or crushed limestone base rock as specified. Backfill material shall be near optimum moisture content for proper compaction, if

necessary, the Contactor shall dry or moisten the material. The backfill shall be placed andcompacted in lifts not exceeding six inches (6 In.). The Contractor shall furnish the necessary mechanical tampers to affect the specified compaction. Compaction testing of trench backfill will be required if suitable compaction is questioned by the Owner or Owner's Representative.

3.2 TESTING

A. Ground Grid Resistance Testing: Ground grid resistance testing will be performed by theContractor. The Contractor shall notify the Owner NLT five (5) days prior to testing to allow witness if desired.

Following completion of the ground grid installation, except for connection to an adjacentground grid (such as a substation ground grid), where present, the tester shall perform ground grid resistance testing.

The testing shall be made with all metallic external connections to the station (AC serviceneutral, adjacent substation ground grid, telephone lines, farm fences, etc.) disconnected unless otherwise approved by the Owner.

The testing shall consist of multiple measurements, with procedures and probe locations approved by the Owner using the Three Point Fall-of-Potential method and a suitable threeor four-point instrument. The instrument shall have been calibrated within the past twelve
(12) months and the manufacturer's instructions shall be closely followed.

The initial test will be made at the Primary Base Grounding Point riser with the remote current probe placed a distance of NLT five (5) times the maximum diagonal dimension ofthe grounding grid (including guy anchors if applicable) away from the nearest edge of theground grid. Readings shall be made at potential probe intervals of ten percent (10%) of the current probe distance through a range of ten to fifty percent (10 – 50%) of the currentprobe distance and five percent (5%) of the current probe distance through a range of fifty-five to ninety-five percent (55 – 95%) of the current probe distance. This test shall be repeated using a widely different current probe location.

Additional tests shall be made with the same current probe at the same location and the potential probe at sixty-two percent (62%) of the distance to the current probe. These shallmeasure the resistance at the Primary Base Grounding Point, each tower leg ground riser, each shelter ground riser, and each fence corner ground riser.

Test reports, such as the Ground Grid Resistance Test Report, shall be completed with station location; date; temperature; soil condition; instrument model, serial and calibrationdate; test lead resistance; layout sketch; field measurement readings and a graph of the results. Contractor completed and signed reports shall be provided to the Owner within forty-eight (48) hours of performing the testing and prior to connection of external metallicconnections.

END OF SECTION 338243

SECTION 338320 – ANTENNA SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract including General and Supplementary Conditions, Bid Form, and other Division Specification Sections apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for Antenna Systems for the project construction activities, schedule of submittals, and schedule for testing.

1.3 GENERAL

A. The Contractor shall install the specified materials. The Contractor shall also furnish and install the antenna supports, and accessories as stated as shownon the plans. This work includes all miscellaneous materials to provide durable and operational antenna system installation. Personnel performing this work shall be experienced in handling and installing this equipment and the work shall be done carefullyand professionally.

B. The Contractor shall photograph each antenna mounting, antenna-transmission line connection (after testing and final connection - before and after weatherproofing), and ground kit installation (before and after weatherproofing). Two photos, from near right angles from each other, shall be taken for each location. The photos shall be taken at a resolution of NLT 5 megapixels. A high-quality JPG file shall be submitted to the RCR, on a USB drive to contain all station photos for each station, as soon as practical. If not before, they shall be provided with the final documentation for the station. The file name or meta data shall include the station I.D., description of the location of the photo, date thephoto was taken, and any pertinent notes regarding the installation.

1.4 SUBMITTALS

A. The following applicable submittals are required:

1. On-Site Construction Photo Files
2. On-Site Antenna System Test Reports
3. Final Construction Report including “as built” drawings, photo files, test reportsand files, and other information specified herein

PART 2 - PRODUCTS

2.1 LAND MOBILE RADIO (LMR) ANTENNA MOUNT (PROCUREMENT BY DESIGNATED BRAND-TALLEY (TLY) TOWER ANTENNA SYSTEM CONFIGURATIONS, NO SUBSTITUTIONS)

A. Land Mobile Radio (LMR) antenna mount(s) shall be furnished and installed as specified.The base antenna mount shall provide a 2-1/2 inch O.D. mounting pipe with vertical alignment and an outset from the tower as specified or shown on the plans at the intendedantenna mounting elevation. The antenna attachment mount shall be suitable for use on thetower without causing damage or stress to the tower members. The antenna mount shall befabricated from steel components, all hot-dip galvanized after fabrication. The mount shallinclude a separate structural member, if required, for mounting of a mid or upper sway brace (outrigger) for all side-mounted antennas.

2.2 MICROWAVE ANTENNA MOUNT

A. Microwave antenna mount(s) shall be furnished and installed as specified. The base antenna mount shall provide a 4-1/2 inch O.D. mounting pipe with vertical alignment andan outset from the tower as specified or shown on the plans at the intended antenna mounting elevation. The antenna attachment mount shall be suitable for use on the tower without causing damage or stress to the tower members. The antenna mount shall be fabricated from steel components, all hot-dip galvanized after fabrication. The mount shallinclude a separate structural member, if required, for mounting of a mid or upper sway brace.

PART 3 - EXECUTION

3.1 ANTENNA INSTALLATION

A. Land Mobile Radio (LMR) Antenna: Land Mobile Radio (LMR) antenna (s), as specified, shall be assembled and installed in accordance with the manufacturer's instructions and may require single or multiple mountings. Care shall be taken to avoid damage to the antenna and elements and to mount the antenna or individual antenna elements at the elevations stated or shown on the plans. Care shall be taken to mount multi-element antennas with the proper phasing and proper configuration on the tower. The antenna pigtail(s) shall be physically secured to a mount or tower member within 24 inches of the antenna such that stress from wind, ice, and the transmission line connection is not placedon the pigtail antenna attachment or connection.

B. Microwave Antenna: Microwave antenna(s) shall be assembled and installed per the manufacturer's instructions and mounted on the tower at the elevation and azimuth stated or shown on the plans. Care shall be taken to avoid damage to the antenna and feedhorn and to mount at the elevation and polarity stated and shown on the plans. Microwave antenna installations may also include the installation of high wind load kits, additional sway-bars and antenna connection ice shields. Structural members shall be furnished and installed, if needed, to attach the additional sway-bars at locations providing rigid mountingof the antenna and ease of adjustment.

All antenna mounting connection points shall be clean and the hardware tightened to the proper torque to assure mechanical stability and proper grounding of the antenna components.

3.2 TRANSMISSION LINE INSTALLATION

A. Transmission lines shall be installed at the locations as shown on the plans or as directed by the Owner and/or Engineer. Each transmission line shall be installed in one continuous length from theconnection at the antenna (antenna port or jumper) to the connection at the shelter entrancesurge protector or radio (radio port, adapter, or jumper). Splice points or splice repairs in the main run of transmission line are not acceptable.

B. Installation requirements:

1. Hangers shall be installed with manufacturer recommended tooling and per manufacturer's instructions. Care shall be taken to install lines with the proper orientation when the antenna and radio end connectors are different. The Owner and/or Engineer shallbe notified prior to installation to allow witness, if desired.

2. The transmission line shall be hoisted using cable manufacturer approved hoisting grips. On long runs, hoisting grips shall be spaced such that the transmission line is supported at least every 150 feet. Hoisting grips shall remain on the transmission line

after it is installed and attached to the tower where specified as additional vertical support for the transmission line.

3. Padded bolt-on hangers or snap-in hangers, appropriately sized, shall be used for all elliptical waveguides. Bolt-on or snap-in hangers, appropriately sized, shall be used for coaxial cables.

4. Transmission lines shall be properly attached to the antenna following the procedure recommended by the manufacturer. A flex connection or adapter is generally not allowed and will be used only if shown on the plans or approved by the Owner.

5. Connections made prior to the completion of testing which will be left overnight, etc. shall be temporarily weather proofed to prevent entry of moisture into the connector or cable. Following test acceptance the final connection shall be made, hardware tightened to the manufactures recommended torque, and weather proofed. Weather proofing shall be done only when the components are dry and above freezing. The procedure shall be as shown in the Andrew Installation Instructions for Weather Proofing Kit for Connectors and Antennas, Bulletin 7634613, Rev. A, see Appendix 4, except replace step 2 with the following:

   2A Thoroughly clean the connector and NLT 12" of the cable adjacent to the connector with an alcohol pad then allow to dry.

   2B Backwrap (sticky side out) the coupling nut and sufficient space behind the nut to allow the nut to be loosened (approximately ½ inch and ¼ inch onto the opposite connector with an adhesive weather proofing PVC tape (Scotch 88 or approved equal). Wrap the tape in the direction of the coupling nut tightening overlapping one-half and stretching only enough to closely conform to the connectors. When complete CUT, do not pull, the tape.

6. The transmission line shall be secured not more than three-feet (3 Ft.) from the antenna connection in a manner to relieve stress on the connector in all temperature, wind, and ice conditions.

7. Horizontal transmission line runs, from the antenna connection to the transmission line ladder, shall be routed along and under structural members or additional members added to protect the transmission line from damage by up to fifty-pound (50 Lb.) ice chunks falling from the tower above.

8. Manufacturer approved transmission line hangers shall be used to attach the transmission line to the tower or other members NMT the cable manufacturers recommended spacing, typically every 0.91 m (3 Ft.) or at wider spacing if dictated by support members and approved by the Owner and/or Engineer. Existing transmission line ladder attachment points shall be used for routing the transmission line unless unavailable or described otherwise on the plans.

9. Transmission lines shall be suspended from the transmission line bridge between the tower and the shelter. Attachments of the transmission line to the transmission line bridge shall not exceed 0.91 m (3 Ft.) spacing. The Contractor shall form a one to two inch (1-2 In.) drip loop in the transmission line near the shelter to assure that water on the transmission line runs away from the shelter.

10. Shelter /cabinet entrance wall feed-through panels or ports and appropriate rubber sealing boots shall be used. Cables shall be inserted and sealed to water- and dust-tight integrity.

11. Interior shelter runs shall be supported by cable ladders or hangers spaced at NMT 0.91m (3 Ft.) intervals.

12. Radio end connections may include surge arresters, adapters, flex sections, pressure windows, etc., as shown on the plans.

C. The Contractor shall take every precaution to prevent damage to the transmission line suchas kinks; exceeding minimum bending limits; damage to outer covering, punctures, cuts; or any other damage. Any damage or suspected possible damage shall be immediately reported to the Owner. The Contractor shall use bending and stripping tools recommendedby the transmission line manufacturer.

3.3 ANTENNA SYSTEM TESTING AND ALIGNMENT

A. General: The Contractor shall furnish trained and qualified personnel who have been certified by the test equipment manufacturer and all equipment necessary to perform and document the testing and alignment of the completed antenna systems. The Contractor shallsubmit a copy of the proposed test plan including procedure, test equipment data and calibration certifications, and personnel names, functions and certifications for approval bythe Owner and/or Engineer no later than 30 days prior to initiating tests. A copy of the equipment calibrationcertifications shall be with the equipment and available for Owner review while the work is performed. The Owner and/or Engineer may witness all tests and may also test using the Owner's and/or Engineer's test equipment.

The Contractor shall disconnect the antenna and perform with the end open, shorted, or a precision 50 ohm load connected certain tests. Following test approval by the Owner, TheContractor shall then reconnect the antenna and weatherproof the connection. A copy of the *LMR Antenna and Tline Test Sheet*, shall be printed and presented for each antenna system to the Owner upon completion of each site.

B. Land Mobile Radio (LMR) Antenna Systems: An Anritsu LMR Master Model S412E or approved equal device shall be used to perform the test(s) shown with the general procedures shown below:

1. Antenna Return Loss Sweep Acceptance Test: Antenna Return Loss may be measured to verify the integrity of the antenna at the time of delivery to the Contractor. The antenna shall be oriented vertical and placed NLT six-feet (6 Ft.) above grade in an area clear of obstructions during the test. The test frequency range and other parameters shall be as directed by the Owner or Designer. Should the Contractor electnot to test, the antenna will be presumed satisfactory. Should subsequent testing showan abnormal return loss, the Contractor will be responsible for repair or replacement.

2. Cable Return Loss Sweep Acceptance Test: Cable Return Loss may be measured following complete installation of the cable but prior to connection to the antenna. Acertified 50 ohm precision load shall be installed on the antenna end connector. The test frequency range and other parameters shall be as directed by the Owner or Designer.

3. Cable Return Loss Sweep Performance Test: Cable Return Loss may be measured following complete installation of the cable but prior to connection to the antenna. Acertified 50 ohm precision load shall be installed on the antenna end connector. The test frequency range and other parameters shall be as directed by the Owner or Designer.

4. Cable Insertion Loss Sweep Performance Test: Cable Return Loss may be measured following complete installation of the cable but prior to connection to the antenna. Aprecision short shall be installed on the antenna end connector. The test frequency range and other parameters shall be as directed by the Owner or Designer.

5. Cable Length DTF Measurement: The cable length may be measured after installationof the cable. The test frequency range and other parameters shall be as directed by theOwner or Designer.

6. Antenna System Return Loss Sweep Performance Test: The complete antenna systemreturn loss may be measured after installation is completed and the antenna is connected. The test frequency range and other parameters shall be as directed by the Owner or Designer.

7. Fault Location DTF Measurement: The fault location DTF measurements may be made on the completed antenna system or cable for establishing a baseline for futurecomparison or troubleshooting if a problem is suspected. The test frequency range shall be as directed by the Owner or Designer for baseline measurement but may be varied for troubleshooting measurements.

   Cable fault location measurements shall be made with the antenna disconnected and a precision 50 ohm terminator installed and the test shall be run over the entire lengthof the cable plus 20 percent (%).

   Locations indicating abnormal return loss shall be visually inspected, repaired or replaced as directed by the Owner and/or Engineer. All tests shall be repeated following any repair.

8. Interference: Following antenna alignment an interference measurement of the spectrum centered on the receiver frequencies covering a total bandwidth of 100 MHzshall be made at the radio end of the antenna system. A second measurement shall cover the frequency band of operation for the antenna system. This measurement shallbe made with the lowest possible noise floor and recorded via photograph or plotter output and included in the test records.

C. Test Report: The Contractor shall furnish native test instrument files and PDF files of thescreen shots clearly showing the test location measurement, parameters, and resulting measurements within two (2) work days following testing at each site.

   The Contractor shall furnish a comprehensive Test Report within ten (10) days of each sitecompletion. The report shall clearly define the site and include color prints of the display,clearly identified as to site, antenna system, and location as appropriate. Each antenna system shall be certified as meeting these specifications and industry accepted tolerances. Native test instrument files and PDF files of the displays shall also be included with the Site Test Report.

END OF SECTION 338320

APPENDIX 1

LEAD BASED PAINT (LBP) REPORT

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ENVIRONMENTAL • ARCHITECTURE • ENGINEERING
10845 Olive Boulevard, Suite 260, Saint Louis, Missouri 63141 - 314.997.6111 - www.trileaf.com

August 12, 2020

Ms. Emily Roseberry
Selective Site Consultants
7171 West 95th Street
Overland Park, Kansas 66212

RE: LEAD-BASED PAINT SAMPLING
P-003257 Springfield
3131 East Kearney Street
Springfield, Missouri 65803

Dear Ms. Roseberry:

This report summarizes the results of a lead-based paint inspection performed by Mirowski Inspections on behalf of Trileaf Corporation on August 3, 2020 at the existing self-support telecommunication tower located at 3131 East Kearney Street, Springfield, Greene County, Missouri 65803. The inspection and sampling efforts were performed in accordance to the agreed upon scope of work between Selective Site Consultants (SSC) and Trileaf Corporation dated July 17, 2020. The inspection included surveying the existing tower site at ground-level to identify any painted surfaces which may be disturbed during the removal of the tower.

The United States Environmental Protection Agency (EPA) defines "lead-based paint" (LBP) as paint containing equal-to or greater-than one milligram per square centimeter or 0.5% by weight of lead, which converts to 5,000 parts-per-million (ppm). The EPA banned the use of LBP in target housing and child-occupied facilities in 1978; however, LBP is still utilized in some applications. According to 41 CFR 101-42.001, lead-containing paint is defined as paint or other similar surface coating material that contains lead or lead compounds in excess of 0.06 percent of the weight of the total nonvolatile content of the paint or the weight of the dried paint film. As the base of the tower was painted, two (2) paint samples were collected from the existing telecommunication tower, and sent to a Missouri-licensed Pro Laboratories for analysis by flame absorption. As indicated in Table 1 and the attached report, the paint collected from the tower contains 37,000 ppm and 47,000 ppm of lead, which is above the applicable threshold for LBP; therefore, LBP is anticipated to be disturbed during the removal of the existing tower.

Table 1: Lead-Based Paint Samples and Resultant Laboratory Findings

Material	Location	Condition	Potential for Disturbance	Lead Based	Lead Containing
Red Paint	East side of the tower	Good	High	Yes	Yes
Red Paint	West side of the tower	Good	High	Yes	Yes

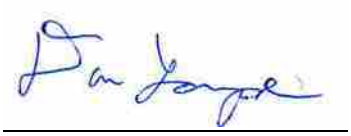
Due to the presence of LBP, Trileaf recommends that construction personnel be made aware of the LBP. If avoidance of the paint is impossible, disturbance should be done in accordance with applicable OSHA, EPA, and state requirements, which may include abatement.

In conclusion, lead-based paint does pose a concern to the proposed tower removal at 3131 East Kearney Street, Springfield, Greene County, Missouri 65803.

Please call me at (314) 997-6111 or e-mail me at d.lampe@trileaf.com if you have any additional questions or concerns. Thank you again for allowing Trileaf to be of assistance.

Sincerely,

Larissa Ehlert
Project Scientist II
Trileaf Corporation



Dan Lampe
Project Manager II
Trileaf Corporation

LEAD ANALYSIS REPORT

1675 N. Commerce Parkway, Weston, FL 33326 / TOLL FREE 800-427-0550

TEST ADDRESS:
#00016735
3131 E. KEARNEY ST
SPRINGFIELD, MO 65803

CLIENT:
MIROWSKI INSPECTIONS, LLC
1500 E ST LOUIS ST
SPRINGFIELD, MO 65802

REPORT NUMBER: 1352307
RECEIVED DATE: 08/05/2020
ANALYSIS DATE: 08/07/2020
REPORT DATE: 08/07/2020
PHONE: 417-873-9517

EMAIL: info@mirowskiinspections.com

CERTIFICATE OF LEAD ANALYSIS

ANALYSIS METHOD EPA SW 846 7000B

SAMPLE ID	TYPE	LOCATION	RESULT	CONCLUSION
1352307-1	P	EAST SIDE OF TOWER	47,000 PPM	ELEVATED
1352307-2	P	WEST SIDE OF TOWER	37,000 PPM	ELEVATED

Sample Type Codes: P = Paint D = Dust S = Soil B = Bulk

EPA THRESHOLD STANDARDS

Lead in Paint:	Lead in Dust		Lead in Soil:	
≤ 5000 PPM	Floors/Flooring: ≤10 µg/ft²	Window Sills: ≤ 100 µg/ft²	Soil Play Area	≤ 400 PPM
≤ 0.5 %	Exterior Concrete: ≤850 µg/ft²	Window Trough: ≤ 400 µg/ft²	Soil Remainder	≤ 1200 PPM

Diana Sauri, Quality Control Manager

Minimum Detection Limit (MDL): 5.0 PPM. For work involving HUD, Child occupied buildings and other residential units, the Federal Lead Standard is 0.5% by weight (5000 PPM). The Machine Reporting Limit is 10 micrograms (PPM) of total Lead.

Lead Paint
* = Sample submitted was less than the recommended amount. A minimum of 0.1 grams should be submitted.
** = Sample contains substantial amounts of substrate which may affect the calculated results with units of ppm and % by weight.
*** = Sample submitted was less than the recommended amount. A minimum of 0.1 grams should be submitted. Sample contains substantial amounts of substrate which may affect the calculated results with units of ppm and % by weight.
Lead Dust:
**** = The laboratory has been unable to verify that the wipe samples submitted conform to ASTM E1792 or specifications issued by the EPA
***** = Could not calculate concentration (µg/ft²). Area for sample not provided on chain-of-custody

The above PRO-LAB / SSPTM, INC. results are provided by Environmental Hazards Services, LLC. California Certification #2319; NY ELAP #11714

TRILEAF™

PROFESSIONAL RESUME

LARISSA EHLERT

PROJECT SCIENTIST II

Education

B.S Environmental Biology and Evolution
Missouri State University/ Springfield, Mo

Areas of Expertise

Ms. Larissa Ehlert has experience performing site inspections and conducting due diligence pursuant to EPA All Appropriate Inquiries (AAI) and the American Society of Testing and Materials (ASTM) for commercial real estate and lending projects.

Environmental service expertise includes:

Phase I Environmental Site Assessments
Phase II Environmental Site Assessments
Historical City Directories
Asbestos Building Inspections
National Wetland Inventory Maps
Flood Insurance Rate Maps
Soil Characterization
Field Reconnaissance
Historical Topographic Maps and Aerial Imagery
Land Use History
Local Government Consultations

Certifications/Affiliations

Certified Asbestos Building Inspector – MO, KS
OSHA 40-Hour HAZWOPER

TRILEAF™

PROFESSIONAL RESUME

DAN LAMPE

PROJECT MANAGER

Education

B.S. Biology / Emphasis in Wildlife
Minor in Chemistry
Missouri State University / Springfield, MO

Areas of Expertise

Mr. Lampe has experience with the investigation and management of environmental due diligence pursuant to EPA All Appropriate Inquiries (AAI) and the American Society of Testing and Materials (ASTM), as well as National Environmental Policy Act (NEPA) and environmental permitting projects. Mr. Lampe operates as the primary point-of-contact for clients over a large geography, specializing within the Midwestern and Western Regions of the United States.

Environmental service expertise includes:

Environmental Site Assessments
Soil and Groundwater Management Plans
Environmental Evaluation Summaries
Indoor Air Quality Assessments
Asbestos Inspections
DAS In-Building Limited Site Inspections
CERCLA Liability
Mold and Lead-Based Paint Surveys
FCC Regulatory Compliance
Small Cell Solutions
NEPA Environmental Assessments
Critical Habitat and Species Review
Migratory Bird Evaluations
Nationwide Programmatic Agreement Review
Groundwater Well Installation and Monitoring
Construction Environmental Oversight
Soil Characterization
Vendor Management

Certifications/Affiliations

OSHA 40-Hour HAZWOPER
ANSI/FCC RF Radiation Safety Competent Person
Environmental Professional (EP) as defined by ASTM Standard E1527-13 (AAI)

APPENDIX 2

TROOP D HEADQUARTERS AND SERVICE CENTER
GEOTECHNICAL REPORTS

Terracon GeoReport

Geotechnical Engineering Report

SSC Self-Support Tower – Springfield, MO
Springfield, Missouri
October 19, 2020
Terracon Project No. B5205063

Prepared for:
Selective Site Consultants, Inc.
Overland Park, Kansas

Prepared by:
Terracon Consultants, Inc.
Springfield, Missouri

October 19, 2020

Selective Site Consultants, Inc.
7171 West 95th Street, Suite 600
Overland Park, Kansas 66212

Attn: Ms. Emily Roseberry
P: (913) 438-7700
E: ERoseberry@ssc.us.com

Re: Geotechnical Engineering Report
SSC Self-Support Tower – Springfield, MO
3025 E. Kearney Street
Springfield, Missouri
Terracon Project No. B5205063

Dear Ms. Roseberry:

We have completed the Geotechnical Engineering services for the above-referenced project. This study was performed in general accordance with Selective Site Consultants Purchase Order SSC-1253, dated September 18, 2020. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,

Terracon Consultants, Inc.

STATE OF MISSOURI
ALLEN G. MINKS
NUMBER E-22438
REGISTERED PROFESSIONAL ENGINEER

Jessica M. Cannon, E.I.
Staff Geotechnical Engineer

Allen G. Minks, P.E. 10-19-2020
Senior Consultant
Missouri No. E-22438
Renews:12/31/2021

REPORT TOPICS

ATTACHMENTS

Note: Refer to each individual Attachment for a listing of contents.

Geotechnical Engineering Report

SSC Self-Support Tower – Springfield, MO

3025 E. Kearney Street

Springfield, Missouri

Terracon Project No. B5205063

October 19, 2020

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed self-support tower to be located at 3025 E. Kearney Street in Springfield, Missouri. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil and rock conditions
- Groundwater conditions
- Site preparation and earthwork
- Excavation considerations
- Foundation design and construction
- Seismic site class per IBC

The geotechnical engineering scope of services for this project included the advancement of three (3) soil borings to depths of approximately 8 to 17 feet below existing site grades. Samples were obtained from only one of the borings.

Maps showing the site and boring locations are included in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs in the **Exploration Results** section of this report.

The **General Comments** section provides an understanding of the report limitations.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project is located west of 3025 E. Kearney Street in Springfield, Missouri. Latitude: 37.2399°N, Longitude: 93.2313°W See **Site Location**

Item	Description
Existing Improvements	An existing structure is located to the north of the proposed tower location.
Current Ground Cover	Lightly-vegetated
Existing Topography	Relatively flat
Expected Subsurface Conditions	Based on the Geological Map provided by the United States Geologic Survey (USGS), the subject site is located over the Kinderhookian Series. The Kinderhookian Series consists of limestone bedrock with smaller amounts of siltstone, shale, and sandstone.
Solution Features	Solution features, including springs, caves, and sinkholes, are commonly present in the bedrock formations in this area. Based on the review of information available from MDNR, the subject site does not contain any previously identified sinkhole formations. However, there is a sinkhole less than a quarter mile to the northeast of the project site. It is difficult to predict future sinkhole activity. Site grading and drainage may alter site conditions and could possibly cause sinkholes in areas that have no history of this activity. See **Solutions Features Map**.

PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed in the project planning stage. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Project Description	The project includes the construction of a 200-foot tall, self-support tower.
Maximum Loads (estimated by Terracon)	■ Tower (vertical) – 200 kips ■ Slabs: 150 pounds per square foot (psf)
Grading/Slopes	Minimal grading is anticipated to achieve final grades. We anticipate up to 3 feet of cut and/or fill may be required to develop final grade. Final slope angles no steeper than 3H:1V (Horizontal: Vertical) are expected.
Below-Grade Structures	None anticipated.

GEOTECHNICAL CHARACTERIZATION

Subsurface Profile

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, and geologic setting. This characterization, termed GeoModel, forms the basis of our geotechnical analyses and evaluation of site preparation and foundation options. Conditions encountered at each exploration point are indicated on the individual logs. The individual logs and GeoModel can be found in the **Exploration Results** section of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	**Surface**	Topsoil
2	**Fat Clay**	Fat clay (CH) with varying amounts of gravel and limestone fragments
3	**Bedrock**	Limestone, slightly weathered

Groundwater Conditions

The boreholes were observed while drilling and after completion for the presence and level of groundwater. The water levels observed in the boreholes can be found on the boring logs in **Exploration Results**.

Groundwater was not encountered in our borings. This does not necessarily mean the borings terminated above groundwater. Rock coring was performed in Boring B-1, beginning at a depth of 12 feet, which introduces water into the borehole. Due to the low permeability of the soils encountered in the borings, a relatively long period of time may be necessary for a groundwater level to develop and stabilize in a borehole. Long-term observations in piezometers or observation wells sealed from the influence of surface water are often required to define groundwater levels in materials of this type.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be different from the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

GEOTECHNICAL OVERVIEW

Expansive Soils

The fat clay (CH) soils encountered in the borings are high in plasticity and prone to volume change with variations in moisture content. For this reason, we recommend that at least the upper 24 inches of soil below the bottom of the floor slab level consist of low plasticity (LP) material as defined in the **Earthwork** section.

This LP layer should also be confirmed or placed below other flatwork abutting the structure. The procedures recommended in this report may not eliminate all future subgrade volume change and resultant movements. However, the procedures outlined should reduce the potential for subgrade volume change. Additional reductions in subgrade movements could be achieved by using a thicker LP zone. LP material could be imported or the high plasticity soils could be chemically modified to reduce their volume change susceptibility.

This report provides recommendations to help mitigate the effects of soil shrinkage and expansion. However, even if these procedures are followed, some movement and at least minor cracking in the structure could still occur. The severity of cracking and other cosmetic damage, such as uneven floor slabs on grade, will likely increase if any modification of the site results in excessive wetting or drying of the expansive soils. Eliminating the risk of movement and cosmetic distress may not be feasible, but it may be possible to further reduce the risk of movement if more extensive measures are used during construction. We would be pleased to discuss other construction alternatives with you upon request.

Soft Subgrade

The near surface soils could become unstable with typical earthwork and construction traffic, especially after precipitation events. Effective drainage should be completed early in the construction sequence and maintained after construction to avoid potential issues. If possible, grading should be performed during the warmer and drier times of the year. If grading is performed during the wetter months, an increased risk for possible undercutting and replacement of unstable subgrade will persist. Additional site preparation recommendations, including subgrade improvement and fill placement, are provided in the **Earthwork** section.

EARTHWORK

Site Preparation

Prior to placing fill, existing vegetation and root mat should be removed. Complete stripping of the topsoil should be performed in the proposed structures areas.

We recommend that the exposed subgrade be thoroughly evaluated by a Geotechnical Engineer prior to placement of new fill. The soils on the site are sensitive to disturbance from construction equipment traffic, particularly during wet periods. Excessively wet or dry material should either be removed or moisture conditioned and recompacted. The exposed subgrade should be proofrolled where possible to aid in locating loose or soft areas. Proofrolling can be performed with a loaded, tandem-axle dump truck. If unsuitable areas are observed during construction, subgrade improvement will then be necessary to establish a suitable subgrade support condition. Potential subgrade stabilization techniques are discussed below.

- **Scarification and Recompaction** – It may be feasible to scarify, dry, and recompact the exposed soils. The success of this procedure would depend primarily upon favorable weather and sufficient time to dry the soils. Stable subgrades would likely not be achievable if the thickness of the unstable soil is greater than about 1 foot, if the unstable soil is at or near groundwater levels, or if construction is performed during a period of wet or cool weather when drying is difficult.

- **Crushed Stone** – The use of crushed stone or gravel is the most common procedure to improve subgrade stability. Typical undercut depths would be expected to range from about 6 to 30 inches below finished subgrade elevation with this procedure. The use of high modulus geosynthetics (i.e., geotextile or geogrid) could also be considered after underground work such as utility construction is completed. Prior to placing the geosynthetic, we recommend that all below-grade construction, such as utility line installation, be completed to avoid damaging the geosynthetic. Equipment should not be operated above the geosynthetic until one full lift of crushed stone fill is placed above it. The maximum particle size of granular material placed over the geosynthetic should meet the manufacturer's specifications, and generally should not exceed 1½ inches.

Fill Material Types

Compacted structural fill should meet the following material property requirements:

Fill Type [1]	USCS Classification	Acceptable Location for Placement
High Plasticity Material	CH (LL≥70 or PI≥40)	Below upper 3 feet of floors and other lightly-loaded structures; 2 feet of foundations; and 1 foot of pavement base rock
Moderate to High Plasticity Material [2]	CH or CL, with 70>LL≥45 or 40>PI≥25	Below upper 2 feet of floor slabs and any other lightly-loaded structures, below upper 1 foot of pavement base rock
Granular Material [3]	GM, GC, SM, or SC	All locations and elevations
Low Plasticity (LP) Material [4]	CL (LL<45 & PI<25) or Granular Material [3]	

1. Compacted structural fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to Terracon for evaluation. On-site soils generally appear suitable for use as fill outside of the LP zone.
2. Delineation of moderate to high plasticity clays should be performed in the field by a qualified geotechnical engineer or their representative, and could require additional laboratory testing. If fat clay material contains greater than 35 percent granular material retained on a ¾-inch sieve, it may be used in the low volume change zone.
3. Crushed limestone aggregate, limestone screenings or granular material such as sand, gravel or crushed stone containing at least 15 percent low plasticity fines.
4. Low plasticity cohesive soil or granular soil having low plasticity fines. Material should be approved by the geotechnical engineer.

Fill Compaction Requirements

Item	Description
Fill Lift Thickness	9 inches or less in loose thickness for heavy compaction equipment 4 to 6 inches or less in loose thickness for light, hand-operated compaction equipment
Compaction Requirements [1]	At least 95 percent of the material's standard Proctor maximum dry density
Moisture Content – Cohesive Soil	-1 to +3 percent of the optimum moisture content value as determined by the standard Proctor test
Moisture Content – Granular Material	Workable moisture levels [2]

1. We recommend that engineered fill be tested for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.
2. Specifically, moisture levels should be maintained low enough to allow for satisfactory compaction to be achieved without the cohesionless fill material pumping when proofrolled.

Utility Trench Backfill

All trench excavations should be made with sufficient working space to permit construction including backfill placement and compaction. If utility trenches in cohesive soils are backfilled with relatively clean granular material, they should be capped with at least 18 inches of cohesive fill to reduce the infiltration and conveyance of surface water through the trench backfill.

Grading and Drainage

All grades must provide effective drainage away from the structure during and after construction and should be maintained throughout the life of the structure. Water retained next to the structure can result in soil movements greater than those discussed in this report.

Exposed ground should be sloped and maintained at a minimum 5 percent away from the structure for at least 10 feet beyond the perimeter. After construction, final grades should be checked to document that effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted, as necessary, as part of the structure's maintenance program.

Earthwork Construction Considerations

After completion of filling and grading, care should be taken to maintain the subgrade water content. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Any water that collects over, or adjacent to, construction areas should be promptly removed. If the subgrade freezes, or becomes excessively wet or dry, or is disturbed, the affected material should be removed, or these materials should be scarified, moisture conditioned, and recompacted, prior to further construction. All of these processes should be observed by Terracon.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local, and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming any responsibility for

construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

Construction Observation and Testing

The Geotechnical Engineer should be retained during the construction phase of the project to observe earthwork and to perform tests and observations during subgrade preparation, proofrolling, placement and compaction of controlled compacted fills, backfilling of excavations into the completed subgrade, and just prior to construction of slabs.

SHALLOW FOUNDATIONS

If the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations.

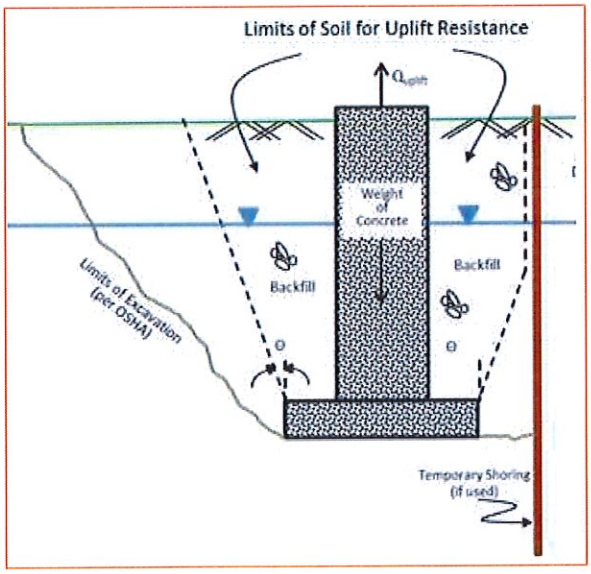
Mat Foundation Design Parameters

Parameter	Value
Suitable bearing materials [1]	Stiff native clays or newly placed engineered fill extending to suitable native soils
Minimum embedment below finished grade for frost protection [2]	30 inches
Allowable sustained uniform bearing pressure [3]	3,000 psf
Modulus of Subgrade Reaction, k	65 pci
Minimum Width	4 feet
Modulus Correction Factor[1]	$k_c=k((b+1)/2b)^2$
Estimated total settlement [4]	Less than 1 inch
Differential Settlement	¾-inch over 40 feet
Ultimate coefficient of sliding friction [5]	0.35

1. See **Geotechnical Considerations** of this report. Assumes any unsuitable or soft soils, will be undercut and replaced with compacted structural fill.
2. The embedment depth is applicable to perimeter footings and footings below unheated areas for frost protection and to reduce the effects of seasonal moisture variations in the subgrade soils. Interior footings can bear at shallower depths. **For a mat foundation, we recommend a minimum embedment depth of 4 feet.**
3. The recommended allowable sustained uniform bearing pressure, which includes a factor of safety of 3, is the pressure in excess of the minimum surrounding overburden pressure at the pad base elevation. The net allowable bearing pressure can be increased by ⅓ for transient loads (e.g., wind or seismic).
4. Foundation settlement will depend upon variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the footings, the thickness of compacted fill, and the quality of the earthwork operations. These settlement estimates are based on an embedment depth of least 4 feet.
5. Can be used to compute sliding resistance where foundations are placed on suitable soil. Should be neglected for foundations subject to net uplift conditions.

Design Parameters - Uplift Loads

Uplift resistance of spread footings can be developed from the effective weight of the footing and the overlying soils. As illustrated on the subsequent figure, the effective weight of the soil prism defined by diagonal planes extending up from the top of the perimeter of the foundation to the ground surface at an angle, θ, of 20 degrees from the vertical can be included in uplift resistance. The maximum allowable uplift capacity should be taken as a sum of the effective weight of soil plus the dead weight of the foundation, divided by an appropriate factor of safety. A maximum total unit weight of 120 pcf should be used for the backfill. This unit weight should be reduced to 60 pcf for portions of the backfill or natural soils below the groundwater elevation.

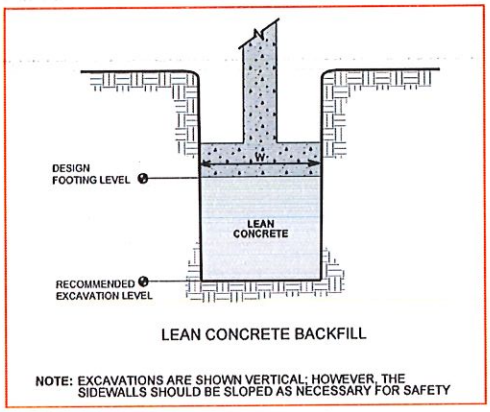


Foundation Construction Considerations

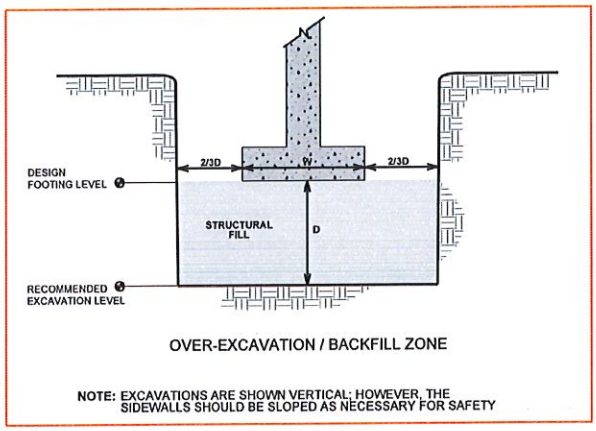
As noted in **Earthwork**, the footing excavations should be evaluated by the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed. Placement of a lean concrete mud-mat over the bearing soils should be considered if the excavations must remain open for an extended period of time.

Groundwater was not encountered in the borings, but could be encountered during foundation excavations or in other excavation activities. In addition, some surface and/or perched groundwater may enter foundation excavations during construction. It is anticipated that any water entering foundation excavations from these sources can be removed using sump pumps or gravity drainage. Additional dewatering efforts may be required if greater inflow occurs.

If unsuitable bearing soils are encountered at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils. The footings could then bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. This is illustrated on the sketch below.



As an alternative, the footings could also bear on properly compacted structural backfill extending down to suitable soils. Overexcavation for compacted structural fill placement below footings should extend laterally beyond all edges of the footings at least 8 inches per foot of overexcavation depth below footing base elevation. Overexcavation for structural fill placement below footings should be conducted as shown below. The overexcavation should be backfilled up to the footing base elevation as recommended in the **Earthwork** section.



OVER-EXCAVATION / BACKFILL ZONE

NOTE: EXCAVATIONS ARE SHOWN VERTICAL; HOWEVER, THE SIDEWALLS SHOULD BE SLOPED AS NECESSARY FOR SAFETY

DEEP FOUNDATIONS

Drilled Shaft Design Parameters

Soil design parameters are provided below in the **Drilled Shaft Design Summary** table for the design of drilled shaft foundations. The values presented for allowable side friction and end bearing include a factor of safety.

Drilled Shaft Design Summary [1, 2]								
Approximate Depth (feet)	Allowable Skin Friction (psf) [3]	Allowable End Bearing Pressure (psf) [4]	Effective Unit Weight (pcf) [5]	Allowable Passive Pressure (psf)	Cohesion (psf)	Internal Angle of Friction (Degrees)	Strain ε_{50} [6]	Lateral Subgrade Modulus (pci) [6]
0 – 3	--	--	--	--	--	--	--	--
(3 – 5) Stiff clay without free water	380	5,700	120	1,900	1,900	--	0.007	625
(5 to 12) Stiff clay without free water	1,000	15,000	120	5,000	5,000	--	0.005	1,650
(12 to 17) Limestone	1,500	25,000	150	7,000	7,000	--	0.0005	2,500

1. Design capacities are dependent upon the method of installation, and quality control parameters. The values provided are estimates and should be verified when installation protocol have been finalized.
2. Design capacities can be increased by 33 percent for highly transient loads unless those loads have been factored to account for transient conditions.
3. Pier observation is recommended to adjust pier length if variable soil conditions are encountered.
4. Applicable for compressive loading only. Reduce to 2/3 of values shown for uplift loading. Effective weight of shaft can be added to uplift load capacity.
5. Minimum pier length of 4 diameters required. Terracon should be contacted if the pier length is less than four times the pier diameter as modifications to our design parameters may be warranted. The drilled pier must extend 3 feet, or one pier diameter, whichever is greater, into the bearing strata to achieve the full listed capacity.
6. Lateral subgrade modulus and ε_{50} values provided above are to be used with LPILE software.

The above-indicated cohesion and lateral subgrade modulus values are ultimate values without factors of safety. The end bearing is an allowable parameter with a factor of safety of 3. The skin friction and passive resistance are allowable parameters with factors of safety of 2. The values given in the above table are based on our borings and past experience with similar soil types. Lateral resistance and friction in the upper 3 feet should be ignored due to the potential effects of frost action, desiccation, and drilling disturbance.

Long-term settlement of a drilled shaft foundation designed and constructed in accordance with the recommendations presented in this report, should be about ½ inch or less.

Drilled Shaft Construction Considerations

Pier drilling through the weathered limestone may be difficult based upon the materials encountered within the borings. Concentrated effort and/or core barrels may be necessary to advance the shaft excavation through the weathered bedrock overlying competent bedrock. Groundwater was not encountered during drilling, but could be encountered during drilled pier excavation. Therefore, temporary casing may be needed to advance drilled pier excavations. Temporary casing should be installed if personnel will enter the shafts.

The bottom of the pier excavations should be cleaned of any water and loose material before placing reinforcing steel and concrete. A minimum shaft diameter of at least 30 inches is required for entry of personnel, and to facilitate clean-out and possible dewatering of the pier excavation.

Concrete should be placed soon after excavating to reduce bearing surface disturbance. It is recommended that the Geotechnical Engineer be retained to observe and test the foundation bearing materials. Any water accumulating in the pier excavation should be pumped from the excavation or the water level should be allowed to stabilize and then concrete placed using the tremie method.

If concrete will be placed as the temporary casing is being removed, we recommend the concrete mixture be designed with a slump of about 5 to 7 inches to reduce the potential for arching when removing the casing. While removing the casing from a pier excavation during concrete placement, the concrete inside the casing should be maintained at a sufficient level to resist any earth and hydrostatic pressures outside the casing during the entire casing removal procedure.

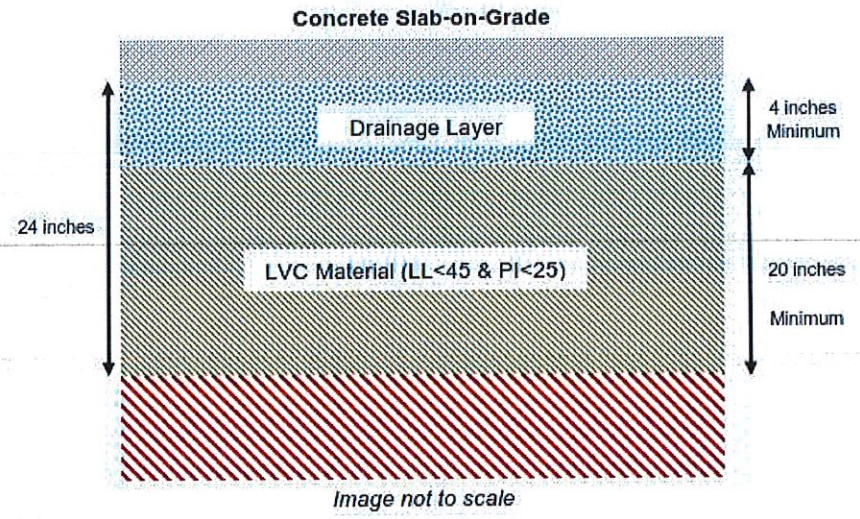
We recommend that a representative of Terracon be present during drilling activities to evaluate the materials removed from the drilled pier excavations to document that adequate capacity has been developed, to observe the base of the drilled pier to document that the cuttings have been adequately removed, and also to observe concrete placement.

Although obvious signs of harmful gases such as methane, carbon monoxide, etc., were not noted in the borings during the drilling operations, gas could be encountered in the drilled shaft excavations during construction. The contractor should check for gases and/or oxygen deficiency

prior to any workers entering the excavation. Casing will be required if personnel enter the excavation.

FLOOR SLABS

The subgrade soils include moderate to high plasticity clays, and these soils exhibit the potential to swell with increased water content. Construction of the floor slab, combined with revising site drainage creates the potential for gradual increased water contents within the clays. Increases in water content could cause the clays to swell and damage the floor slab. To reduce the swell potential, we recommend that at least the upper 24 inches of materials below the floor slab be an approved Low Plasticity (LP) material.



Design parameters for floor slabs assume that the requirements for **Earthwork** have been followed. Specific attention should be given to positive drainage away from the structure. This also includes positive drainage of the aggregate base beneath the floor slab.

Floor Slab Design Parameters

Item	Description
Floor slab support [1]	Minimum 4 inches of free-draining (less than 5 percent passing the U.S. No. 200 sieve) crushed aggregate compacted to at least 95 percent of ASTM D 698 [2, 3] over at least 20 inches of low plasticity cohesive or granular soils with at least 15 percent passing the U.S. No. 200 sieve
Estimated modulus of subgrade reaction [2]	150 pounds per square inch per inch (psi/in) for point loads.

1. Floor slabs should be structurally independent of any building footings or walls to reduce the potential of floor slab cracking caused by differential movements between the slab and foundation.
2. Modulus of subgrade reaction is an estimated value based upon our experience with the subgrade condition, the requirements noted in **Earthwork**, and the floor slab support as noted in this table including the 24-inch thick LP layer. It is provided for point loads. For large area loads the modulus of subgrade reaction would be lower.
3. Other design considerations, such as cold temperatures and condensation development, could warrant more extensive design provisions.

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or any cracks that develop should be sealed with a waterproof, nonextruding compressible compound specifically recommended for heavy-duty concrete and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through the use of sufficient control joints, appropriate reinforcing or other means.

Floor Slab Construction Considerations

Finished subgrade within and for at least 10 feet beyond the floor slab should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become excessively wet or dry, or damaged prior to construction of floor slabs, the affected material should be removed and structural fill should be added to replace the resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should approve the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel, and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

SEISMIC CONSIDERATIONS

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Class is required to determine the Seismic Design Category for a structure. The Site Class is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7-10. Based on the soil/bedrock properties encountered at the site and as described on the boring logs, the **Seismic Site Class is C**. Borings at this site were extended to a maximum depth of 17 feet. The site properties below the boring depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. Additional deeper borings or geophysical testing may be performed to confirm the conditions below the current boring depth.

GENERAL COMMENTS

Our services are conducted with the understanding of the project as described in the proposal, and incorporate collaboration with the design team as we complete our services. The design team should collaborate with Terracon to confirm these assumptions and to prepare the final design plans and specifications. Any information conveyed prior to the final report is for informational purposes only and should not be considered or used for decision-making purposes.

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations may occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in the final report, to provide observation and testing services during construction. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our scope of services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third party beneficiaries intended. Any third party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for third parties.

Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation costs. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation costs. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, cost estimating, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Number of Borings	Boring Depth (feet)	Planned Location
3	8 to 17	Self-support tower legs

Boring Layout and Elevations: Selective Site Development provided the boring locations. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±20 feet). Approximate elevations (rounded to the nearest ½-foot) were obtained with a surveyor's level and grade rod. The top of the concrete foundation of the southwest corner of the existing tower was used as a temporary benchmark with an assigned elevation of 100.0 feet. If more precise elevations and boring locations are desired, we recommend the borings be surveyed.

Subsurface Exploration Procedures: We advanced the borings with an ATV-mounted rotary drill rig using continuous flight, solid-stem augers. Four samples were obtained in Boring B-1 in the upper 10 feet. Soil sampling was performed using split-barrel sampling procedures. Upon encountering auger refusal in Boring B-1, 5 feet of rock core was obtained using NQ2 rocking procedures. Samples were not obtained in B-2 and B-3.

In the split-barrel sampling procedure, the number of blows required to advance a standard 2-inch O.D. split-barrel sampler the last 12 inches of the typical total 18-inch penetration by means of a 140-pound hammer with a free fall of 30 inches, is the standard penetration resistance (SPT N-value). This value is used to estimate the in-situ relative density of cohesionless soils and the consistency of cohesive soils. A CME automatic SPT hammer was used to advance the split-barrel sampler in the borings performed on this site. A greater efficiency is achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope.

The sampling depths, penetration distances, and other sampling information were recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

Based on the material's texture and plasticity, we describe and classify soil samples in accordance with the Unified Soil Classification System. The project engineer reviewed the field data and assigned various laboratory tests to better understand the engineering properties of the soil strata. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods are applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- Water content

Rock classification is conducted using locally accepted practices and Description of Rock Properties for engineering purposes; petrographic analysis may reveal other rock types.

SITE LOCATION AND EXPLORATION PLANS

Contents:

Site Location Plan
Exploration Plan
Solution Features Map

Note: All attachments are one page unless noted above.

SITE LOCATION

SSC Self-Support Tower - Springfield, MO ■ Springfield, MO
October 19, 2020 ■ Terracon Project No. B5205063

Terracon GeoReport

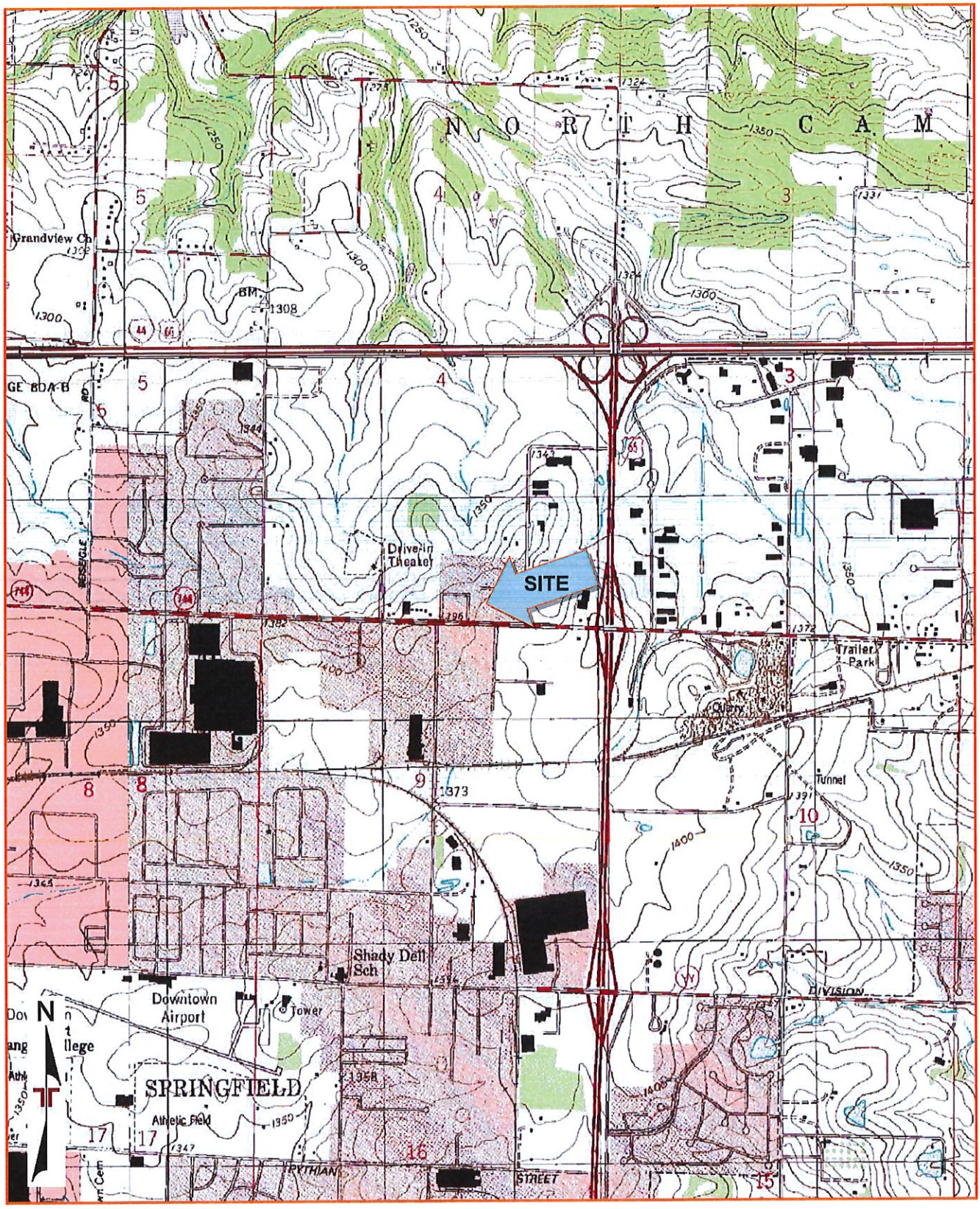


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY
QUADRANGLES INCLUDE: EBENEZER, MO (1/1/1975), BASSVILLE, MO (1/1/1970), SPRINGFIELD, MO (1/1/1996) and GALLOWAY, MO (1/1/1996).

EXPLORATION PLAN

SSC Self-Support Tower - Springfield, MO ■ Springfield, MO
October 19, 2020 ■ Terracon Project No. B5205063

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

SOLUTION FEATURES MAP

SSC Self-Support Tower – Springfield ■ Springfield, Missouri
October 9, 2020 ■ Terracon Project No. B5205063

Terracon GeoReport

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

EXPLORATION RESULTS

Contents:

Boring Logs (B-1 through B-3)
GeoModel
Rock Core Photograph
Ground Resistivity Measurement Record

Note: All attachments are one page unless noted above.

BORING LOG NO. B-201

PROJECT: SSC Self-Support Tower - Springfield, MO

CLIENT: Selective Site Consultants, Inc.
Overland Park, KS

SITE: 3025 E. Kearney Street
Springfield, MO

LOCATION See Exploration Plan

Latitude: 37.2399° Longitude: -93.2313°

Approximate Surface Elev.: 100.0 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	POCKET PENETROMETER (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.2	100+/-									
		TOPSOIL										
2		**FAT CLAY (CH)**, trace gravel, dark brownish red, stiff to hard					10	6-8-9 N=17	1	4.5	18.7	
							18	4-5-7 N=12	2	4.25	27.2	
				5				5-6-50/3"	3	4.0	25.1	
								12-17-50/3"	4	3.5	16.0	
				10								
		12.0	88+/-									
3		**LIMESTONE**, light gray, slightly weathered					60	REC: 100% RQD: 68%	Run-1			
				15								
		17.0	83+/-									
		Boring Terminated at 17 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-12 feet: Solid-stem augers
12-17 feet: NQ2 rock coring

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were measured in the field using a surveyor's level and grade rod.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered prior to rock coring

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 09-28-2020	Boring Completed: 09-28-2020
Drill Rig: CME 750	Driller: Midwest Drilling
Project No.: B5205063	

BORING LOG NO. B-202

PROJECT: SSC Self-Support Tower - Springfield, MO

CLIENT: Selective Site Consultants, Inc.
Overland Park, KS

SITE: 3025 E. Kearney Street
Springfield, MO

LOCATION See Exploration Plan

Latitude: 37.2398° Longitude: -93.2313°

Approximate Surface Elev.: 100.0 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	POCKET PENETROMETER (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.2	100+/-									
			TOPSOIL									
2			**FAT CLAY (CH)**, trace gravel, dark brownish red	5								
		8.0	92+/-									
		9.0	**FAT CLAY (CH)**, with limestone fragments, reddish brown 91+/-									
			Auger Refusal at 9 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-9 feet: Solid-stem augers

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were measured in the field using a surveyor's level and grade rod.

Notes:
Probe boring, sampling was not performed.

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
4765 W Junction St
Springfield, MO

Boring Started: 09-28-2020	Boring Completed: 09-28-2020
Drill Rig: CME 750	Driller: Midwest Drilling
Project No.: B5205063	

BORING LOG NO. B-203

PROJECT: SSC Self-Support Tower - Springfield, MO

CLIENT: Selective Site Consultants, Inc.
Overland Park, KS

SITE: 3025 E. Kearney Street
Springfield, MO

LOCATION See Exploration Plan

Latitude: 37.2398° Longitude: -93.2312°

Approximate Surface Elev.: 100.5 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	POCKET PENETROMETER (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
1		0.2	100.5+/-									
		TOPSOIL										
2		**FAT CLAY (CH)**, trace gravel, dark brownish red		5								
		8.0	92.5+/-									
		Auger Refusal at 8 Feet										

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-8 feet: Solid-stem augers

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were measured in the field using a surveyor's level and grade rod.

Notes:
Probe boring, sampling was not performed.

WATER LEVEL OBSERVATIONS

Groundwater not encountered

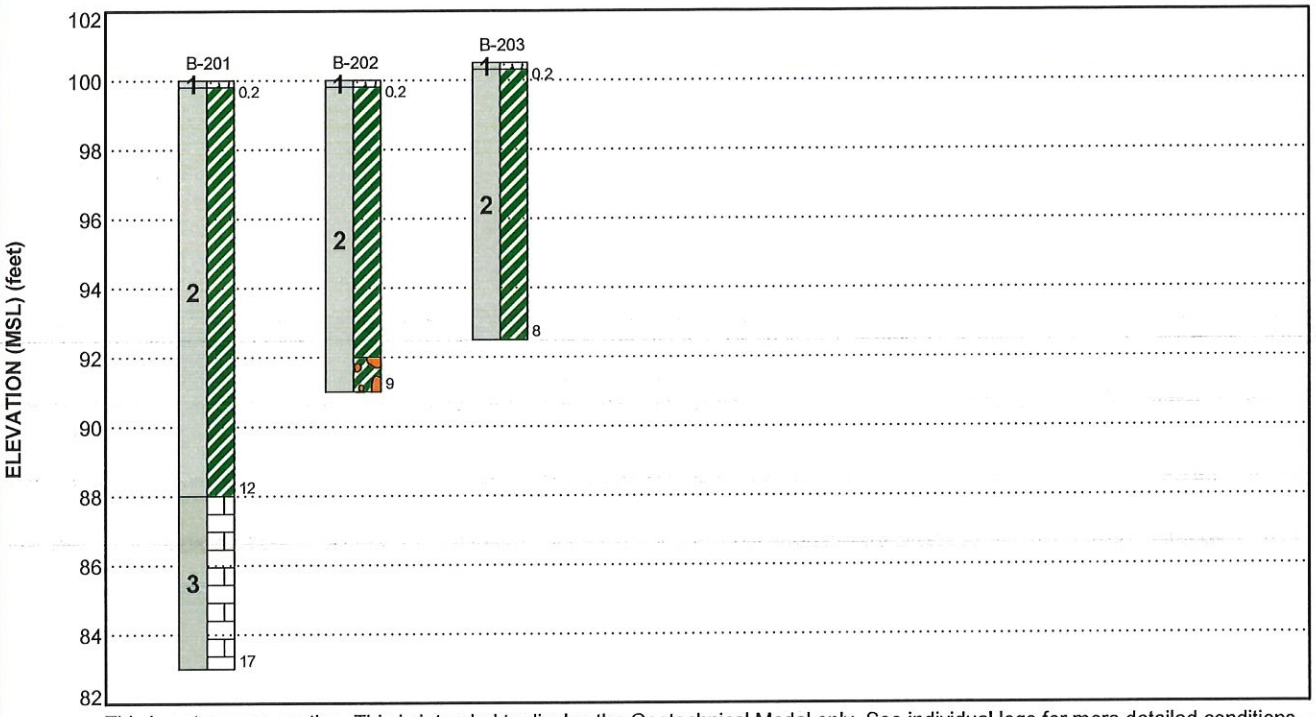
Terracon
4765 W Junction St
Springfield, MO

Boring Started: 09-28-2020	Boring Completed: 09-28-2020
Drill Rig: CME 750	Driller: Midwest Drilling
Project No.: B5205063	

GEOMODEL

SSC Self-Support Tower - Springfield, MO ■ Springfield, MO
Terracon Project No. B5205063

Terracon GeoReport



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

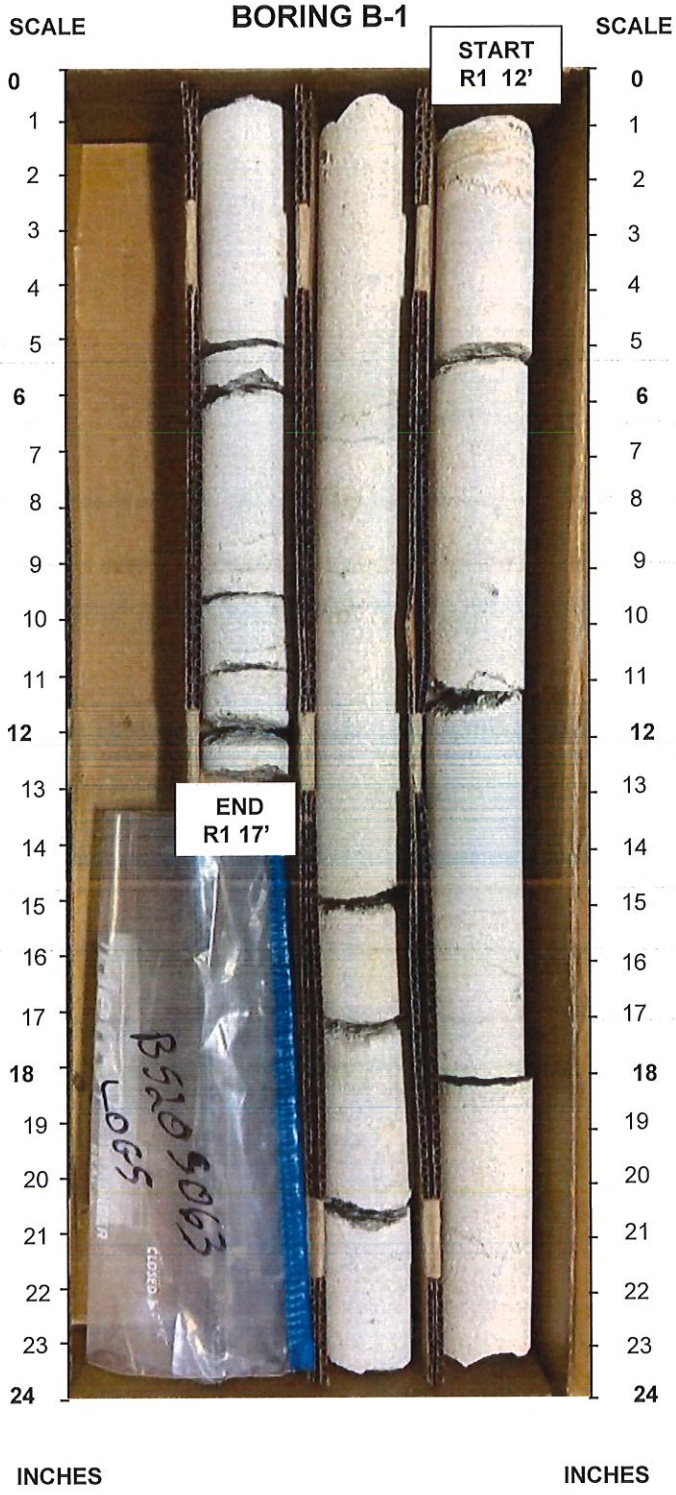
Model Layer	Layer Name	General Description
1	Surface	Topsoil
2	Fat clay	Fat clay (CH) with varying amounts of limestone fragments
3	Bedrock	Limestone, slightly weathered

LEGEND

- Topsoil
- Fat Clay
- Limestone
- Gravelly Fat Clay

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

BORING B-1



Project Manager: JDE	Project No. B5205063	Terracon GeoReport 11600 Lilburn Park Rd. St. Louis, MO 63146	ROCK CORE PHOTOGRAPH SSC Self-Support Tower Springfield, MO Springfield, Missouri
Drawn by: JMC	Scale: As shown		
Checked by: AGM	File Name: Rock Core Photo		
Approved by: AGM	Date: 10/14/2020		

GROUND RESISTIVITY MEASUREMENT RECORD

Job Name: SSC SST - Springfield
Job Number: B5205063
Job Location: Springfield, MO
Temperature: 75°F
Test Date: 9/23/2020
Test Location: 37.2399° , -93.2313°
Instrument Make and Model: AEMC 6470 (4-point Wenner Method)
Weather Conditions: Sunny
Soil Conditions at Surface: Dry

TRANSVERSE NO. 1 (N-S Direction)				
A= Probe Spacing (ft)	Inner Probe, Distance from Center (ft)	Outer Probe Distance from Center (ft)	R_e= measured resistance (ohms)	Apparent Resistivity (ohm-cm) A x R_e x 191.5
2.5	1.25	3.75	11.43	**5,472**
12.5	6.25	18.75	2.15	**5,137**
20	10	30	1.93	**7,380**
50	25	75	1.47	**14,056**

TRANSVERSE NO. 1 (E-W Direction)				
A= Probe Spacing (ft)	Inner Probe, Distance from Center (ft)	Outer Probe Distance from Center (ft)	R_e= measured resistance (ohms)	Apparent Resistivity (ohm-cm) A x R_e x 191.5
2.5	1.25	3.75	10.11	**4,840**
12.5	6.25	18.75	2.22	**5,312**
20	10	30	1.66	**6,346**
50	25	75	1.44	**13,769**

SUPPORTING INFORMATION

Contents:

Note: All attachments are one page unless noted above.

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SSC Self-Support Tower - Springfield, MO ■ Springfield, MO

Terracon Project No. B5205063

Terracon GeoReport

SAMPLING	WATER LEVEL	FIELD TESTS
Rock Core Split Spoon	Water Initially Encountered Water Level After a Specified Period of Time Water Level After a Specified Period of Time Cave In Encountered Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	N Standard Penetration Test Resistance (Blows/Ft.) (HP) Hand Penetrometer (T) Torvane (DCP) Dynamic Cone Penetrometer UC Unconfined Compressive Strength (PID) Photo-Ionization Detector (OVA) Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

LOCATION AND ELEVATION NOTES

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (psf)**	**Standard Penetration or N-Value Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 500	0 - 1
Loose	4 - 9	Soft	500 to 1,000	2 - 4
Medium Dense	10 - 29	Medium Stiff	1,000 to 2,000	4 - 8
Dense	30 - 50	Stiff	2,000 to 4,000	8 - 15
Very Dense	> 50	Very Stiff	4,000 to 8,000	15 - 30
		Hard	> 8,000	> 30

RELEVANCE OF SOIL BORING LOG

The soil boring logs contained within this document are intended for application to the project as described in this document. Use of these soil boring logs for any other purpose may not be appropriate.

UNIFIED SOIL CLASSIFICATION SYSTEM

Terracon GeoReport

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:**	Cu ≥ 4 and 1 ≤ Cc ≤ 3 [E]		GW	Well-graded gravel [F]
			Cu < 4 and/or [Cc<1 or Cc>3.0] [E]		GP	Poorly graded gravel [F]
		Gravels with Fines:	Fines classify as ML or MH		GM	Silty gravel [F, G, H]
			Fines classify as CL or CH		GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:**	Cu ≥ 6 and 1 ≤ Cc ≤ 3 [E]		SW	Well-graded sand [I]
			Cu < 6 and/or [Cc<1 or Cc>3.0] [E]		SP	Poorly graded sand [I]
		Sands with Fines:	Fines classify as ML or MH		SM	Silty sand [G, H, I]
			Fines classify as CL or CH		SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A"		CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K, L, M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K, L, M, N]
			Liquid limit - not dried			Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K, L, M]
			PI plots below "A" line		MH	Elastic Silt [K, L, M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K, L, M, P]
			Liquid limit - not dried			Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

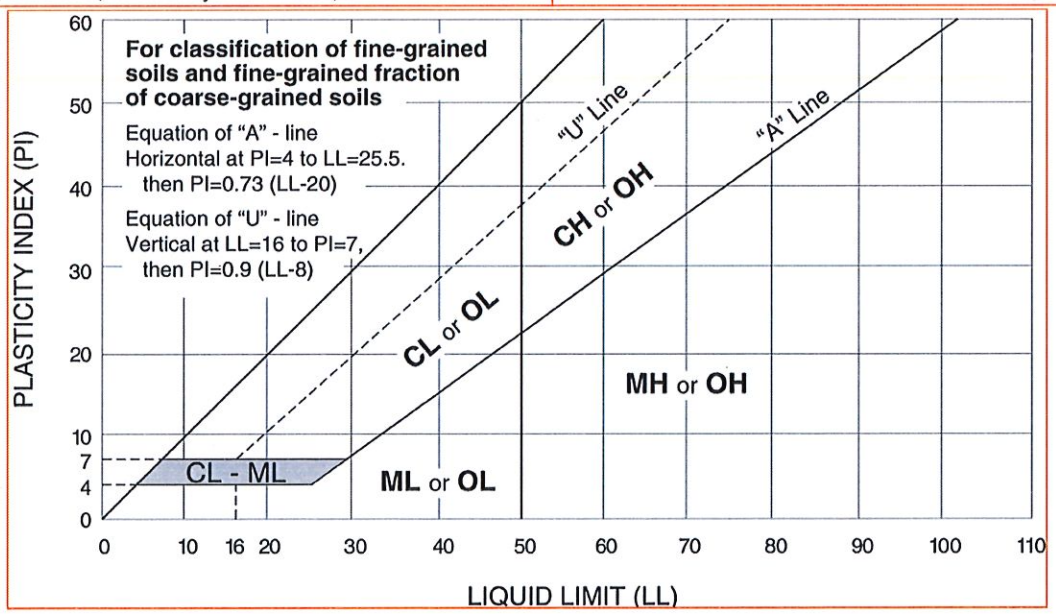
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



DESCRIPTION OF ROCK PROPERTIES

Terracon GeoReport

WEATHERING	
Term	**Description**
Unweathered	No visible sign of rock material weathering, perhaps slight discoloration on major discontinuity surfaces.
Slightly weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than in its fresh condition.
Moderately weathered	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.
Highly weathered	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones.
Completely weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.
Residual soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

STRENGTH OR HARDNESS		
Description	**Field Identification**	**Uniaxial Compressive Strength, psi (MPa)**
Extremely weak	Indented by thumbnail	40-150 (0.3-1)
Very weak	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife	150-700 (1-5)
Weak rock	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer	700-4,000 (5-30)
Medium strong	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with single firm blow of geological hammer	4,000-7,000 (30-50)
Strong rock	Specimen requires more than one blow of geological hammer to fracture it	7,000-15,000 (50-100)
Very strong	Specimen requires many blows of geological hammer to fracture it	15,000-36,000 (100-250)
Extremely strong	Specimen can only be chipped with geological hammer	>36,000 (>250)

DISCONTINUITY DESCRIPTION			
Fracture Spacing (Joints, Faults, Other Fractures)		**Bedding Spacing (May Include Foliation or Banding)**	
Description	**Spacing**	**Description**	**Spacing**
Extremely close	< ¾ in (<19 mm)	**Laminated**	< ½ in (<12 mm)
Very close	¾ in – 2-1/2 in (19 - 60 mm)	**Very thin**	½ in – 2 in (12 – 50 mm)
Close	2-1/2 in – 8 in (60 – 200 mm)	**Thin**	2 in – 1 ft. (50 – 300 mm)
Moderate	8 in – 2 ft. (200 – 600 mm)	**Medium**	1 ft. – 3 ft. (300 – 900 mm)
Wide	2 ft. – 6 ft. (600 mm – 2.0 m)	**Thick**	3 ft. – 10 ft. (900 mm – 3 m)
Very Wide	6 ft. – 20 ft. (2.0 – 6 m)	**Massive**	> 10 ft. (3 m)

Discontinuity Orientation (Angle): Measure the angle of discontinuity relative to a plane perpendicular to the longitudinal axis of the core. (For most cases, the core axis is vertical; therefore, the plane perpendicular to the core axis is horizontal.) For example, a horizontal bedding plane would have a 0-degree angle.

ROCK QUALITY DESIGNATION (RQD) [1]	
Description	**RQD Value (%)**
Very Poor	0 - 25
Poor	25 – 50
Fair	50 – 75
Good	75 – 90
Excellent	90 - 100

1. The combined length of all sound and intact core segments equal to or greater than 4 inches in length, expressed as a percentage of the total core run length.

Reference: U.S. Department of Transportation, Federal Highway Administration, Publication No FHWA-NHI-10-034, December 2009
Technical Manual for Design and Construction of Road Tunnels – Civil Elements

Terracon GeoReport

Geotechnical Engineering Report

SSC Self-Support Tower – Carthage, MO
Carthage, Missouri
October 14, 2020
Terracon Project No. B3205016

Prepared for:
Selective Site Consultants, Inc.
Overland Park, Kansas

Prepared by:
Terracon Consultants, Inc.
Springfield, Missouri

October 14, 2020

Selective Site Consultants, Inc.
7171 West 95th Street, Suite 600
Overland Park, Kansas 66212

Attn: Ms. Emily Roseberry
P: (913) 438-7700
E: ERoseberry@ssc.us.com

Re: Geotechnical Engineering Report
SSC Self-Support Tower – Carthage, MO
5182 Grand Avenue
Carthage, Missouri
Terracon Project No. B3205016

Dear Ms. Roseberry:

We have completed the Geotechnical Engineering services for the above-referenced project. This study was performed in general accordance with Selective Site Consultants Purchase Order SSC-1225, dated September 18, 2020. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,

Terracon Consultants, Inc.

STATE OF MISSOURI
ALLEN G. MINKS
NUMBER E-22438
REGISTERED PROFESSIONAL ENGINEER

Jessica M. Cannon, E.I.
Staff Geotechnical Engineer

Allen G. Minks, P.E.
Senior Consultant
Missouri No. E-22438
Renews:12/31/2021

10-14-2020

REPORT TOPICS

ATTACHMENTS

Note: Refer to each individual Attachment for a listing of contents.

Geotechnical Engineering Report

SSC Self-Support Tower – Carthage, MO

5182 Grand Avenue

Carthage, Missouri

Terracon Project No. B3205016

October 14, 2020

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed self-support tower to be located at 5182 Grand Avenue in Carthage, Missouri. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil and rock conditions
- Groundwater conditions
- Site preparation and earthwork
- Excavation considerations
- Foundation design and construction
- Seismic site class per IBC

The geotechnical engineering scope of services for this project included the advancement of three (3) soil borings to depths of approximately 20 to 31 feet below existing site grades. Samples were obtained from only one of the borings.

Maps showing the site and boring locations are included in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs in the **Exploration Results** section of this report.

The **General Comments** section provides an understanding of the report limitations.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project is located east of 5182 Grand Avenue in Carthage, Missouri. Latitude: 37.0979°N, Longitude: 94.3094°W See **Site Location**
Existing Improvements	An existing structure is located to the west of the proposed tower location.

Item	Description
Current Ground Cover	Lightly-vegetated
Existing Topography	Relatively flat
Expected Subsurface Conditions	Based on the Geological Map provided by the United States Geologic Survey (USGS), the subject site is located over the Meramecian Series. The Meramecian Series consists of limestone bedrock.
Solution Features	Solution features, including springs, caves, and sinkholes, are commonly present in the bedrock formations in this area. Based on the review of information available from MDNR, the subject site does not contain any previously identified sinkhole formations. It is difficult to predict future sinkhole activity. Site grading and drainage may alter site conditions and could possibly cause sinkholes in areas that have no history of this activity.

PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed in the project planning stage. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Project Description	The project includes the construction of a 200-foot tall, self-support tower.
Maximum Loads (estimated by Terracon)	■ Tower (vertical) – 200 kips ■ Slabs: 150 pounds per square foot (psf)
Grading/Slopes	Minimal grading is anticipated to achieve final grades. We anticipate up to 3 feet of cut and/or fill may be required to develop final grade. Final slope angles no steeper than 3H:1V (Horizontal: Vertical) are expected.
Below-Grade Structures	None anticipated.

GEOTECHNICAL CHARACTERIZATION

Subsurface Profile

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, and geologic setting. This characterization, termed GeoModel, forms the basis of our geotechnical analyses and evaluation of site preparation and foundation options. Conditions encountered at each exploration point are indicated on the individual logs. The individual logs and GeoModel can be found in the **Exploration Results** section of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	Surface	Topsoil
2	Lean Clay	Lean clay (CL) with limestone fragments
3	Fat Clay	Fat clay (CH) with varying amounts of limestone fragments
4	Gravel	Clayey gravel (GC) with sand
5	Bedrock	Limestone, slightly weathered

Groundwater Conditions

The boreholes were observed while drilling and after completion for the presence and level of groundwater. The water levels observed in the boreholes can be found on the boring logs in **Exploration Results**.

Groundwater was encountered in Boring B-3 near a depth of 24 feet while drilling. Groundwater was not encountered in Boring B-1 prior to rock coring, or in B-2. This does not necessarily mean these borings terminated above groundwater or the water level summarized above is a stable groundwater level. Due to the low permeability of the soils encountered in the borings, a relatively long period of time may be necessary for a groundwater level to develop and stabilize in a borehole. Long-term observations in piezometers or observation wells sealed from the influence of surface water are often required to define groundwater levels in materials of this type.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be different from the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

GEOTECHNICAL OVERVIEW

Expansive Soils

The fat clay (CH) soils encountered in the borings are high in plasticity and prone to volume change with variations in moisture content. For this reason, we recommend that at least the upper 24 inches of soil below the bottom of the floor slab level consist of low plasticity (LP) material as defined in the **Earthwork** section.

This LP layer should also be confirmed or placed below other flatwork abutting the structure. The procedures recommended in this report may not eliminate all future subgrade volume change and

resultant movements. However, the procedures outlined should reduce the potential for subgrade volume change. Additional reductions in subgrade movements could be achieved by using a thicker LP zone. LP material could be imported or the high plasticity soils could be chemically modified to reduce their volume change susceptibility.

This report provides recommendations to help mitigate the effects of soil shrinkage and expansion. However, even if these procedures are followed, some movement and at least minor cracking in the structure could still occur. The severity of cracking and other cosmetic damage, such as uneven floor slabs on grade, will likely increase if any modification of the site results in excessive wetting or drying of the expansive soils. Eliminating the risk of movement and cosmetic distress may not be feasible, but it may be possible to further reduce the risk of movement if more extensive measures are used during construction. We would be pleased to discuss other construction alternatives with you upon request.

Soft Subgrade

The near surface soils could become unstable with typical earthwork and construction traffic, especially after precipitation events. Effective drainage should be completed early in the construction sequence and maintained after construction to avoid potential issues. If possible, grading should be performed during the warmer and drier times of the year. If grading is performed during the wetter months, an increased risk for possible undercutting and replacement of unstable subgrade will persist. Additional site preparation recommendations, including subgrade improvement and fill placement, are provided in the **Earthwork** section.

EARTHWORK

Site Preparation

Prior to placing fill, existing vegetation and root mat should be removed. Complete stripping of the topsoil should be performed in the proposed structures areas.

We recommend that the exposed subgrade be thoroughly evaluated by a Geotechnical Engineer prior to placement of new fill. The soils on the site are sensitive to disturbance from construction equipment traffic, particularly during wet periods. Excessively wet or dry material should either be removed or moisture conditioned and recompacted. The exposed subgrade should be proofrolled where possible to aid in locating loose or soft areas. Proofrolling can be performed with a loaded, tandem-axle dump truck. If unsuitable areas are observed during construction, subgrade improvement will then be necessary to establish a suitable subgrade support condition. Potential subgrade stabilization techniques are discussed below.

- **Scarification and Recompaction** – It may be feasible to scarify, dry, and recompact the exposed soils. The success of this procedure would depend primarily upon favorable

weather and sufficient time to dry the soils. Stable subgrades would likely not be achievable if the thickness of the unstable soil is greater than about 1 foot, if the unstable soil is at or near groundwater levels, or if construction is performed during a period of wet or cool weather when drying is difficult.

- **Crushed Stone** – The use of crushed stone or gravel is the most common procedure to improve subgrade stability. Typical undercut depths would be expected to range from about 6 to 30 inches below finished subgrade elevation with this procedure. The use of high modulus geosynthetics (i.e., geotextile or geogrid) could also be considered after underground work such as utility construction is completed. Prior to placing the geosynthetic, we recommend that all below-grade construction, such as utility line installation, be completed to avoid damaging the geosynthetic. Equipment should not be operated above the geosynthetic until one full lift of crushed stone fill is placed above it. The maximum particle size of granular material placed over the geosynthetic should meet the manufacturer's specifications, and generally should not exceed 1½ inches.

Fill Material Types

Compacted structural fill should meet the following material property requirements:

Fill Type [1]	USCS Classification	Acceptable Location for Placement
High Plasticity Material	CH (LL≥70 or PI≥40)	Below upper 3 feet of floors and other lightly-loaded structures; 2 feet of foundations; and 1 foot of pavement base rock
Moderate to High Plasticity Material [2]	CH or CL, with 70>LL≥45 or 40>PI≥25	Below upper 2 feet of floor slabs and any other lightly-loaded structures, below upper 1 foot of pavement base rock
Granular Material [3]	GM, GC, SM, or SC	All locations and elevations
Low Plasticity (LP) Material [4]	CL (LL<45 & PI<25) or Granular Material [3]	

1. Compacted structural fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to Terracon for evaluation. On-site soils generally appear suitable for use as fill outside of the LP zone.
2. Delineation of moderate to high plasticity clays should be performed in the field by a qualified geotechnical engineer or their representative, and could require additional laboratory testing. If fat clay material contains greater than 35 percent granular material retained on a ¾-inch sieve, it may be used in the low volume change zone.
3. Crushed limestone aggregate, limestone screenings or granular material such as sand, gravel or crushed stone containing at least 15 percent low plasticity fines.

4. Low plasticity cohesive soil or granular soil having low plasticity fines. Material should be approved by the geotechnical engineer.

Fill Compaction Requirements

Item	Description
Fill Lift Thickness	9 inches or less in loose thickness for heavy compaction equipment 4 to 6 inches or less in loose thickness for light, hand-operated compaction equipment
Compaction Requirements [1]	At least 95 percent of the material's standard Proctor maximum dry density
Moisture Content – Cohesive Soil	-1 to +3 percent of the optimum moisture content value as determined by the standard Proctor test
Moisture Content – Granular Material	Workable moisture levels [2]

1. We recommend that engineered fill be tested for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.
2. Specifically, moisture levels should be maintained low enough to allow for satisfactory compaction to be achieved without the cohesionless fill material pumping when proofrolled.

Utility Trench Backfill

All trench excavations should be made with sufficient working space to permit construction including backfill placement and compaction. If utility trenches in cohesive soils are backfilled with relatively clean granular material, they should be capped with at least 18 inches of cohesive fill to reduce the infiltration and conveyance of surface water through the trench backfill.

Grading and Drainage

All grades must provide effective drainage away from the structure during and after construction and should be maintained throughout the life of the structure. Water retained next to the structure can result in soil movements greater than those discussed in this report.

Exposed ground should be sloped and maintained at a minimum 5 percent away from the structure for at least 10 feet beyond the perimeter. After construction, final grades should be checked to document that effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted, as necessary, as part of the structure's maintenance program.

Earthwork Construction Considerations

After completion of filling and grading, care should be taken to maintain the subgrade water content. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Any water that collects over, or adjacent to, construction areas should be promptly removed. If the subgrade freezes, or becomes excessively wet or dry, or is disturbed, the affected material should be removed, or these materials should be scarified, moisture conditioned, and recompacted, prior to further construction. All of these processes should be observed by Terracon.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local, and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming any responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

Construction Observation and Testing

The Geotechnical Engineer should be retained during the construction phase of the project to observe earthwork and to perform tests and observations during subgrade preparation, proofrolling, placement and compaction of controlled compacted fills, backfilling of excavations into the completed subgrade, and just prior to construction of slabs.

SHALLOW FOUNDATIONS

If the site has been prepared in accordance with the requirements noted in **Earthwork**, the following design parameters are applicable for shallow foundations. Foundations should not bear on or above the existing fill materials.

Mat Foundation Design Parameters

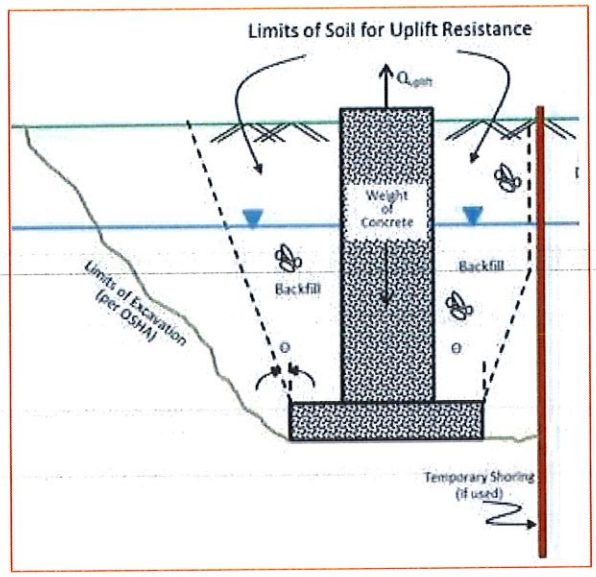
Parameter	Value
Suitable bearing materials [1]	Medium stiff to stiff native clays or newly placed engineered fill extending to suitable native soils
Minimum embedment below finished grade for frost protection [2]	30 inches

Parameter	Value
Allowable sustained uniform bearing pressure [3]	2,500 psf
Design Modulus of Subgrade Reaction, k	90 pci
Minimum Width	4 feet
Modulus Correction Factor[1]	$k_c=k((b+1)/2b)^2$
Estimated total settlement [4]	Less than 1 inch
Differential Settlement	¾-inch over 40 feet
Vertical modulus of subgrade reaction (approximate)	35 psi/in
Ultimate coefficient of sliding friction [5]	0.35

1. See **Geotechnical Considerations** of this report. Assumes any unsuitable or soft soils, including any undocumented fill, will be undercut and replaced with compacted structural fill.
2. The embedment depth is applicable to perimeter footings and footings below unheated areas for frost protection and to reduce the effects of seasonal moisture variations in the subgrade soils. Interior footings can bear at shallower depths. **For a mat foundation, we recommend a minimum embedment depth of 4 feet.**
3. The recommended allowable sustained uniform bearing pressure, which includes a factor of safety of 3, is the pressure in excess of the minimum surrounding overburden pressure at the pad base elevation. The net allowable bearing pressure can be increased by ⅓ for transient loads (e.g., wind or seismic).
4. Foundation settlement will depend upon variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the footings, the thickness of compacted fill, and the quality of the earthwork operations. These settlement estimates are based on an embedment depth of least 4 feet.
5. Can be used to compute sliding resistance where foundations are placed on suitable soil. Should be neglected for foundations subject to net uplift conditions.

Design Parameters - Uplift Loads

Uplift resistance of spread footings can be developed from the effective weight of the footing and the overlying soils. As illustrated on the subsequent figure, the effective weight of the soil prism defined by diagonal planes extending up from the top of the perimeter of the foundation to the ground surface at an angle, θ, of 20 degrees from the vertical can be included in uplift resistance. The maximum allowable uplift capacity should be taken as a sum of the effective weight of soil plus the dead weight of the foundation, divided by an appropriate factor of safety. A maximum total unit weight of 115 pcf should be used for the backfill. This unit weight should be reduced to 55 pcf for portions of the backfill or natural soils below the groundwater elevation.

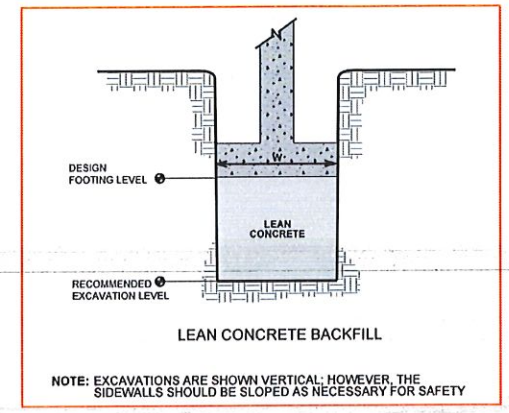


Foundation Construction Considerations

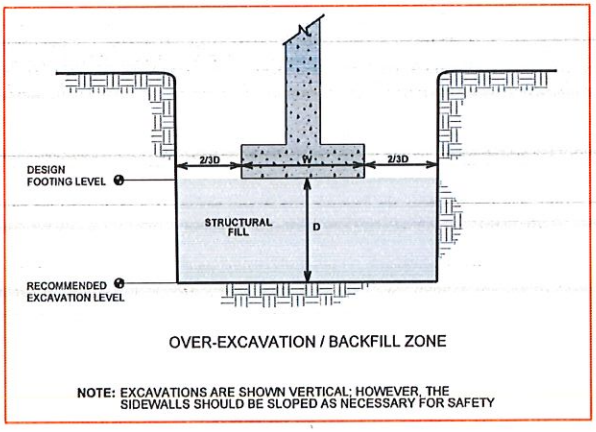
As noted in **Earthwork**, the footing excavations should be evaluated under the direction of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed. Placement of a lean concrete mud-mat over the bearing soils should be considered if the excavations must remain open for an extended period of time.

While groundwater was not encountered in the borings at a depth within shallow foundations, it could still be encountered during foundation excavations or in other excavation activities. In addition, some surface and/or perched groundwater may enter foundation excavations during construction. It is anticipated that any water entering foundation excavations from these sources can be removed using sump pumps or gravity drainage. Additional dewatering efforts may be required if greater inflow occurs.

If unsuitable bearing soils are encountered at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils. The footings could then bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. This is illustrated on the sketch below.



As an alternative, the footings could also bear on properly compacted structural backfill extending down to suitable soils. Overexcavation for compacted structural fill placement below footings should extend laterally beyond all edges of the footings at least 8 inches per foot of overexcavation depth below footing base elevation. Overexcavation for structural fill placement below footings should be conducted as shown below. The overexcavation should be backfilled up to the footing base elevation as recommended in the **Earthwork** section.



DEEP FOUNDATIONS

Drilled Shaft Design Parameters

Soil design parameters are provided below in the **Drilled Shaft Design Summary** table for the design of drilled shaft foundations. The values presented for allowable side friction and end bearing include a factor of safety.

Drilled Shaft Design Summary [1, 2]								
Approximate Depth (feet)	Allowable Skin Friction (psf) [3]	Allowable End Bearing Pressure (psf) [4]	Effective Unit Weight (pcf) [5]	Allowable Passive Pressure (psf)	Cohesion (psf)	Internal Angle of Friction (Degrees)	Strain ε_{50} [6]	Lateral Subgrade Modulus (pci) [6]
0 – 3	--	--	--	--	--	--	--	--
(3 – 12) Clayey gravel	350	8,000	120	1,000	--	30	--	225
(12 to 26) Stiff clay without free water	1,000	15,000	115	5,000	5,000	--	0.005	1,650
(26 to 31) Limestone	1,500	25,000	150	7,000	7,000	--	0.0005	2,500

1. Design capacities are dependent upon the method of installation, and quality control parameters. The values provided are estimates and should be verified when installation protocol have been finalized.
2. Design capacities can be increased by 33 percent for highly transient loads unless those loads have been factored to account for transient conditions.
3. Pier observation is recommended to adjust pier length if variable soil conditions are encountered.
4. Applicable for compressive loading only. Reduce to 2/3 of values shown for uplift loading. Effective weight of shaft can be added to uplift load capacity.
5. Minimum pier length of 4 diameters required. Terracon should be contacted if the pier length is less than four times the pier diameter as modifications to our design parameters may be warranted. The drilled pier must extend 3 feet, or one pier diameter, whichever is greater, into the bearing strata to achieve the full listed capacity.
6. Lateral subgrade modulus and ε_{50} values provided above are to be used with LPILE software.

The above-indicated cohesion and lateral subgrade modulus values are ultimate values without factors of safety. The end bearing is an allowable parameter with a factor of safety of 3. The skin friction and passive resistance are allowable parameters with factors of safety of 2. The values given in the above table are based on our borings and past experience with similar soil types. Lateral resistance and friction in the upper 3 feet should be ignored due to the potential effects of frost action, desiccation, and drilling disturbance.

Long-term settlement of a drilled shaft foundation designed and constructed in accordance with the recommendations presented in this report, should be about ½ inch or less.

Drilled Shaft Construction Considerations

Pier drilling through the weathered limestone may be difficult based upon the material encountered within the borings. Concentrated effort and/or core barrels may be necessary to advance the shaft excavation through the weathered bedrock overlying competent bedrock. Groundwater was encountered during drilling and may be encountered during drilled pier excavation. Therefore, temporary casing may be needed to advance drilled pier excavations. Temporary casing should be installed if personnel will enter the shafts.

The bottom of the pier excavations should be cleaned of any water and loose material before placing reinforcing steel and concrete. A minimum shaft diameter of at least 30 inches is required for entry of personnel, and to facilitate clean-out and possible dewatering of the pier excavation.

Concrete should be placed soon after excavating to reduce bearing surface disturbance. It is recommended that the Geotechnical Engineer be retained to observe and test the foundation bearing materials. Any water accumulating in the pier excavation should be pumped from the excavation or the water level should be allowed to stabilize and then concrete placed using the tremie method.

If concrete will be placed as the temporary casing is being removed, we recommend the concrete mixture be designed with a slump of about 5 to 7 inches to reduce the potential for arching when removing the casing. While removing the casing from a pier excavation during concrete placement, the concrete inside the casing should be maintained at a sufficient level to resist any earth and hydrostatic pressures outside the casing during the entire casing removal procedure.

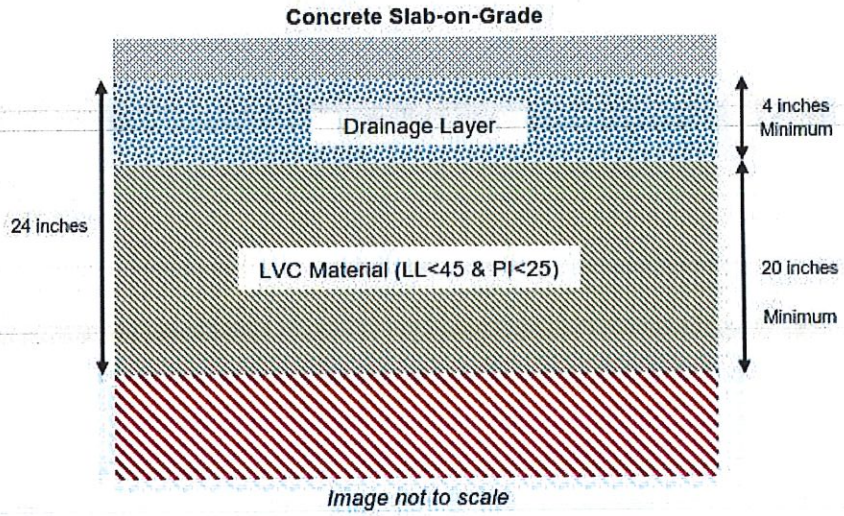
We recommend that a representative of Terracon be present during drilling activities to evaluate the materials removed from the drilled pier excavations to document that adequate capacity has been developed, to observe the base of the drilled pier to document that the cuttings have been adequately removed, and also to observe concrete placement.

Although obvious signs of harmful gases such as methane, carbon monoxide, etc., were not noted in the borings during the drilling operations, gas could be encountered in the drilled shaft excavations during construction. The contractor should check for gases and/or oxygen deficiency prior to any workers entering the excavation. Casing will be required if personnel enter the excavation.

FLOOR SLABS

The subgrade soils include moderate to high plasticity clays, and these soils exhibit the potential to swell with increased water content. Construction of the floor slab, combined with revising site drainage creates the potential for gradual increased water contents within the clays. Increases in water content could cause the clays to swell and damage the floor slab. To reduce the swell potential,

we recommend that at least the upper 24 inches of materials below the floor slab be an approved Low Plasticity (LP) material.



Design parameters for floor slabs assume that the requirements for **Earthwork** have been followed. Specific attention should be given to positive drainage away from the structure. This also includes positive drainage of the aggregate base beneath the floor slab.

Floor Slab Design Parameters

Item	Description
Floor slab support [1]	Minimum 4 inches of free-draining (less than 5 percent passing the U.S. No. 200 sieve) crushed aggregate compacted to at least 95 percent of ASTM D 698 [2, 3] over at least 20 inches of low plasticity cohesive or granular soils with at least 15 percent passing the U.S. No. 200 sieve
Estimated modulus of subgrade reaction [2]	150 pounds per square inch per inch (psi/in) for point loads.

1. Floor slabs should be structurally independent of any building footings or walls to reduce the potential of floor slab cracking caused by differential movements between the slab and foundation.
2. Modulus of subgrade reaction is an estimated value based upon our experience with the subgrade condition, the requirements noted in **Earthwork**, and the floor slab support as noted in this table including the 24-inch thick LP layer. It is provided for point loads. For large area loads the modulus of subgrade reaction would be lower.
3. Other design considerations, such as cold temperatures and condensation development, could warrant more extensive design provisions.

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, or when the slab will

support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or any cracks that develop should be sealed with a waterproof, nonextruding compressible compound specifically recommended for heavy-duty concrete and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through the use of sufficient control joints, appropriate reinforcing or other means.

Floor Slab Construction Considerations

Finished subgrade within and for at least 10 feet beyond the floor slab should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become excessively wet or dry, or damaged prior to construction of floor slabs, the affected material should be removed and structural fill should be added to replace the resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should approve the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel, and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

SEISMIC CONSIDERATIONS

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Class is required to determine the Seismic Design Category for a structure. The Site Class is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7-10. Based on the soil/bedrock properties encountered at the site and as described on the boring logs, the **Seismic Site Class is C**. Borings at this site were extended to a maximum depth of 31 feet. The site properties below the boring depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. Additional deeper borings or geophysical testing may be performed to confirm the conditions below the current boring depth.

GENERAL COMMENTS

Our services are conducted with the understanding of the project as described in the proposal, and incorporate collaboration with the design team as we complete our services. The design team should collaborate with Terracon to confirm these assumptions and to prepare the final design plans and specifications. Any information conveyed prior to the final report is for informational purposes only and should not be considered or used for decision-making purposes.

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations may occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in the final report, to provide observation and testing services during construction. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our scope of services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third party beneficiaries intended. Any third party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation costs. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation costs. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, cost estimating, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Number of Borings	Boring Depth (feet)	Planned Location
3	20 to 31	Self-support tower legs

Boring Layout and Elevations: Selective Site Development provided the boring locations. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±20 feet). Approximate elevations were obtained from Google Earth Pro. If more precise elevations and boring locations are desired, we recommend the borings be surveyed.

Subsurface Exploration Procedures: We advanced the borings with an ATV-mounted rotary drill rig using continuous flight, solid-stem augers. Four samples were obtained in Boring B-1 in the upper 10 feet and at intervals of 5 feet thereafter. Soil sampling was performed using split-barrel sampling procedures. Upon encountering auger refusal in Boring B-1, 5 feet of rock core was obtained using NQ2 rocking procedures. Samples were not obtained in B-2 and B-3.

In the split-barrel sampling procedure, the number of blows required to advance a standard 2-inch O.D. split-barrel sampler the last 12 inches of the typical total 18-inch penetration by means of a 140-pound hammer with a free fall of 30 inches, is the standard penetration resistance (SPT N-value). This value is used to estimate the in-situ relative density of cohesionless soils and the consistency of cohesive soils. A CME automatic SPT hammer was used to advance the split-barrel sampler in the borings performed on this site. A greater efficiency is achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope.

The sampling depths, penetration distances, and other sampling information were recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

Based on the material's texture and plasticity, we describe and classify soil samples in accordance with the Unified Soil Classification System. The project engineer reviewed the field data and assigned various laboratory tests to better understand the engineering properties of the

soil strata. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods are applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- Water content

Rock classification is conducted using locally accepted practices and Description of Rock Properties for engineering purposes; petrographic analysis may reveal other rock types.

SITE LOCATION AND EXPLORATION PLANS

Contents:

Site Location Plan
Exploration Plan

Note: All attachments are one page unless noted above.

SITE LOCATION

SSC Self-Support Tower – Carthage, MO ■ Carthage, MO
October 14, 2020 ■ Terracon Project No. B3205016

Terracon GeoReport

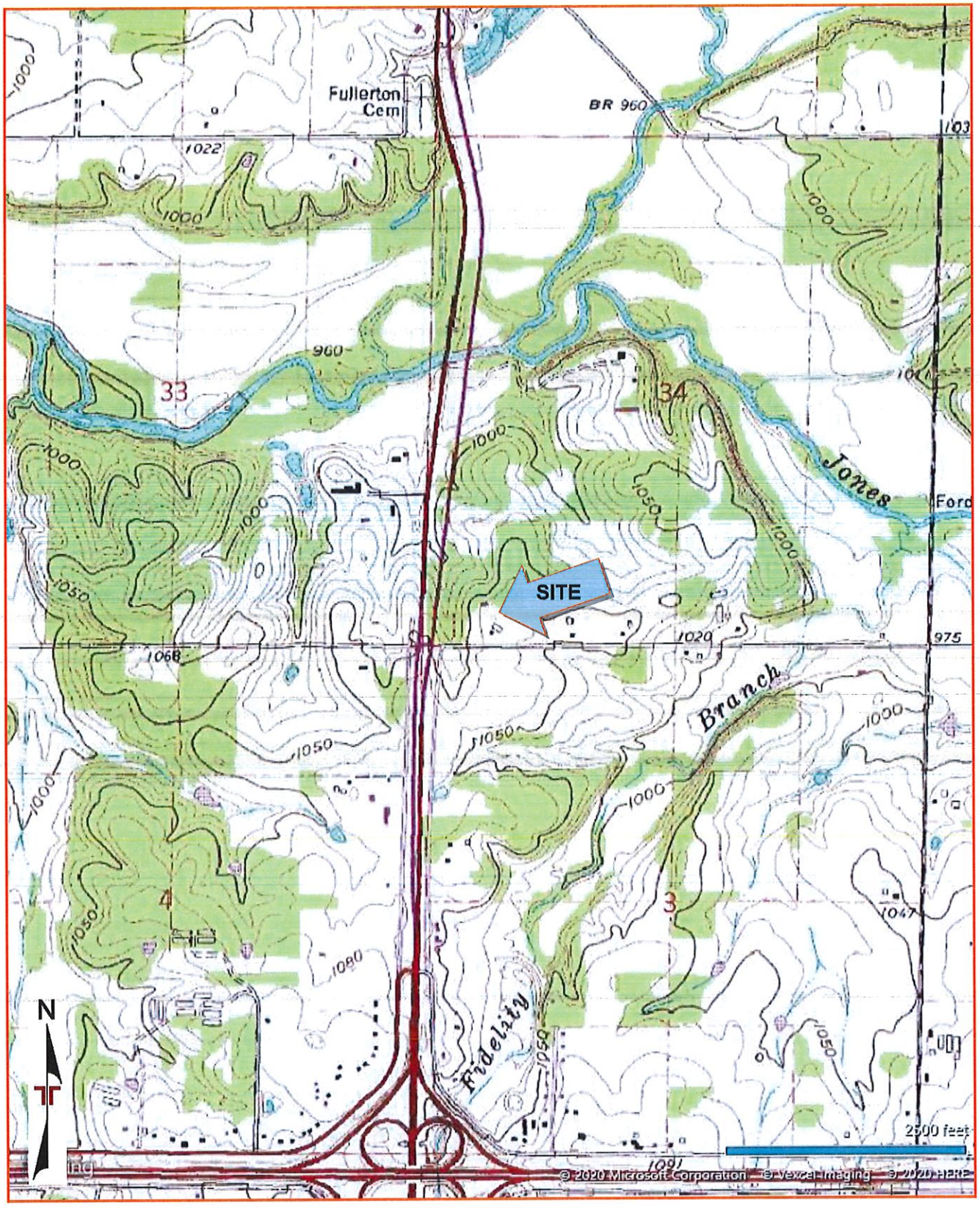


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY QUADRANGLES INCLUDE: HALLTOWN NE, MO (1/1/1969), BROOKLINE, MO (1/1/1975), BILLINGS, MO (1/1/1975) and REPUBLIC, MO (1/1/1975).

EXPLORATION PLAN

SSC Self-Support Tower – Carthage, MO ■ Carthage, MO
October 14, 2020 ■ Terracon Project No. B3205016

Terracon GeoReport

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

EXPLORATION RESULTS

Contents:

Boring Logs (B-1 through B-3)
GeoModel
Rock Core Photograph
Ground Resistivity Measurement Record

Note: All attachments are one page unless noted above.

BORING LOG NO. B-101

PROJECT: SSC Self-Support Tower - Carthage, MO

CLIENT: Selective Site Consultants, Inc.
Overland Park, KS

SITE: 5182 Grand Avenue
Carthage, MO

LOCATION See Exploration Plan

Latitude: 37.0979° Longitude: -94.3094°

Approximate Surface Elev.: 1065 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description
0.2	1065+/-	**TOPSOIL**, (approximately 2 inches)
		CLAYEY GRAVEL (GC), with sand, tan with light reddish brown, very dense
12.0	1053+/-	
		FAT CLAY (CH), trace gravel, light gray to gray, hard
		dense
		very stiff
26.0	1039+/-	
		LIMESTONE, light gray, slightly weathered
31.0	1034+/-	
		Boring Terminated at 31 Feet

MODEL LAYER	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	SAMPLE NUMBER	POCKET PENETROMETER (tsf)	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI
4	0								
	5			6	28-50/4"	1		9.8	
				6	38-50/1"	2		10.1	
				0	50/2"	3		8.7	
	10			16	22-24-23 N=47	4		36.3	
3	15			15	10-16-22 N=38	5	2.5	24.6	
	20			17	6-8-31 N=39	6		34.4	
	25			16	6-8-9 N=17	7	2.0	25.5	
5	30			113	REC: 94% RQD: 60%	Run-1			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-26 feet: Solid-stem augers
26-31 feed: NQ2 rock coring

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations obtained from Google Earth Pro

Notes:
No recovery in Sample No. 3, grab sample obtained from auger cuttings.

WATER LEVEL OBSERVATIONS

Groundwater not encountered prior to rock coring

Terracon
508 E. 9th St.
Joplin, MO

Boring Started: 09-27-2020	Boring Completed: 09-27-2020
Drill Rig: CME 750	Driller: Midwest Drilling
Project No.: B3205016	

BORING LOG NO. B-102

PROJECT: SSC Self-Support Tower - Carthage, MO

CLIENT: Selective Site Consultants, Inc.
Overland Park, KS

SITE: 5182 Grand Avenue
Carthage, MO

LOCATION See Exploration Plan

Latitude: 37.0978° Longitude: -94.3095°

Approximate Surface Elev.: 1066 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	
0.2	1066+/-	**TOPSOIL**, (approximately 2 inches)
		LEAN CLAY (CL), with limestone fragments, brown
6.0	1060+/-	**FAT CLAY (CH)**, with limestone fragments, reddish brown
		limestone layer from 14 to 15 feet
20.0	1046+/-	***Auger Refusal on Apparent Limestone at 20 Feet***

MODEL LAYER | GRAPHIC LOG | DEPTH (Ft.) | WATER LEVEL OBSERVATIONS | SAMPLE TYPE | RECOVERY (In.) | FIELD TEST RESULTS | SAMPLE NUMBER | POCKET PENETROMETER (tsf) | WATER CONTENT (%) | ATTERBERG LIMITS LL-PL-PI

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-20 feet: Solid-stem augers

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations obtained from Google Earth Pro

Notes:
Probe boring, sampling was not performed.

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
508 E. 9th St.
Joplin, MO

Boring Started: 09-27-2020	Boring Completed: 09-27-2020
Drill Rig:	Driller: Midwest Drilling
Project No.: B3205016	

BORING LOG NO. B-103

PROJECT: SSC Self-Support Tower - Carthage, MO

CLIENT: Selective Site Consultants, Inc.
Overland Park, KS

SITE: 5182 Grand Avenue
Carthage, MO

LOCATION See Exploration Plan

Latitude: 37.0978° Longitude: -94.3094°

Approximate Surface Elev.: 1066 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	
0.2	1066+/-	**TOPSOIL**, (approximately 2 inches)
		LEAN CLAY (CL), with limestone fragments, brown
6.0	1060+/-	**FAT CLAY (CH)**, with limestone fragments, reddish brown
20.0	1046+/-	**FAT CLAY (CH)**, trace limestone fragments, brown
23.0	1043+/-	**FAT CLAY (CH)**, with limestone fragments, reddish brown
25.5	1040.5+/-	***Auger Refusal on Apparent Limestone at 25.5 Feet***

MODEL LAYER: 1, 2, 3

GRAPHIC LOG

DEPTH (Ft.): 5, 10, 15, 20, 25

WATER LEVEL OBSERVATIONS: ▽ 24 feet while drilling

SAMPLE TYPE

RECOVERY (In.)

FIELD TEST RESULTS

SAMPLE NUMBER

POCKET PENETROMETER (tsf)

WATER CONTENT (%)

ATTERBERG LIMITS: LL-PL-PI

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
0-25.5 feet: Solid-stem augers

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations obtained from Google Earth Pro

Notes:
Probe boring, sampling was not performed.

WATER LEVEL OBSERVATIONS

▽ *24 feet while drilling*

Terracon
508 E. 9th St.
Joplin, MO

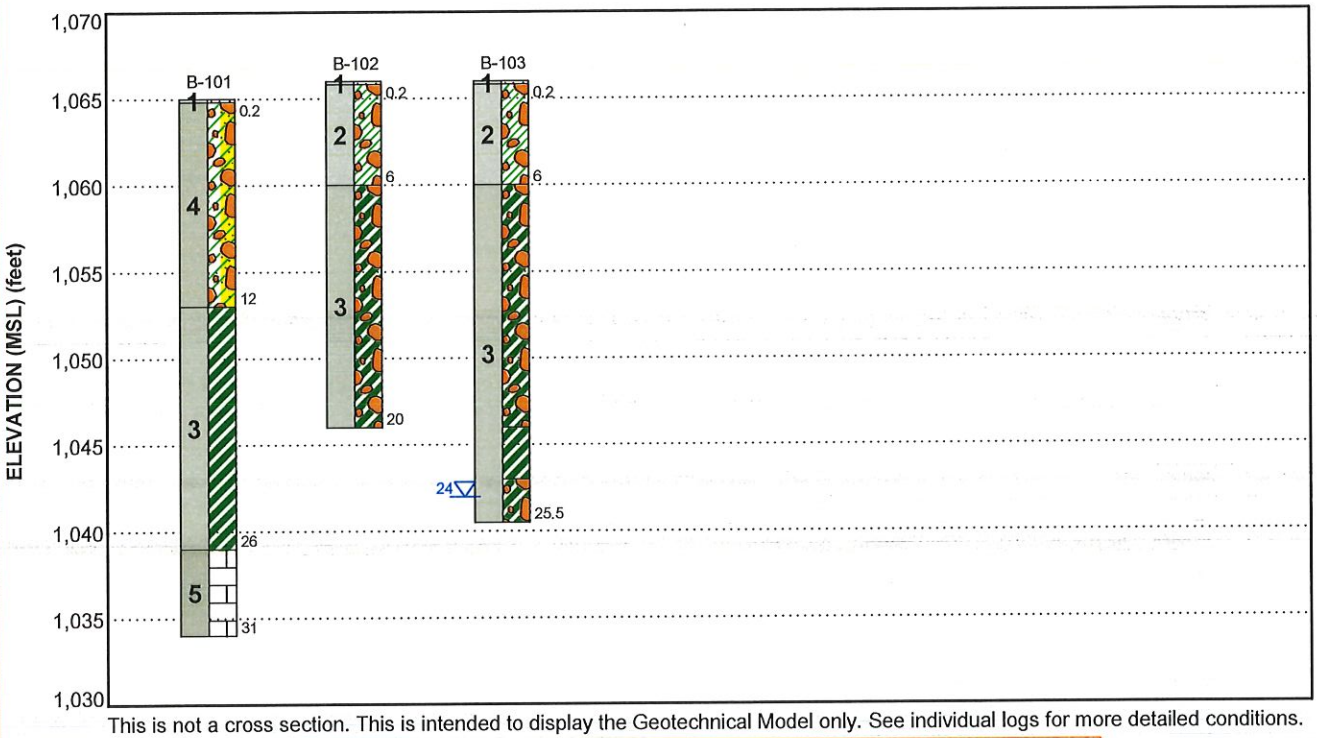
Boring Started: 09-27-2020	Boring Completed: 09-27-2020
Drill Rig:	Driller: Midwest Drilling
Project No.: B3205016	

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL B3205016 SSC SELF SUPPORT .GPJ TERRACON_DATATEMPLATE.GDT 10/14/20

GEOMODEL

SSC Self-Support Tower - Carthage, MO ■ Carthage, MO
Terracon Project No. B3205016

Terracon GeoReport



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	Surface	Topsoil
2	Lean Clay	Lean clay (CL) with limestone fragments
3	Fat Clay	Fat clay (CH) with varying amounts of limestone fragments
4	Gravel	Clayey gravel (GC) with sand
5	Bedrock	Limestone, slightly weathered

LEGEND

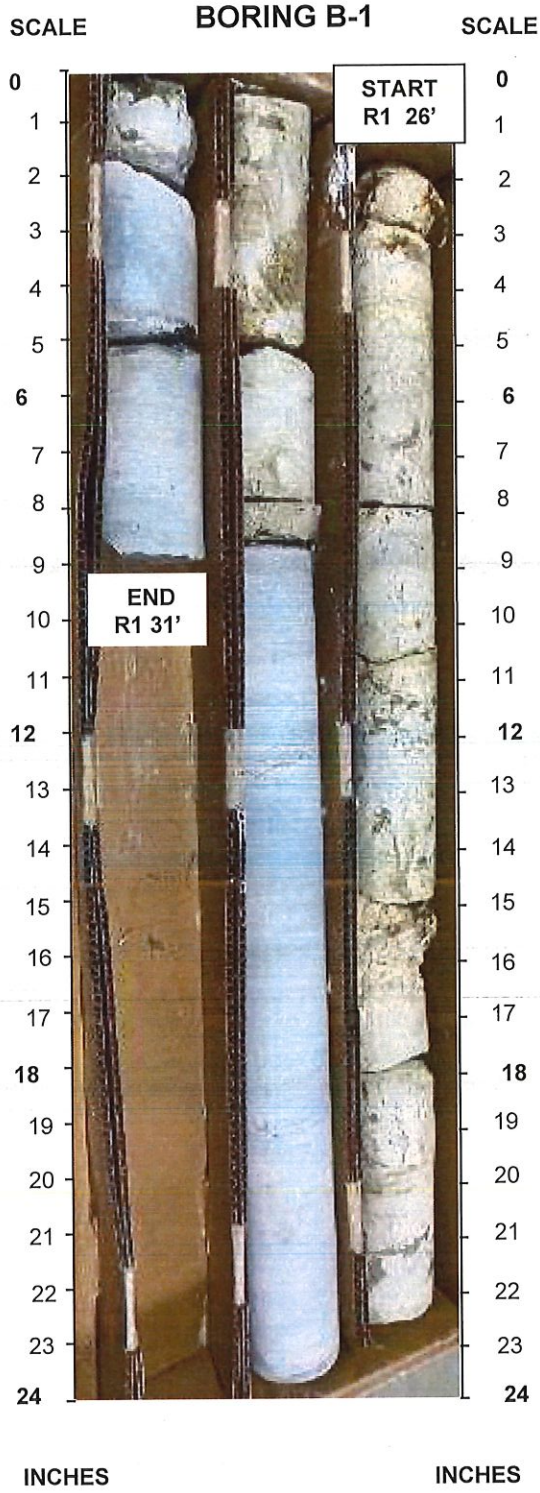
- Topsoil
- Limestone
- Clayey Gravel with Sand
- Gravelly Lean Clay
- Fat Clay
- Gravelly Fat Clay

▽ First Water Observation

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time. Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

BORING B-1



Project Manager: JDE	Project No. B3205016	Terracon GeoReport 11600 Lilburn Park Rd. St. Louis, MO 63146	ROCK CORE PHOTOGRAPH SSC Self-Support Tower Carthage, MO Carthage, Missouri
Drawn by: JMC	Scale: As shown		
Checked by: AGM	File Name: Rock Core Photo		
Approved by: AGM	Date: 10/08/2020		

GROUND RESISTIVITY MEASUREMENT RECORD

Job Name:	SSC - Carthage Tower	Job Number:	B3205016
Job Location:	Carthage, MO	Temperature:	70°F
Test Date:	9/24/2020		
Test Location:	37.0979° , -94.3094°		
Instrument Make and Model:	AEMC 6470 (4-point Wenner Method)		
Weather Conditions:	Sunny		
Soil Conditions at Surface:	Dry		

TRANSVERSE NO. 1 (N-S Direction)				
A= Probe Spacing (ft)	Inner Probe, Distance from Center (ft)	Outer Probe Distance from Center (ft)	R_e= measured resistance (ohms)	Apparent Resistivity (ohm-cm) A x R_e x 191.5
2.5	1.25	3.75	121.20	**58,025**
12.5	6.25	18.75	10.28	**24,608**
20	10	30	5.32	**20,379**
50	25	75	3.54	**33,896**

TRANSVERSE NO. 1 (E-W Direction)				
A= Probe Spacing (ft)	Inner Probe, Distance from Center (ft)	Outer Probe Distance from Center (ft)	R_e= measured resistance (ohms)	Apparent Resistivity (ohm-cm) A x R_e x 191.5
2.5	1.25	3.75	105.40	**50,460**
12.5	6.25	18.75	11.17	**26,738**
20	10	30	3.97	**15,186**
50	25	75	1.38	**13,214**

SUPPORTING INFORMATION

Contents:

Note: All attachments are one page unless noted above.

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SSC Self-Support Tower - Carthage, MO ■ Carthage, MO

Terracon Project No. B3205016

Terracon GeoReport

SAMPLING	WATER LEVEL	FIELD TESTS
Rock Core Split Spoon	Water Initially Encountered Water Level After a Specified Period of Time Water Level After a Specified Period of Time Cave In Encountered Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	N Standard Penetration Test Resistance (Blows/Ft.) (HP) Hand Penetrometer (T) Torvane (DCP) Dynamic Cone Penetrometer UC Unconfined Compressive Strength (PID) Photo-Ionization Detector (OVA) Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

LOCATION AND ELEVATION NOTES

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength Qu, (psf)**	**Standard Penetration or N-Value Blows/Ft.**
Very Loose	0 - 3	Very Soft	less than 500	0 - 1
Loose	4 - 9	Soft	500 to 1,000	2 - 4
Medium Dense	10 - 29	Medium Stiff	1,000 to 2,000	4 - 8
Dense	30 - 50	Stiff	2,000 to 4,000	8 - 15
Very Dense	> 50	Very Stiff	4,000 to 8,000	15 - 30
		Hard	> 8,000	> 30

RELEVANCE OF SOIL BORING LOG

The soil boring logs contained within this document are intended for application to the project as described in this document. Use of these soil boring logs for any other purpose may not be appropriate.

UNIFIED SOIL CLASSIFICATION SYSTEM

Terracon GeoReport

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:**	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or [$Cc<1$ or $Cc>3.0$] [E]		GP	Poorly graded gravel [F]
		Gravels with Fines:	Fines classify as ML or MH		GM	Silty gravel [F, G, H]
			Fines classify as CL or CH		GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:**	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or [$Cc<1$ or $Cc>3.0$] [E]		SP	Poorly graded sand [I]
		Sands with Fines:	Fines classify as ML or MH		SM	Silty sand [G, H, I]
			Fines classify as CL or CH		SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A"		CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OL	Organic clay [K, L, M, N] / Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K, L, M]
			PI plots below "A" line		MH	Elastic Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OH	Organic clay [K, L, M, P] / Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

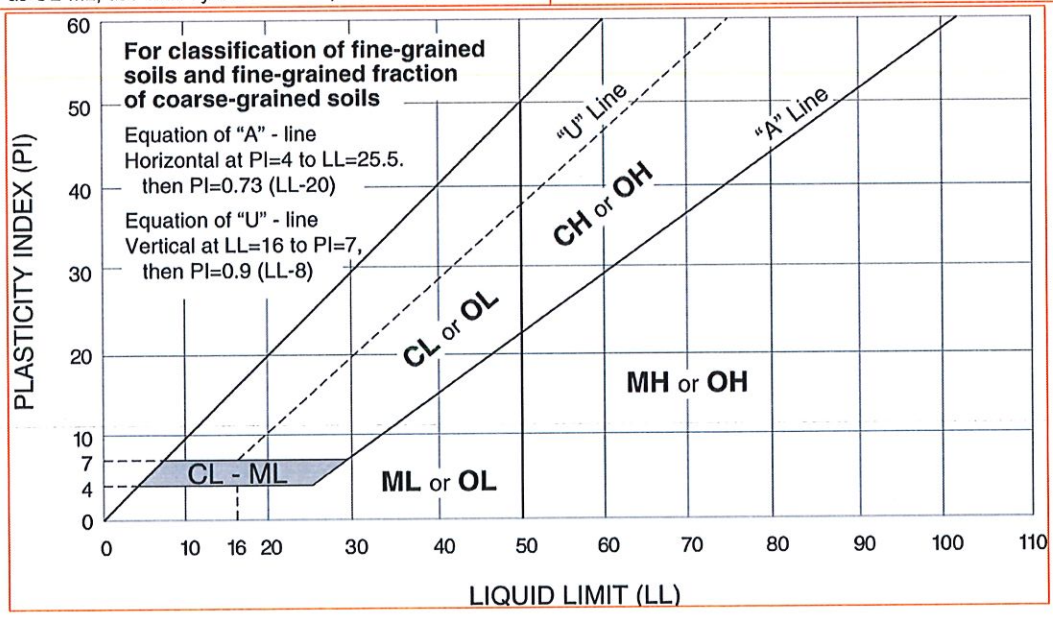
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



DESCRIPTION OF ROCK PROPERTIES

Terracon GeoReport

WEATHERING	
Term	**Description**
Unweathered	No visible sign of rock material weathering, perhaps slight discoloration on major discontinuity surfaces.
Slightly weathered	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering and may be somewhat weaker externally than in its fresh condition.
Moderately weathered	Less than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as corestones.
Highly weathered	More than half of the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as corestones.
Completely weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is still largely intact.
Residual soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

STRENGTH OR HARDNESS		
Description	**Field Identification**	**Uniaxial Compressive Strength, psi (MPa)**
Extremely weak	Indented by thumbnail	40-150 (0.3-1)
Very weak	Crumbles under firm blows with point of geological hammer, can be peeled by a pocket knife	150-700 (1-5)
Weak rock	Can be peeled by a pocket knife with difficulty, shallow indentations made by firm blow with point of geological hammer	700-4,000 (5-30)
Medium strong	Cannot be scraped or peeled with a pocket knife, specimen can be fractured with single firm blow of geological hammer	4,000-7,000 (30-50)
Strong rock	Specimen requires more than one blow of geological hammer to fracture it	7,000-15,000 (50-100)
Very strong	Specimen requires many blows of geological hammer to fracture it	15,000-36,000 (100-250)
Extremely strong	Specimen can only be chipped with geological hammer	>36,000 (>250)

DISCONTINUITY DESCRIPTION			
Fracture Spacing (Joints, Faults, Other Fractures)		**Bedding Spacing (May Include Foliation or Banding)**	
Description	**Spacing**	**Description**	**Spacing**
Extremely close	< ¾ in (<19 mm)	**Laminated**	< ½ in (<12 mm)
Very close	¾ in – 2-1/2 in (19 - 60 mm)	**Very thin**	½ in – 2 in (12 – 50 mm)
Close	2-1/2 in – 8 in (60 – 200 mm)	**Thin**	2 in – 1 ft. (50 – 300 mm)
Moderate	8 in – 2 ft. (200 – 600 mm)	**Medium**	1 ft. – 3 ft. (300 – 900 mm)
Wide	2 ft. – 6 ft. (600 mm – 2.0 m)	**Thick**	3 ft. – 10 ft. (900 mm – 3 m)
Very Wide	6 ft. – 20 ft. (2.0 – 6 m)	**Massive**	> 10 ft. (3 m)

Discontinuity Orientation (Angle): Measure the angle of discontinuity relative to a plane perpendicular to the longitudinal axis of the core. (For most cases, the core axis is vertical; therefore, the plane perpendicular to the core axis is horizontal.) For example, a horizontal bedding plane would have a 0-degree angle.

ROCK QUALITY DESIGNATION (RQD) [1]	
Description	**RQD Value (%)**
Very Poor	0 - 25
Poor	25 – 50
Fair	50 – 75
Good	75 – 90
Excellent	90 - 100

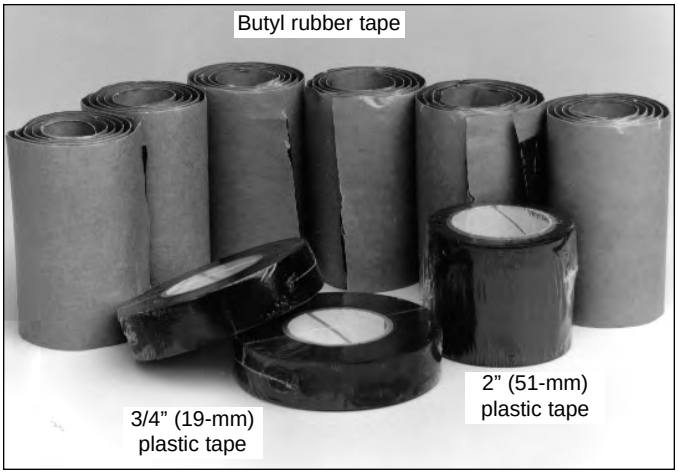
1. The combined length of all sound and intact core segments equal to or greater than 4 inches in length, expressed as a percentage of the total core run length.

Reference: U.S. Department of Transportation, Federal Highway Administration, Publication No FHWA-NHI-10-034, December 2009
Technical Manual for Design and Construction of Road Tunnels – Civil Elements

APPENDIX 3

ANDREW INSTALLATION INSTRUCTIONS for WEATHER PROOFING KIT for CONNECTORS & ANTENNAS

Weatherproofing Kit for Connectors and Antennas



Introduction

The application of sealing materials to antenna cable connections protects them from weather conditions. These include moisture penetration and loosening of connections from vibrations caused by strong winds.

Andrew Corporation recommends weatherproofing these connections according to the following procedures. Standard weatherproofing tapes, both butyl and plastic electrical tapes, are applied to the following:

• main feeder cable-to-jumper cable connection and
• jumper cable-to-antenna connection.

Become thoroughly familiar with and apply the Installation Tips given here.

Description

The use of this kit provides an additional moisture seal for cable connections. It also prevents loosening of connections from vibration or other external stresses which would eventually allow moisture penetration. The sealed connection is suitable for typical exposed and buried cable applications.

The kit can be used for one or more connections depending on the configuration and cable type as follows:

Connection type	Cable diameter	Connections per kit
LDF12 (2-1/4") to LDF4 (1/2")	2-1/4" to 1/2" (57 mm to 13 mm)	2
LDF7/VXL7 (1-5/8" to LDF4 (1/2")	1-5/8" to 1/2" (41 mm to 13 mm)	2
LDF6/VXL6 (1-1/4") to LDF4 (1/2"	1-1/4" to 1/2" (32 mm to 13 mm)	2
LDF5/VXL5 (7/8") to LDF4 (1/2")	7/8" to 1/2" (22 mm to 13 mm)	4
LDF4 (1/2") to LDF4 (1/2")	1/2" to 1/2" (13 mm to 13 mm)	12
VXL5 (7/8") to Device	7/8" to 1/2" (22 mm to 13 mm)	12
LDF4 (1/2") to Device	1/2" to 1/2" (13 mm to 13 mm)	12

Installation Tips

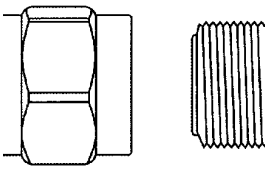
- When applied, the tape must be above 32°F (0°C) to ensure adhesion. Keep tape warm by carrying in coat pockets.
- Do not stretch the tape. Apply only enough tension to provide a smooth wrap.
- Smooth each wrapped layer with your hands to ensure full adhesion.
- Do not pull the tape to tear it - always cut it. Pulled tape eventually unravels, decreasing protection.
- Add extra final layers of tape in warmer climates where there will be long exposure to damaging ultra violet (UV) rays. Two or thee extra layers of tape will provide additional UV protection.
- On vertical runs, the last wrap of 3/4" tape should be wrapped from the bottom to the top. This provides a shingle effect.
- When wrapping tape, overlap the tape to half-width as shown here.

Tape overlap

Installation Training Available at Andrew Institute

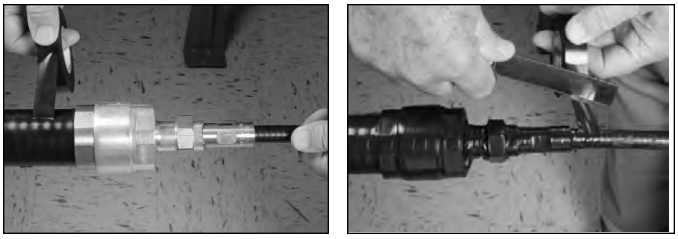
Feeder Cable to Jumper Cable Connection

1 Tighten the connection with a torque wrench to the proper torque value to ensure that correct internal seals and surface contacts are made.



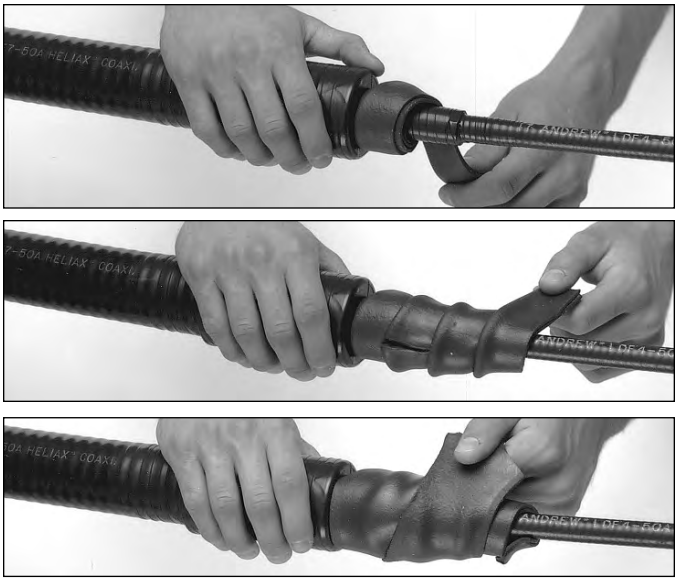
Connector coupling

Torque wrench	Connector type	Torque
Andrew 244377	7-16 DIN	18 - 22 lb·ft
Andrew 244379	N	15 - 25 lb·in



Plastic tape wrap

2 Prepare the cable by removing any cable markers and drying the cable and connectors. Starting at 2" (51 mm) from the feeder connector, wrap the connection with a layer of 3/4" (19-mm) plastic tape. Overlap the tape to half-width and extend the wrapping 2" (51 mm) beyond the jumper connector or plastic strain relief of a SureFlex™ jumper. **Note:** *Do not remove the jumper strain relief.*



Rubber tape fill

3 Cut the rubber tape into three 12" (305-mm) lengths for 2-1/4" (57-mm), 1-5/8" (41-mm), and 1-1/4" (32-mm) to 1/2" (13-mm) connections.

For 7/8" (22-mm) to 1/2" (13-mm) connections, cut three 4" (102-mm) lengths of tape.

Form a tapered surface by starting with two tapes that are folded to half-width and finishing with one full-width tape.

Rubber tape wrap

4 Cut the rubber tape into three 12" (305-mm) lengths for 2-1/4" (57-mm), 1-5/8" (41-mm), and 1-1/4" (32-mm) to 1/2" (13-mm) connections. For 7/8" (22-mm) to 1/2" (13-mm) connections, cut three 8" (203-mm) lengths of tape. For 1/2" (13-mm) to 1/2" (13-mm) connections, cut three 8" (203-mm) lengths of tape.

Lay the three rubber tapes around the entire connection so that they overlap. Pull the tape as needed for overlap. Press the tapes together along the overlaps.

End of 2" plastic tape wrap

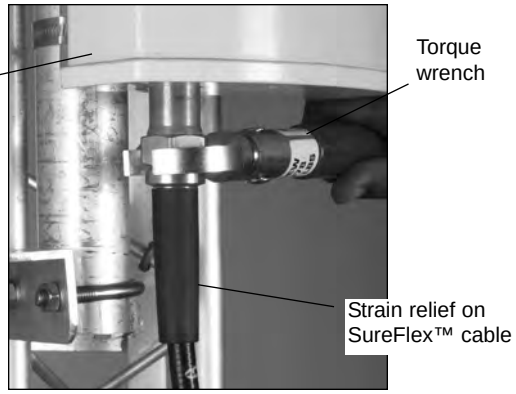
Start of 3/4" plastic tape wrap

5 Wrap the connection with a layer of the 2" (51 mm) tape and then three continuous layers the 3/4" (19 mm) plastic tape. Overlap each tape to half-width and extend the wrapping 2" (51 mm) beyond the previous tape.

Jumper Cable to Antenna Connection

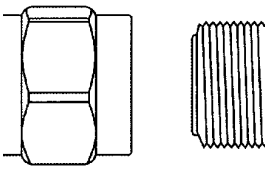
Due to the variability in design of base station antennas at the point of connector interface, special attention must be given to the application of weatherproofing materials. The following illustrations demonstrate the recommendations of Andrew Corporation in cases where there is ample access to the connection and where access is restricted.

Ample Access



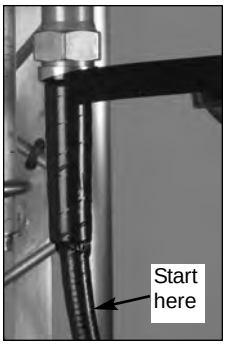
Tighten connection

1 Tighten the connection with a torque wrench to the proper torque value to ensure that correct internal seals and surface contacts are made.



Connector coupling

Torque wrench	Connector type	Torque
Andrew 244377	7-16 DIN	18 - 22 lb·ft
Andrew 244379	N	15 - 25 lb·in



Plastic wrap

Cut

Smooth

2 Wrap the connection with a layer of 3/4” (19-mm) plastic tape, starting at 1" (25 mm) from the connector or plastic strain relief of a SureFlex™ jumper. Overlap the tape to half-width and extend the wrapping to the flange of the antenna connector. Avoid making creases or wrinkles. Smooth the tape edges.

Stretch rubber

Wrap

Smooth

3 Cut an 5" (125-mm) length of rubber tape. Expand the width of the tape by stretching it so that it will wrap completely around the connector and cable. Wrap the tape around the cable connector and the cable. Press the tape edges together so that there are no gaps. Press the tape against the connection and cable. The tape should extend 1" (25 mm) beyond the plastic tape on the jumper.

Plastic wrap

Cut

4 Start wrapping a layer of 2” (50-mm) plastic tape 1" (25 mm) below the rubber tape, overlapping at half width. Finish the wrap at the flange of the antenna connector and cut the tape. Repeat this process for second layer.

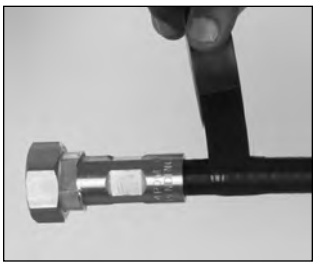
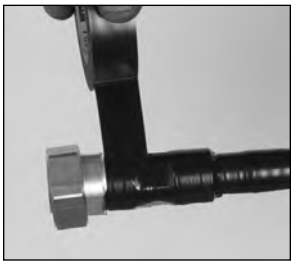
Plastic wrap

Cut

5 Start wrapping three layers of 3/4” (19-mm) plastic tape 1" (25 mm) below the previous 2" (50-mm) wrap, overlapping at half width.

Restricted Access

Where access to the antenna connector and jumper cable will be restricted for taping, most of the jumper cable must be prepared before it is connected.

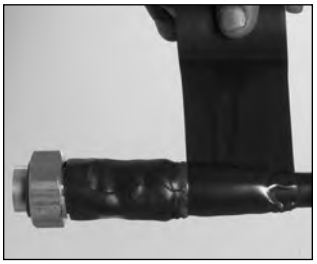
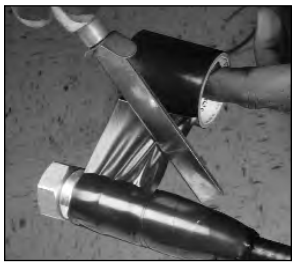



Plastic wrap

1 Wrap the cable and connector body with a layer of 3/4” (19-mm) plastic tape, starting at 1" (25 mm) from the connector body. Overlap the tape to half-width. *Do not tape the connector clamping nut.* Avoid making creases or wrinkles. Smooth the tape edges.

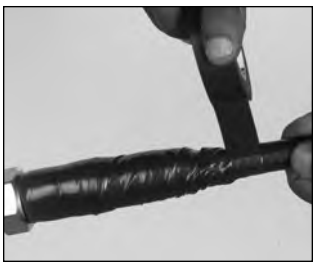

Rubber wrap

2 Cut a 3-1/2" (90-mm) length of rubber tape. Expand the width of the tape by stretching it so that it will wrap completely around the connector body and cable. Wrap the tape around the cable connector body and the cable. *Do not tape the connector clamping nut.* Press the tape edges together so that there are no gaps. Press the tape against the connector body and cable. The tape should extend 1" (25 mm) beyond the plastic tape on the jumper.

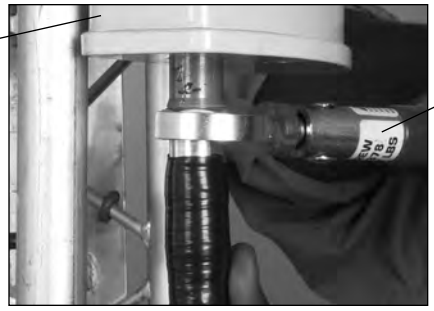
Plastic wrap

3 Start wrapping a layer of 2” (50-mm) plastic tape 1" (25 mm) beyond the rubber tape, overlapping at half width. Finish the wrap at the connector clamping nut and cut the tape. Repeat this process for a second layer.



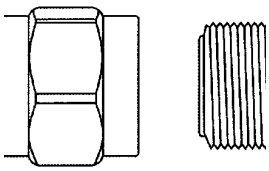

Plastic wrap

4 Start wrapping a layer of 3/4” (19-mm) plastic tape 1" (25 mm) beyond the 2" (50-mm) tape, overlapping at half width. Finish the wrap at the connector clamping nut and cut the tape. Repeat this process for a second layer and a third layer.



Tighten connection

5 Connect the jumper cable to the antenna connector. Tighten the connection with a torque wrench to the proper torque value to ensure that correct internal seals and surface contacts are made.



Connector coupling

Torque wrench	Connector type	Torque
Andrew 244377	7-16 DIN	18 - 22 lb·ft
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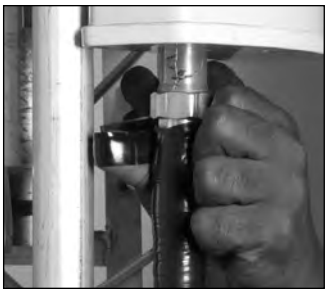
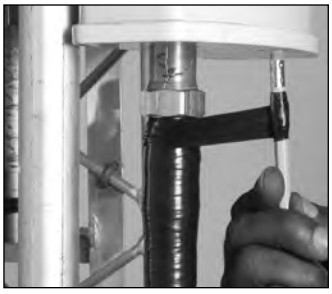
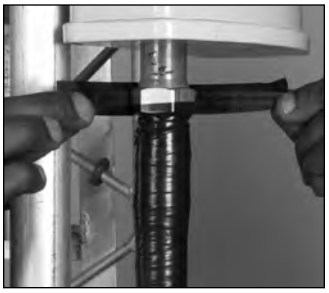


Hold roll and push tape



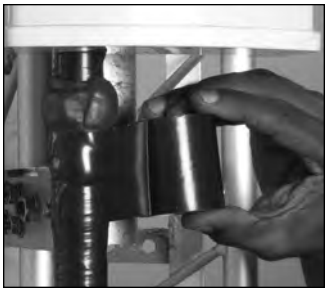
Uncoil tape from pencil



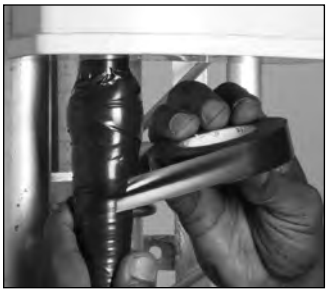
Apply tape in strips

6 Start wrapping three layers of 3/4” (19-mm) plastic tape 1" (25 mm) at the connector clamping nut, overlapping at half width. The tape should extend 1" (25 mm) beyond the cable connector clamping nut.

The tape can be applied in one or more strips if necessary. A strip can be coiled onto an applicator such as a pencil. Apply only enough tension to get good adhesion and keep the tape smooth.

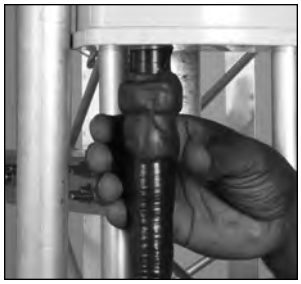


Apply wide tape



Apply narrow tape

Completed wrapping



Rubber wrap

7 Cut a 2" (50-mm) length of rubber tape. Expand the width of the tape by stretching it so that it will wrap completely around the connector body and clamping nut. Wrap the tape around the cable connector. Press the tape edges together so that there are no gaps. Press the tape against the connector body.

8 Wrap two layers of 2" (50-mm) plastic tape and then three layers of 3/4” (19-mm) plastic tape to complete the wrapping. Start each wrap 1" (25 mm) from the previous wrap.

Note: When removing the weatherproofing from connections, take precautions to not cut through the jacket of the coaxial cable. If the jacket is cut, the rewrapping should start at the point of the exposed copper outer conductor.

Andrew 221213 Weatherproofing Kit Components

Part number	Description
9905-41	3/4" x 66' black plastic tape
9905-71	2" x 20' black plastic tape
42615-4	Butyl rubber tape