



STATE OF UTAH - DEPARTMENT OF ADMINISTRATIVE SERVICES

Division of Facilities Construction and Management

DFCM

STANDARD LOW BID PROJECT

March 8, 2010

STADIUM LIGHTING AND TOWER REPLACEMENT

WEBER STATE UNIVERSITY OGDEN, UTAH

DFCM Project Number
09061810

**Electrical Consulting Engineers
Akbar Matinkhah
939 South West Temple
SLC UT**

TABLE OF CONTENTS

	<u>Page Numbers</u>
Title Sheet	1
Table of Contents	2
Notice to Contractors	3
Project Description	4
Project Schedule	5
Bid Form	6
Instructions to Bidders	8
Bid Bond	12
Instructions and Subcontractors List Form	13
Contractor's Agreement	16
Performance Bond	21
Payment Bond	22
Certificate of Substantial Completion	23
General Contractor Past Performance Rating Form	
Technical Specifications:	
Drawings:	

Current copies of the following documents are hereby made part of these contract documents by reference. These documents are available on the DFCM web site at <http://dfcm.utah.gov/StdDocs/index.html> "Standard Documents" – "Reference Documents I" – "Item 6. Supplemental General Conditions" or are available upon request from DFCM:

DFCM Supplemental General Conditions dated July 1, 2009 *

DFCM Supplemental General Conditions dated July 15, 2008

DFCM General Conditions dated May 25, 2005

DFCM Application and Certification for Payment dated May 25, 2005.

*** NOTE: THE NEW SUPPLEMENTAL GENERAL CONDITIONS EFFECTIVE JULY 1, 2009 ADDRESSING HEALTH INSURANCE AND IMMIGRATION ARE REFERENCED AT THE LINK ABOVE.**

The Agreement and General Conditions dated May 25, 2005 have been updated from versions that were formally adopted and in use prior to this date. The changes made to the General Conditions are identified in a document entitled Revisions to General Conditions that is available on DFCM's web site at <http://dfcm.utah.gov>

NOTICE TO CONTRACTORS

Sealed bids will be received by the Division of Facilities Construction and Management (DFCM) for:

STADIUM LIGHTING AND TOWER UPGRADES
WEBER STATE UNIVERSITY – OGDEN, UTAH
DFCM PROJECT NO: 09061810

Bids will be in accordance with the Contract Documents that will be available on **Monday, March 8, 2010** and distributed in electronic format only on CDs from DFCM, 4110 State Office Building, Salt Lake City, Utah and on the DFCM web page at <http://dfcm.utah.gov>. For questions regarding this project, please contact Tim K Parkinson DFCM, at 801- 450-2478. No others are to be contacted regarding this bidding process. The construction estimate for this project is \$335,000.00

A **mandatory** pre-bid meeting will be held at **1:00 PM on Thursday, March 11, 2010** at Weber State University Facilities Management Office. All bidders wishing to bid on this project are required to attend this meeting.

Bids will be received until the hour of **2:00 PM on Tuesday, March 23, 2010** at DFCM, 4110 State Office Building, Salt Lake City, Utah 84114. Bids will be opened and read aloud in the DFCM Conference Room, 4110 State Office Building, Salt Lake City, Utah. NOTE: Bids must be received at 4110 State Office Building by the specified time.

A bid bond in the amount of five percent (5%) of the bid amount, made payable to the Division of Facilities Construction and Management on DFCM's bid bond form, shall accompany the bid.

The Division of Facilities Construction and Management reserves the right to reject any or all bids or to waive any formality or technicality in any bid in the interest of DFCM.

DIVISION OF FACILITIES CONSTRUCTION AND MANAGEMENT
Joanna Reese, Contract Coordinator
4110 State Office Building, Salt Lake City, Utah 84114

PROJECT DESCRIPTION

This Project includes the removal of existing Lighting fixtures, Towers and bases. Contractor will be responsible for the Installation of new bases, Towers and Lighting fixtures. This also includes structural upgrades as per the contract drawings and specifications. All work must be coordinated with the using agency. Work does have a substantial Completion date of July 4, 2010

**PROJECT SCHEDULE**

**PROJECT NAME: STADIUM LIGHTING AND TOWER REPLACEMENT
WEBER STATE UNIVERSITY – OGDEN, UTAH
DFCM PROJECT NO. 09061810**

Event	Day	Date	Time	Place
Bidding Documents Available	Monday	March 8, 2010	1:00 PM	DFCM 4110 State Office Bldg SLC, UT and the DFCM web site *
Mandatory Pre-bid Site Meeting	Thursday	March 11, 2010	1:00 PM	Weber State University Facilities Mngement Office
Last Day to Submit Questions	Monday	March 15, 2010	8:00 AM	<u>Tim K Parkinson</u> – DFCM E-mail tparkins@utah.gov Fax 801-538-3267
Addendum Deadline (exception for bid delays)	Wednesday	March 17, 2010	1:00 PM	DFCM web site *
Prime Contractors Turn In Bid and Bid Bond	Tuesday	March 23, 2010	2:00 PM	DFCM 4110 State Office Bldg SLC, UT
Sub-contractor List Due	Wednesday	March 24, 2010	2:00 PM	DFCM 4110 State Office Bldg SLC, UT Fax 801-538-3677
Substantial Completion Date	Sunday	July 4, 2010	5:00 PM	Onsite

* NOTE: DFCM's web site address is <http://dfcm.utah.gov>



STATE OF UTAH - DEPARTMENT OF ADMINISTRATIVE SERVICES

Division of Facilities Construction and Management

DFCM

BID FORM

NAME OF BIDDER _____ DATE _____

To the Division of Facilities Construction and Management
4110 State Office Building
Salt Lake City, Utah 84114

The undersigned, responsive to the "Notice to Contractors" and in accordance with the "Instructions to Bidders", in compliance with your invitation for bids for the **Stadium Lighting and Tower Replacement – Weber State University – Ogden, Utah – DFCM Project 09061810** and having examined the Contract Documents and the site of the proposed Work and being familiar with all of the conditions surrounding the construction of the proposed Project, including the availability of labor, hereby proposes to furnish all labor, materials and supplies as required for the Work in accordance with the Contract Documents as specified and within the time set forth and at the price stated below. This price is to cover all expenses incurred in performing the Work required under the Contract Documents of which this bid is a part:

I/We acknowledge receipt of the following Addenda: _____

For all work shown on the Drawings and described in the Specifications and Contract Documents, I/we agree to perform for the sum of:

_____ DOLLARS (\$_____)

(In case of discrepancy, written amount shall govern)

I/We guarantee that the Work will be Substantially Complete by July 4, 2010, should I/we be the successful bidder, and agree to pay liquidated damages in the amount of **\$250.00** per day for each day after expiration of the Contract Time as stated in Article 3 of the Contractor's Agreement.

This bid shall be good for 45 days after bid opening.

Enclosed is a 5% bid bond, as required, in the sum of _____

The undersigned Contractor's License Number for Utah is _____.

Upon receipt of notice of award of this bid, the undersigned agrees to execute the contract within ten (10) days, unless a shorter time is specified in the Contract Documents, and deliver acceptable Performance and Payment bonds in the prescribed form in the amount of 100% of the Contract Sum for faithful performance of the contract.

The Bid Bond attached, in the amount not less than five percent (5%) of the above bid sum, shall become the property of the Division of Facilities Construction and Management as liquidated damages for delay and additional expense caused thereby in the event that the contract is not executed and/or acceptable 100% Performance and Payment bonds are not delivered within the time set forth.

Type of Organization:

(Corporation, Partnership, Individual, etc.)

Any request and information related to Utah Preference Laws:

Respectfully submitted,

Name of Bidder

ADDRESS:

Authorized Signature

INSTRUCTIONS TO BIDDERS

1. Drawings and Specifications, Other Contract Documents

Drawings and Specifications, as well as other available Contract Documents, may be obtained as stated in the Invitation to Bid.

2. Bids

Before submitting a bid, each contractor shall carefully examine the Contract Documents, shall visit the site of the Work; shall fully inform themselves as to all existing conditions and limitations; and shall include in the bid the cost of all items required by the Contract Documents. If the bidder observes that portions of the Contract Documents are at variance with applicable laws, building codes, rules, regulations or contain obvious erroneous or uncoordinated information, the bidder shall promptly notify the DFCM Representative and the necessary changes shall be accomplished by Addendum.

The bid, bearing original signatures, must be typed or handwritten in ink on the Bid Form provided in the procurement documents and submitted in a sealed envelope at the location specified by the Invitation to Bid prior to the deadline for submission of bids.

A bid bond properly signed by a qualified surety, as indicated on the DFCM Bid Bond form provided along with this Instruction to Bidders, in the amount of 5% of the bid, shall accompany the bid submission to DFCM. **THIS BID BOND MUST BE ON THE DFCM BID BOND FORM PROVIDED WITH THIS INSTRUCTION TO BIDDERS IN ORDER TO BE CONSIDERED AN ACCEPTABLE BID** unless only one bid is received by DFCM, or the failure to comply with the bid bond requirements is determined by the Director of DFCM to be nonsubstantial based on the following:

- (a) the bid bond is submitted on a form other than DFCM's required Bid Bond form and the bid bond meets all other requirements including being issued by a surety firm authorized to do business in the State of Utah and be listed in the U.S. Department of the Treasury Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies for an amount not less than the amount of the bond to be issued. A co-surety may be utilized to satisfy this requirement; and
- (b) the contractor provides a bid bond properly signed by a qualified surety and on the required DFCM Bid Bond form by the close of business of the next succeeding business day after the DFCM notifies the bidder of the defective bid bond.

3. Contract and Bond

The Contractor's Agreement will be in the form found in the specifications. The Contract Time will be as indicated in the bid. The successful bidder, simultaneously with the execution of the Contract Agreement, will be required to furnish a performance bond and a payment bond, both bearing original signatures, upon the forms provided in the procurement documents. The performance and payment bonds shall be for an amount equal to one hundred percent (100%) of the contract sum and secured from a company that meets the requirements specified in the requisite forms. Any bonding requirements for subcontractors will be specified in the Supplementary General Conditions.

4. Listing of Subcontractors

Listing of Subcontractors shall be as summarized in the “Instructions and Subcontractor’s List Form”, which are included as part of these Contract Documents. The Subcontractors List shall be delivered to DFCM or faxed to DFCM at 801-538-3677 within 24 hours of the bid opening. Requirements for listing additional subcontractors will be listed in the Contract Documents.

DFCM retains the right to audit or take other steps necessary to confirm compliance with requirements for the listing and changing of subcontractors. Any contractor who is found to not be in compliance with these requirements is subject to a debarment hearing and may be debarred from consideration for award of contracts for a period of up to three years.

5. Interpretation of Drawings and Specifications

If any person or entity contemplating submitting a bid is in doubt as to the meaning of any part of the drawings, specifications or other Contract Documents, such person shall submit to the DFCM Project Manager a request for an interpretation thereof. The person or entity submitting the request will be responsible for its prompt delivery. Any interpretation of the proposed documents will be made only by addenda posted on DFCM’s web site at <http://dfcm.utah.gov>. Neither the DFCM nor A/E will be responsible for any other explanations or interpretations of the proposed documents. A/E shall be deemed to refer to the architect or engineer hired by DFCM as the A/E or Consultant for the Project.

6. Addenda

Addenda will be posted on DFCM’s web site at <http://dfcm.utah.gov>. Contractors are responsible for obtaining information contained in each addendum from the web site. Addenda issued prior to the submittal deadline shall become part of the bidding process and must be acknowledged on the bid form. Failure to acknowledge addenda may result in disqualification from bidding.

7. Award of Contract

The Contract will be awarded as soon as possible to the lowest, responsive and responsible bidder, based on the lowest combination of base bid and acceptable prioritized alternates, provided the bid is reasonable, is in the interests of the State of Utah to accept and after applying the Utah Preference Laws in U.C.A. Title 63, Chapter 56. DFCM reserves the right to waive any technicalities or formalities in any bid or in the bidding. Alternates will be accepted on a prioritized basis with Alternate 1 being highest priority, Alternate 2 having second priority, etc.

8. DFCM Contractor Performance Rating

As a contractor completes each DFCM project, DFCM, the architect/engineer and the using agency will evaluate project performance based on the enclosed “DFCM Contractor Performance Rating” form. The ratings issued on this project will not affect this project but may affect the award on future projects.

9. Licensure

The Contractor shall comply with and require all of its subcontractors to comply with the license laws as required by the State of Utah.

10. Permits

In concurrence with the requirements for permitting in the General Conditions, it is the responsibility of the Contractor to obtain the fugitive dust plan requirements from the Utah Division of Air Quality and the SWPPP requirements from the Utah Department of Environmental Quality and submit the completed forms and pay any permit fee that may be required for this specific project. Failure to obtain the required permit may result in work stoppage and/or fines from the regulating authority that will be the sole responsibility of the Contractor. Any delay to the project as a result of any such failure to obtain the permit or noncompliance with the permit shall not be eligible for any extension in the Contract Time.

11. Right to Reject Bids

DFCM reserves the right to reject any or all Bids.

12. Time is of the Essence

Time is of the essence in regard to all the requirements of the Contract Documents.

13. Withdrawal of Bids

Bids may be withdrawn on written request received from bidder prior to the time fixed for opening. Negligence on the part of the bidder in preparing the bid confers no right for the withdrawal of the bid after it has been opened.

14. Product Approvals

Where reference is made to one or more proprietary products in the Contract Documents, but restrictive descriptive materials of one or more manufacturer(s) is referred to in the Contract Documents, the products of other manufacturers will be accepted, provided they equal or exceed the standards set forth in the drawings and specifications and are compatible with the intent and purpose of the design, subject to the written approval of the A/E. Such written approval must occur prior to the deadline established for the last scheduled addenda to be issued. The A/E's written approval will be in an issued addendum. If the descriptive material is not restrictive, the products of other manufacturers specified will be accepted without prior approval provided they are compatible with the intent and purpose of the design as determined by the A/E.

15. Financial Responsibility of Contractors, Subcontractors and Sub-subcontractors

Contractors shall respond promptly to any inquiry in writing by DFCM to any concern of financial responsibility of the contractor, subcontractor or sub-subcontractor.

16. Debarment

By submitting a bid, the Contractor certifies that neither it nor its principals, including project and site managers, have been, or are under consideration for, debarment or suspension, or any action that would exclude such from participation in a construction contract by any governmental department or agency. If the Contractor cannot certify this statement, attach to the bid a detailed written explanation which must be reviewed and approved by DFCM as part of the requirements for award of the Project.

BID BOND

(Title 63, Chapter 56, U. C. A. 1953, as Amended)

KNOW ALL PERSONS BY THESE PRESENTS:

That _____ hereinafter referred to as the "Principal," and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____ and authorized to transact business in this State and U. S. Department of the Treasury Listed, (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); hereinafter referred to as the "Surety," are held and firmly bound unto the STATE OF UTAH, hereinafter referred to as the "Obligee," in the amount of \$ _____ (5% of the accompanying bid), being the sum of this Bond to which payment the Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal has submitted to Obligee the accompanying bid incorporated by reference herein, dated as shown, to enter into a contract in writing for the _____ Project.

NOW, THEREFORE, THE CONDITION OF THE ABOVE OBLIGATION IS SUCH, that if the said principal does not execute a contract and give bond to be approved by the Obligee for the faithful performance thereof within ten (10) days after being notified in writing of such contract to the principal, then the sum of the amount stated above will be forfeited to the State of Utah as liquidated damages and not as a penalty; if the said principal shall execute a contract and give bond to be approved by the Obligee for the faithful performance thereof within ten (10) days after being notified in writing of such contract to the Principal, then this obligation shall be null and void. It is expressly understood and agreed that the liability of the Surety for any and all defaults of the Principal hereunder shall be the full penal sum of this Bond. The Surety, for value received, hereby stipulates and agrees that obligations of the Surety under this Bond shall be for a term of sixty (60) days from actual date of the bid opening.

PROVIDED, HOWEVER, that this Bond is executed pursuant to provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their several seals on the date indicated below, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

DATED this _____ day of _____, 20_____.

Principal's name and address (if other than a corporation):

By: _____

Title: _____

Principal's name and address (if a corporation):

By: _____

Title: _____
(Affix Corporate Seal)

Surety's name and address:

By: _____
Attorney-in-Fact (Affix Corporate Seal)

STATE OF _____)
) ss.
COUNTY OF _____)

On this ___ day of _____, 20_____, personally appeared before me _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney-in-fact of the above-named Surety Company, and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20_____.
My Commission Expires: _____
Resides at: _____

NOTARY PUBLIC

Agency: _____
Agent: _____
Address: _____
Phone: _____

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General



Division of Facilities Construction and

INSTRUCTIONS AND SUBCONTRACTORS LIST FORM

The three low bidders, as well as all other bidders that desire to be considered, are required by law to submit to DFCM within 24 hours of bid opening a list of **ALL** first-tier subcontractors, including the subcontractor's name, bid amount and other information required by Building Board Rule and as stated in these Contract Documents, based on the following:

DOLLAR AMOUNTS FOR LISTING

PROJECTS UNDER \$500,000: ALL FIRST-TIER SUBS \$20,000 OR OVER MUST BE LISTED
PROJECTS \$500,000 OR MORE: ALL FIRST-TIER SUBS \$35,000 OR OVER MUST BE LISTED

- Any additional subcontractors identified in the bid documents shall also be listed.
- The DFCM Director may not consider any bid submitted by a bidder if the bidder fails to submit a subcontractor list meeting the requirements of State law.
- List subcontractors for base bid as well as the impact on the list that the selection of any alternate may have.
- Bidder may not list more than one subcontractor to perform the same work.
- If there are no subcontractors for the job that are required to be reported by State law (either because there are no subcontractors that will be used on the project or because there are no first-tier subcontractors over the dollar amounts referred to above), then you do not need to submit a sublist. If you do not submit a sublist, it will be deemed to be a representation by you that there are no subcontractors on the job that are required to be reported under State law. At any time, DFCM reserves the right to inquire, for security purposes, as to the identification of the subcontractors at any tier that will be on the worksite.

LICENSURE:

The subcontractor's name, the type of work, the subcontractor's bid amount, and the subcontractor's license number as issued by DOPL, if such license is required under Utah Law, shall be listed. Bidder shall certify that all subcontractors, required to be licensed, are licensed as required by State law. A subcontractor includes a trade contractor or specialty contractor and does not include suppliers who provide only materials, equipment, or supplies to a contractor or subcontractor.

'SPECIAL EXCEPTION':

A bidder may list 'Special Exception' in place of a subcontractor when the bidder intends to obtain a subcontractor to perform the work at a later date because the bidder was unable to obtain a qualified or reasonable bid under the provisions of U.C.A. Section 63A-5-208(4). The bidder shall insert the term 'Special Exception' for that category of work, and shall provide documentation with the subcontractor list describing the bidder's efforts to obtain a bid of a qualified subcontractor at a reasonable cost and why the bidder was unable to obtain a qualified subcontractor bid. The Director must find that the bidder complied in good faith with State law requirements for any 'Special Exception' designation, in order for the bid to be considered. If awarded the contract, the Director shall supervise the bidder's efforts to obtain a qualified subcontractor bid. The amount of the awarded contract may not be adjusted to reflect the actual amount of the subcontractor's bid. Any listing of 'Special Exception' on the sublist form shall also include amount allocated for that work.

GROUNDS FOR DISQUALIFICATION:

The Director may not consider any bid submitted by a bidder if the bidder fails to submit a subcontractor list meeting the requirements of State law. Director may withhold awarding the contract to a particular bidder if one or more of the proposed subcontractors are considered by the Director to be unqualified to do the Work or for

INSTRUCTIONS AND SUBCONTRACTORS LIST FORM
Page No. 2

such other reason in the best interest of the State of Utah. Notwithstanding any other provision in these instructions, if there is a good faith error on the sublist form, at the sole discretion of the Director, the Director may provide notice to the contractor and the contractor shall have 24 hours to submit the correction to the Director. If such correction is submitted timely, then the sublist requirements shall be considered met.

CHANGES OF SUBCONTRACTORS SPECIFICALLY IDENTIFIED ON SUBLIST FORM:

Subsequent to twenty-four hours after the bid opening, the contractor may change its listed subcontractors only after receiving written permission from the Director based on complying with all of the following criteria.

- (1) The contractor has established in writing that the change is in the best interest of the State and that the contractor establishes an appropriate reason for the change, which may include, but not is not limited to, the following reasons: the original subcontractor has failed to perform, or is not qualified or capable of performing, and/or the subcontractor has requested in writing to be released.
- (2) The circumstances related to the request for the change do not indicate any bad faith in the original listing of the subcontractors.
- (3) Any requirement set forth by the Director to ensure that the process used to select a new subcontractor does not give rise to bid shopping.
- (4) Any increase in the cost of the subject subcontractor work is borne by the contractor.
- (5) Any decrease in the cost of the subject subcontractor work shall result in a deductive change order being issued for the contract for such decreased amount.
- (6) The Director will give substantial weight to whether the subcontractor has consented in writing to being removed unless the Contractor establishes that the subcontractor is not qualified for the work.

EXAMPLE:

Example of a list where there are only four subcontractors:

TYPE OF WORK	SUBCONTRACTOR, "SELF" OR "SPECIAL EXCEPTION"	SUBCONTRACTOR BID AMOUNT	CONTRACTOR LICENSE #
ELECTRICAL	ABCD Electric Inc.	\$350,000.00	123456789000
LANDSCAPING	"Self" *	\$300,000.00	123456789000
CONCRETE (ALTERNATE #1)	XYZ Concrete Inc	\$298,000.00	987654321000
MECHANICAL	"Special Exception" (attach documentation)	Fixed at: \$350,000.00	(TO BE PROVIDED AFTER OBTAINING SUBCONTRACTOR)

* Bidders may list "self", but it is not required.

PURSUANT TO STATE LAW - SUBCONTRACTOR BID AMOUNTS CONTAINED IN THIS SUBCONTRACTOR LIST SHALL NOT BE DISCLOSED UNTIL THE CONTRACT HAS BEEN AWARDED.



SUBCONTRACTORS LIST
FAX TO 801-538-3677

PROJECT TITLE: _____

Caution: You must read and comply fully with instructions.

Table with 4 columns: TYPE OF WORK, SUBCONTRACTOR, 'SELF' OR 'SPECIAL EXCEPTION', SUBCONTRACTOR BID AMOUNT, CONT. LICENSE #

We certify that:

- 1. This list includes all subcontractors as required by the instructions, including those related to the base bid as well as any alternates.
2. We have listed 'Self' or 'Special Exception' in accordance with the instructions.
3. All subcontractors are appropriately licensed as required by State law.

FIRM: _____

DATE: _____

SIGNED BY: _____

NOTICE: FAILURE TO SUBMIT THIS FORM, PROPERLY COMPLETED AND SIGNED, AS REQUIRED IN THESE CONTRACT DOCUMENTS, SHALL BE GROUNDS FOR OWNER'S REFUSAL TO ENTER INTO A WRITTEN CONTRACT WITH BIDDER. ACTION MAY BE TAKEN AGAINST BIDDERS BID BOND AS DEEMED APPROPRIATE BY OWNER. ATTACH A SECOND PAGE IF NECESSARY.

CONTRACTOR'S AGREEMENT

FOR:

THIS CONTRACTOR'S AGREEMENT, made and entered into this ____ day of _____, 20__, by and between the DIVISION OF FACILITIES CONSTRUCTION AND MANAGEMENT, hereinafter referred to as "DFCM", and _____, incorporated in the State of _____ and authorized to do business in the State of Utah, hereinafter referred to as "Contractor", whose address is _____.

WITNESSETH: WHEREAS, DFCM intends to have Work performed at _____.

WHEREAS, Contractor agrees to perform the Work for the sum stated herein.

NOW, THEREFORE, DFCM and Contractor for the consideration provided in this Contractor's Agreement, agree as follows:

ARTICLE 1. SCOPE OF WORK. The Work to be performed shall be in accordance with the Contract Documents prepared by _____ and entitled "_____."

The DFCM General Conditions ("General Conditions") dated May 25, 2005 and Supplemental General Conditions dated July 15, 2008 and July 1, 2009 ("also referred to as General Conditions") on file at the office of DFCM and available on the DFCM website, are hereby incorporated by reference as part of this Agreement and are included in the specifications for this Project. All terms used in this Contractor's Agreement shall be as defined in the Contract Documents, and in particular, the General Conditions.

The Contractor Agrees to furnish labor, materials and equipment to complete the Work as required in the Contract Documents which are hereby incorporated by reference. It is understood and agreed by the parties hereto that all Work shall be performed as required in the Contract Documents and shall be subject to inspection and approval of DFCM or its authorized representative. The relationship of the Contractor to the DFCM hereunder is that of an independent Contractor.

ARTICLE 2. CONTRACT SUM. The DFCM agrees to pay and the Contractor agrees to accept in full performance of this Contractor's Agreement, the sum of _____ DOLLARS AND NO CENTS (\$_____.00), which is the base bid, and which sum also includes the cost of a 100% Performance Bond and a 100%

CONTRACTOR'S AGREEMENT
PAGE NO. 2

Payment Bond as well as all insurance requirements of the Contractor. Said bonds have already been posted by the Contractor pursuant to State law. The required proof of insurance certificates have been delivered to DFCM in accordance with the General Conditions before the execution of this Contractor's Agreement.

ARTICLE 3. TIME OF COMPLETION AND DELAY REMEDY. The Work shall be Substantially Complete by _____. Contractor agrees to pay liquidated damages in the amount of \$_____ per day for each day after expiration of the Contract Time until the Contractor achieves Substantial Completion in accordance with the Contract Documents, if Contractor's delay makes the damages applicable. The provision for liquidated damages is: (a) to compensate the DFCM for delay only; (b) is provided for herein because actual damages can not be readily ascertained at the time of execution of this Contractor's Agreement; (c) is not a penalty; and (d) shall not prevent the DFCM from maintaining Claims for other non-delay damages, such as costs to complete or remedy defective Work.

No action shall be maintained by the Contractor, including its or Subcontractor or suppliers at any tier, against the DFCM or State of Utah for damages or other claims due to losses attributable to hindrances or delays from any cause whatsoever, including acts and omissions of the DFCM or its officers, employees or agents, except as expressly provided in the General Conditions. The Contractor may receive a written extension of time, signed by the DFCM, in which to complete the Work under this Contractor's Agreement in accordance with the General Conditions.

ARTICLE 4. CONTRACT DOCUMENTS. The Contract Documents consist of this Contractor's Agreement, the Conditions of the Contract (DFCM General Conditions, Supplementary and other Conditions), the Drawings, Specifications, Addenda and Modifications. The Contract Documents shall also include the bidding documents, including the Invitation to Bid, Instructions to Bidders/ Proposers and the Bid/Proposal, to the extent not in conflict therewith and other documents and oral presentations that are documented as an attachment to the contract.

All such documents are hereby incorporated by reference herein. Any reference in this Contractor's Agreement to certain provisions of the Contract Documents shall in no way be construed as to lessen the importance or applicability of any other provisions of the Contract Documents.

ARTICLE 5. PAYMENT. The DFCM agrees to pay the Contractor from time to time as the Work progresses, but not more than once each month after the date of Notice to Proceed, and only upon Certificate of the A/E for Work performed during the preceding calendar month, ninety-five percent (95%) of the value of the labor performed and ninety-five percent (95%) of the value of materials furnished in place or on the site. The Contractor agrees to furnish to the DFCM invoices for materials purchased and on the site but not installed, for which the Contractor requests payment and agrees to

safeguard and protect such equipment or materials and is responsible for safekeeping thereof and if such be stolen, lost or destroyed, to replace same.

Such evidence of labor performed and materials furnished as the DFCM may reasonably require shall be supplied by the Contractor at the time of request for Certificate of Payment on account. Materials for which payment has been made cannot be removed from the job site without DFCM's written approval. Five percent (5%) of the earned amount shall be retained from each monthly payment. The retainage, including any additional retainage imposed and the release of any retainage, shall be in accordance with UCA 13-8-5 as amended. Contractor shall also comply with the requirements of UCA 13-8-5, including restrictions of retainage regarding subcontractors and the distribution of interest earned on the retention proceeds. The DFCM shall not be responsible for enforcing the Contractor's obligations under State law in fulfilling the retention law requirements with subcontractors at any tier.

ARTICLE 6. INDEBTEDNESS. Before final payment is made, the Contractor must submit evidence satisfactory to the DFCM that all payrolls, materials bills, subcontracts at any tier and outstanding indebtedness in connection with the Work have been properly paid. Final Payment will be made after receipt of said evidence, final acceptance of the Work by the DFCM as well as compliance with the applicable provisions of the General Conditions.

Contractor shall respond immediately to any inquiry in writing by DFCM as to any concern of financial responsibility and DFCM reserves the right to request any waivers, releases or bonds from Contractor in regard to any rights of Subcontractors (including suppliers) at any tier or any third parties prior to any payment by DFCM to Contractor.

ARTICLE 7. ADDITIONAL WORK. It is understood and agreed by the parties hereto that no money will be paid to the Contractor for additional labor or materials furnished unless a new contract in writing or a Modification hereof in accordance with the General Conditions and the Contract Documents for such additional labor or materials has been executed. The DFCM specifically reserves the right to modify or amend this Contractor's Agreement and the total sum due hereunder either by enlarging or restricting the scope of the Work.

ARTICLE 8. INSPECTIONS. The Work shall be inspected for acceptance in accordance with the General Conditions.

ARTICLE 9. DISPUTES. Any dispute, PRE or Claim between the parties shall be subject to the provisions of Article 7 of the General Conditions. DFCM reserves all rights to pursue its rights and remedies as provided in the General Conditions.

ARTICLE 10. TERMINATION, SUSPENSION OR ABANDONMENT. This Contractor's Agreement may be terminated, suspended or abandoned in accordance with the General Conditions.

ARTICLE 11. DFCM'S RIGHT TO WITHHOLD CERTAIN AMOUNT AND MAKE USE THEREOF. The DFCM may withhold from payment to the Contractor such amount as, in DFCM's judgment, may be necessary to pay just claims against the Contractor or Subcontractor at any tier for labor and services rendered and materials furnished in and about the Work. The DFCM may apply such withheld amounts for the payment of such claims in DFCM's discretion. In so doing, the DFCM shall be deemed the agent of Contractor and payment so made by the DFCM shall be considered as payment made under this Contractor's Agreement by the DFCM to the Contractor. DFCM shall not be liable to the Contractor for any such payment made in good faith. Such withholdings and payments may be made without prior approval of the Contractor and may be also be prior to any determination as a result of any dispute, PRE, Claim or litigation.

ARTICLE 12. INDEMNIFICATION. The Contractor shall comply with the indemnification provisions of the General Conditions.

ARTICLE 13. SUCCESSORS AND ASSIGNMENT OF CONTRACT. The DFCM and Contractor, respectively bind themselves, their partners, successors, assigns and legal representatives to the other party to this Agreement, and to partners, successors, assigns and legal representatives of such other party with respect to all covenants, provisions, rights and responsibilities of this Contractor's Agreement. The Contractor shall not assign this Contractor's Agreement without the prior written consent of the DFCM, nor shall the Contractor assign any moneys due or to become due as well as any rights under this Contractor's Agreement, without prior written consent of the DFCM.

ARTICLE 14. RELATIONSHIP OF THE PARTIES. The Contractor accepts the relationship of trust and confidence established by this Contractor's Agreement and covenants with the DFCM to cooperate with the DFCM and A/E and use the Contractor's best skill, efforts and judgment in furthering the interest of the DFCM; to furnish efficient business administration and supervision; to make best efforts to furnish at all times an adequate supply of workers and materials; and to perform the Work in the best and most expeditious and economic manner consistent with the interests of the DFCM.

ARTICLE 15. AUTHORITY TO EXECUTE AND PERFORM AGREEMENT. Contractor and DFCM each represent that the execution of this Contractor's Agreement and the performance thereunder is within their respective duly authorized powers.

ARTICLE 16. ATTORNEY FEES AND COSTS. Except as otherwise provided in the dispute resolution provisions of the General Conditions, the prevailing party shall be entitled to reasonable attorney fees and costs incurred in any action in the District Court and/or appellate body to enforce this Contractor's Agreement or recover damages or any other action as a result of a breach thereof.

PERFORMANCE BOND
(Title 63, Chapter 56, U. C. A. 1953, as Amended)

That _____ hereinafter referred to as the "Principal" and _____, a corporation organized and existing under the laws of the State of _____, with its principal office in the City of _____ and authorized to transact business in this State and U. S. Department of the Treasury Listed (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); hereinafter referred to as the "Surety," are held and firmly bound unto the State of Utah, hereinafter referred to as the "Obligee," in the amount of _____ DOLLARS (\$ _____) for the payment whereof, the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written Contract with the Obligee, dated the _____ day of _____, 20____, to construct _____ in the County of _____, State of Utah, Project No. _____, for the approximate sum of _____ Dollars (\$ _____), which Contract is hereby incorporated by reference herein.

NOW, THEREFORE, the condition of this obligation is such that if the said Principal shall faithfully perform the Contract in accordance with the Contract Documents including, but not limited to, the Plans, Specifications and conditions thereof, the one year performance warranty, and the terms of the Contract as said Contract may be subject to Modifications or changes, then this obligation shall be void; otherwise it shall remain in full force and effect.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the state named herein or the heirs, executors, administrators or successors of the Owner.

The parties agree that the dispute provisions provided in the Contract Documents apply and shall constitute the sole dispute procedures of the parties.

PROVIDED, HOWEVER, that this Bond is executed pursuant to the Provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____, 20____.

WITNESS OR ATTESTATION:

PRINCIPAL:

By: _____

(Seal)

Title: _____

WITNESS OR ATTESTATION:

SURETY:

By: _____

Attorney-in-Fact (Seal)

STATE OF _____)
) ss.
COUNTY OF _____)

On this _____ day of _____, 20____, personally appeared before me _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney in-fact of the above-named Surety Company and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20____.

My commission expires: _____

Resides at: _____

NOTARY PUBLIC

Agency: _____
Agent: _____
Address: _____
Phone: _____

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General

PAYMENT BOND

(Title 63, Chapter 56, U. C. A. 1953, as Amended)

KNOW ALL PERSONS BY THESE PRESENTS:

That _____ hereinafter referred to as the "Principal," and _____, a corporation organized and existing under the laws of the State of _____ authorized to do business in this State and U. S. Department of the Treasury Listed (Circular 570, Companies Holding Certificates of Authority as Acceptable Securities on Federal Bonds and as Acceptable Reinsuring Companies); with its principal office in the City of _____, hereinafter referred to as the "Surety," are held and firmly bound unto the State of Utah hereinafter referred to as the "Obligee," in the amount of _____ Dollars (\$ _____) for the payment whereof, the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written Contract with the Obligee, dated the _____ day of _____, 20____, to construct _____ in the County of _____, State of Utah, Project No. _____ for the approximate sum of _____ Dollars (\$ _____), which contract is hereby incorporated by reference herein.

NOW, THEREFORE, the condition of this obligation is such that if the said Principal shall pay all claimants supplying labor or materials to Principal or Principal's Subcontractors in compliance with the provisions of Title 63, Chapter 56, of Utah Code Annotated, 1953, as amended, and in the prosecution of the Work provided for in said Contract, then, this obligation shall be void; otherwise it shall remain in full force and effect.

That said Surety to this Bond, for value received, hereby stipulates and agrees that no changes, extensions of time, alterations or additions to the terms of the Contract or to the Work to be performed thereunder, or the specifications or drawings accompanying same shall in any way affect its obligation on this Bond, and does hereby waive notice of any such changes, extensions of time, alterations or additions to the terms of the Contract or to the Work or to the specifications or drawings and agrees that they shall become part of the Contract Documents.

PROVIDED, HOWEVER, that this Bond is executed pursuant to the provisions of Title 63, Chapter 56, Utah Code Annotated, 1953, as amended, and all liabilities on this Bond shall be determined in accordance with said provisions to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____, 20____.

WITNESS OR ATTESTATION:

PRINCIPAL:

By: _____ (Seal)

Title: _____

WITNESS OR ATTESTATION:

SURETY:

By: _____ Attorney-in-Fact (Seal)

STATE OF _____)
) ss.
COUNTY OF _____)

On this _____ day of _____, 20____, personally appeared before me _____, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who, being by me duly sworn, did say that he/she is the Attorney-in-fact of the above-named Surety Company, and that he/she is duly authorized to execute the same and has complied in all respects with the laws of Utah in reference to becoming sole surety upon bonds, undertakings and obligations, and that he/she acknowledged to me that as Attorney-in-fact executed the same.

Subscribed and sworn to before me this _____ day of _____, 20____.

My commission expires: _____
Resides at: _____

NOTARY PUBLIC

Agency: _____
Agent: _____
Address: _____
Phone: _____

Approved As To Form: May 25, 2005
By Alan S. Bachman, Asst Attorney General



CERTIFICATE OF SUBSTANTIAL COMPLETION

PROJECT _____ PROJECT NO: _____

AGENCY/INSTITUTION _____

AREA ACCEPTED _____

The Work performed under the subject Contract has been reviewed on this date and found to be Substantially Completed as defined in the General Conditions; including that the construction is sufficiently completed in accordance with the Contract Documents, as modified by any change orders agreed to by the parties, so that the State of Utah can occupy the Project or specified area of the Project for the use for which it is intended.

The DFCM - (Owner) accepts the Project or specified area of the Project as Substantially Complete and will assume full possession of the Project or specified area of the Project at _____ (time) on _____ (date).

The DFCM accepts the Project for occupancy and agrees to assume full responsibility for maintenance and operation, including utilities and insurance, of the Project subject to the itemized responsibilities and/or exceptions noted below:

The Owner acknowledges receipt of the following closeout and transition materials:

- As-built Drawings
- O & M Manuals
- Warranty Documents
- Completion of Training Requirements

A list of items to be completed or corrected (Punch List) is attached hereto. The failure to include an item on it does not alter the responsibility of the Contractor to complete all the Work in accordance with the Contract Documents, including authorized changes thereof. The amount of _____(Twice the value of the punch list work) shall be retained to assure the completion of the punch list work.

The Contractor shall complete or correct the Work on the list of (Punch List) items appended hereto within _____ calendar days from the above date of issuance of this Certificate. The amount withheld pending completion of the list of items noted and agreed to shall be: \$_____. If the list of items is not completed within the time allotted the Owner has the right to be compensated for the delays and/or complete the work with the help of independent contractor at the expense of the retained project funds. If the retained project funds are insufficient to cover the delay/completion damages, the Owner shall be promptly reimbursed for the balance of the funds needed to compensate the Owner.

_____ by: _____
CONTRACTOR (include name of firm) (Signature) DATE

_____ by: _____
A/E (include name of firm) (Signature) DATE

_____ by: _____
USING INSTITUTION OR AGENCY (Signature) DATE

_____ by: _____
DFCM (Owner) (Signature) DATE

**General Contractor Performance Rating Form**

Project Name:		DFCM Project#	
Contractor: (ABC Construction, John Doe, 111-111-1111)	A/E: (ABC Architects, Jane Doe, 222-222-2222)	Original Contract Amount:	Final Contract Amount:
DFCM Project Manager:		Contract Date:	
Completion Date:		Date of Rating:	

Rating Guideline	QUALITY OF PRODUCT OR SERVICES	COST CONTROL	TIMELINESS OF PERFORMANCE	BUSINESS RELATIONS
5-Exceptional	Contractor has demonstrated an exceptional performance level in any of the above four categories that justifies adding a point to the score. Contractor performance clearly exceeds the performance levels described as "Very Good"			
4-Very Good	Contractor is in compliance with contract requirements and/or delivers quality product/service.	Contractor is effective in managing costs and submits current, accurate, and complete billings	Contractor is effective in meeting milestones and delivery schedule	Response to inquiries, technical/service/administrative issues is effective
3-Satisfactory	Minor inefficiencies/errors have been identified	Contractor is usually effective in managing cost	Contractor is usually effective in meeting milestones and delivery schedules	Response to inquires technical/service/administrative issues is somewhat effective
2-Marginal	Major problems have been encountered	Contractor is having major difficulty managing cost effectively	Contractor is having major difficulty meeting milestones and delivery schedule	Response to inquiries, technical/service/administrative issues is marginally effective
1-Unsatisfactory	Contractor is not in compliance and is jeopardizing achievement of contract objectives	Contractor is unable to manage costs effectively	Contractor delays are jeopardizing performance of contract objectives	Response to inquiries, technical/service/administrative issues is not effective

1. Rate Contractors quality of workmanship, management of sub contractor performance, project cleanliness, organization and safety requirement.	Score
<u>Agency Comments:</u>	
<u>A & E Comments:</u>	
<u>DFCM Project Manager Comments:</u>	

2. Rate Contractor administration of project costs, change orders and financial management of the project budget.	Score
<u>Agency Comments:</u>	
<u>A & E Comments:</u>	
<u>DFCM Project Manager Comments:</u>	

3. Rate Contractor's performance and adherence to Project Schedule, delay procedures and requirements of substantial completion, inspection and punch-list performance.	Score
<u>Agency Comments:</u>	
<u>A & E Comments:</u>	
<u>DFCM Project Manager Comments:</u>	

4. Evaluate performance of contractor management team including project manager, engineer and superintendent also include in the rating team's ability to work well with owner, user agency and consultants.	Score
<u>Agency Comments:</u>	
<u>A & E Comments:</u>	
<u>DFCM Project Manager Comments:</u>	

5. Rate success of Contractor's management plan, completion of the plans mitigation of project risks and performance of value engineering concepts.	Score
<u>Agency Comments:</u>	
<u>A & E Comments:</u>	
<u>DFCM Project Manager Comments:</u>	

Signed by:	Date:	Mean Score
-------------------	--------------	-------------------

Additional Comments:

Weber State University
Elizabeth Dee Shaw Stewart Stadium

Field Lighting Upgrade
March 3, 2010



DFCM PROJECT NO. 09061810
ECE, LLC PROJECT NO. 3881

16190	SUPPORTING DEVICES	6
16195	ELECTRICAL IDENTIFICATION	4
16452	GROUNDING	4
16470	PANELBOARDS	4
16477	FUSES	3
16526	SPORTS LIGHTING	8
16660	SEISMIC BRACING	3



Utah State Tax Commission

Exemption Certificate for Governments & Schools

(Sales, Use, Tourism and Motor Vehicle Rental Tax)

TC-721G

Rev. 12/08

Name of institution claiming exemption (purchaser)		Telephone Number	
Street Address	City	State	ZIP Code
Authorized Signature	Name (please print)	Title	
Name of Seller or Supplier:			Date

The person signing this certificate **MUST** check the applicable box showing the basis for which the exemption is being claimed. Questions should be directed (preferably in writing) to Taxpayer Services, Utah State Tax Commission, 210 N 1950 W, Salt Lake City, UT 84134. Telephone (801) 297-2200, or toll free 1-800-662-4335.

DO NOT SEND THIS CERTIFICATE TO THE TAX COMMISSION
Keep it with your records in case of an audit.

UNITED STATES GOVERNMENT OR NATIVE AMERICAN TRIBE
I certify the tangible personal property or services purchased are to be paid directly with funds from the entity noted on this form and will be used in the exercise of essential governmental or tribal functions. NOTE: Includes sales of tangible personal property to federally chartered credit unions. "Directly" does not include per diem, entity advances or similar indirect payments.

CONSTRUCTION MATERIALS PURCHASED FOR SCHOOLS OR PUBLIC TRANSIT DISTRICTS
I certify the construction materials purchased are on behalf of a public elementary or secondary school, or public transit district. I further certify the purchased construction materials will be installed or converted into real property owned by the school or public transit district.
Name of school or public transit district: _____
Name of project: _____

UTAH STATE AND LOCAL GOVERNMENTS AND PUBLIC ELEMENTARY AND SECONDARY SCHOOLS
Sales Tax License No. _____
I certify the tangible personal property or services purchased are to be paid directly with funds from the entity noted on this form and will be used in the exercise of that entity's essential functions. For construction materials, if the purchaser is a Utah state or local government, these construction materials will be installed or converted into real property by employees of this government entity. "Directly" does not include per diem, entity advances, or similar indirect payments. **CAUTION:** This exemption does not apply to government or educational entities of other states.

To be valid this certificate must be filled in completely, including a check mark in the proper box.

A sales tax license number is required only where indicated.

Please sign, date and, if applicable, include your license or exemption number.

NOTE TO SELLER: Keep this certificate on file since it must be available for audit review.

NOTE TO PURCHASER: Keep a copy of this certificate for your records. You must notify the seller of cancellation, modification, or limitation of the exemption you have claimed.

If you need an accommodation under the Americans with Disabilities Act, contact the Tax Commission at (801) 297-3811 or TDD (801) 297-2020. Please allow three working days for a response.

MUSCO SPORTS LIGHTING, LLC
Light Structure Pole and Foundation Standard

This confidential report is provided exclusively for the use of engineering approval. The technical information provided herein is the confidential property of Musco Sports Lighting, LLC and reproduction of this report or use of this information for anything other than its limited, intended purpose as to this project, without the written permission of Musco Sports Lighting, LLC is prohibited.

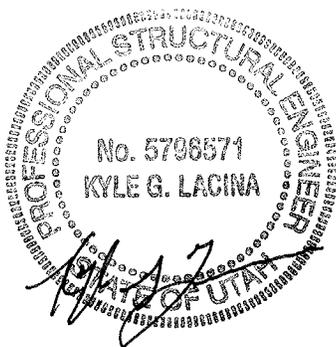
ITEM:
Structural Calculations
Pole/Foundation Standard

PROJECT:
Weber State University Football Field
Field Lighting
Ogden, Utah

PROJECT #:
144554

DATE:
February 22, 2010

ENGINEER:
Structural Engineers, P.C.
114 Nicholas Drive
Marshalltown, IA 50158



I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Utah.

 2-22-2010

Kyle G. Lacina - No. 5796571 Date
License Renewal Date: March 31, 2011

MUSCO SPORTS LIGHTING, LLC
Light Structure Pole Standard, LS Series

Calculation Index

Material	Page Reference
Wind Design Criteria (LS60-F)	1
Pole Analysis (LS60-F w/ 35 Fixtures)	2-9
Precast Pier (By Others)	10
Foundation Analysis	11

CODE REFERENCE:

ASCE 7-05

American Society of Civil Engineers, 'Minimum Design Loads for Buildings and Other Structures,' ASCE 7-05,
American Society of Civil Engineers, New York, New York

AASHTO 2001

Standard Specification for Structural Supports for Highway Signs, Luminaires and Traffic Signals, 2001 Edition,
American Association of State Highway and Transportation Officials, Washington D.C.

IBC 2006

International Building Code 2006
International Code Council, Inc., Washington, DC

Version : LSG2010.1:03FEB2010

MUSCO SPORTS LIGHTING, LLC
Wind Design Criteria

Pole: LS60-F

Code: IBC 2006 (ASCE 7-05)

Wind Category: 100 mph
Exp. C

Wind Design Pressures:

Elev. (ft)	K_z	q_z (psf)	G_f	C_f	F/A_f (psf)
0-15	0.849	20.64	1.13	0.70	16.27
20	0.902	21.93	1.13	0.70	17.28
25	0.945	22.99	1.13	0.70	18.11
30	0.982	23.89	1.13	0.70	18.82
40	1.044	25.38	1.13	0.70	20.00
50	1.094	26.60	1.13	0.70	20.96
60	1.137	27.64	1.13	0.70	21.78
70	1.174	28.55			
80	1.208	29.37			
90	1.238	30.10			
100	1.266	30.78			
120	1.315	31.98			
140	1.359	33.04			
160	1.397	33.98			
180	1.432	34.83			
200	1.464	35.62			

- $q_z = 0.00256 * K_z * K_{zt} * K_d * V^2 * I$ (Eq. 6-15)
- $K_z =$ As listed above. (Sec. 6.5.6.6 & Table 6-3)
- $K_{zt} = 1.00$ (Sec. 6.5.7.2 & Fig. 6-4)
- $K_d = 0.95$ (pole) (Sec. 6.5.4.4 & Table 6-4)
 0.85 (attachments)
- $I = 1.00$ (Table 1-1 & Table 6-1)
- $F = q_z * G_f * C_f * A_f$ (Eq. 6-28)
- $G_f = 1.13$ (Sec. 6.5.8)
- $C_f =$ As listed above for pole. (For Pole, Fig. 6-21)
 1.00 (For Fixtures - included in EPA)

MUSCO SPORTS LIGHTING, LLC

Analysis in accordance with AASHTO 2001 Standard Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals

Wind loading in accordance with: IBC 2006 (ASCE 7-05)

Light Structure Catalog No. = LS60-F
 Number of Fixtures = 35
 Fixture Arrangement = (9+9+9+8)
 Platforms = NA
 EPA of Fixtures & Accessories = 92.5 sq ft
 Weight of Dressed Pole = 5719.1 lb
 Pole Natural Frequency = 0.771 Hz
 Pole Damping Ratio = 0.025
 Allowable Stress Increase, ASI = 1.00
 Wind Speed = 100 mph
 Exposure Category = C
 Importance Factor = 1.00
 Terrain Multiplier = 1.00

Light Structure Data:

Mounting Section Yield Stress Fy = NA
 Extension No. 2 Yield Stress Fy = NA
 Extension No. 1 Yield Stress Fy = NA
 Top Section Yield Stress Fy = 55 ksi
 Bottom Section Yield Stress Fy = 55 ksi

Special Concentrated Loads:

Load No.	Elev. (ft)	M (ft-k)	V (kips)	P (kips)	T (ft-k)	Description of load
1	25.00	0.000	0.063	0.025	0.000	1-QTZ
2	10.00	0.000	0.000	0.050	0.000	1-ECE

Special concentrated loads listed do not include 1.45 magnification factor. Elevations listed are relative to grade.

MUSCO SPORTS LIGHTING, LLC

Analysis in accordance with AASHTO 2001 Standard Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals

Element Forces				
Elev. (ft)	M (ft-k)	V (kips)	P (kips)	T (ft-k)
60.276	0.00	0.000	0.000	0.000
60	0.00	0.009	0.011	0.000
59	0.78	0.987	0.571	2.619
58	1.82	1.022	0.610	2.619
57	3.22	1.992	1.171	5.215
56	5.30	2.027	1.210	5.215
55	7.43	2.062	1.250	5.215
54	10.41	3.024	1.813	7.787
53	13.57	3.060	1.854	7.787
52	17.11	3.911	2.359	9.776
51	21.19	3.947	2.401	9.776
50	25.31	3.984	2.443	9.776
49	29.47	4.020	2.485	9.776
48	33.66	4.057	2.528	9.776
47	37.89	4.093	2.572	9.776
46	42.16	4.130	2.615	9.776
45	46.47	4.167	2.660	9.776
44	50.81	4.205	2.704	9.776
43	55.19	4.242	2.749	9.776
42	59.61	4.280	2.823	9.776
41	64.07	4.318	2.927	9.776
40	68.57	4.356	3.031	9.776
39	73.11	4.393	3.094	9.776
38	77.68	4.431	3.153	9.776
37	82.30	4.468	3.213	9.776
36	86.95	4.506	3.273	9.776
35	91.63	4.544	3.334	9.776
34	96.35	4.581	3.395	9.776
33	101.11	4.619	3.457	9.776
32	105.91	4.657	3.520	9.776
31	110.74	4.695	3.583	9.776
30	115.61	4.734	3.647	9.776
29	120.52	4.772	3.711	9.776
28	125.46	4.810	3.775	9.776
27	130.43	4.848	3.841	9.776
26	135.44	4.886	3.906	9.776
25	140.49	5.015	4.009	9.776
24	145.67	5.054	4.076	9.776
23	150.88	5.092	4.143	9.776
22	156.12	5.130	4.211	9.776
21	161.40	5.168	4.279	9.776
20	166.71	5.206	4.348	9.776
19	172.05	5.244	4.418	9.776
18	177.43	5.282	4.488	9.776
17	182.84	5.319	4.559	9.776
16	188.28	5.357	4.630	9.776
15	193.76	5.394	4.702	9.776
14	199.26	5.431	4.774	9.776
13	204.80	5.469	4.847	9.776
12	210.37	5.507	4.920	9.776

- Includes second order effects factor 1.45 - AASHTO 2001, Sec. 4.8.2

Version : LSG2010.1:03FEB2010

MUSCO SPORTS LIGHTING, LLC

Analysis in accordance with AASHTO 2001 Standard Specification for Structural Supports
for Highway Signs, Luminaires, and Traffic Signals

Element Forces (continued)				
Elev. (ft)	M (ft-k)	V (kips)	P (kips)	T (ft-k)
11	215.97	5.545	4.994	9.776
10	221.62	5.583	7.678	9.776
9	227.32	5.622	7.753	9.776
8	233.04	5.660	7.829	9.776
7	238.79	5.700	7.905	9.776
6	244.56	5.739	7.981	9.776
5	250.37	5.779	8.058	9.776
4	256.20	5.819	8.136	9.776
3	262.06	5.859	8.214	9.776
2	267.94	5.900	8.293	9.776

- Includes second order effects factor 1.45 - AASHTO 2001, Sec. 4.8.2

MUSCO SPORTS LIGHTING, LLC

Analysis in accordance with AASHTO 2001 Standard Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals

Actual and Allowable Stresses								
Elev. (ft)	f _a (ksi)	F _a (ksi)	f _b (ksi)	F _b (ksi)	f _v (ksi)	F _v (ksi)	CSR	CSR/ ASI
60.276	0.00	2.38	0.00	35.16	0.00	18.15	0.00	0.00
60	0.00	2.38	0.00	35.11	0.00	18.15	0.00	0.00
59	0.05	2.38	0.28	34.97	0.64	18.15	0.01	0.01
58	0.06	2.38	0.64	34.83	0.63	18.15	0.02	0.02
57	0.11	2.38	1.10	34.68	1.23	18.15	0.04	0.04
56	0.11	2.38	1.78	34.55	1.21	18.15	0.06	0.06
55	0.11	2.38	2.44	34.41	1.20	17.92	0.08	0.08
54	0.16	2.38	3.35	34.28	1.75	17.65	0.11	0.11
53	0.17	2.38	4.28	34.15	1.73	17.38	0.14	0.14
52	0.21	2.38	5.29	34.03	2.14	17.13	0.18	0.18
51	0.21	2.38	6.42	33.90	2.11	16.87	0.21	0.21
50	0.21	2.38	7.51	33.78	2.09	16.63	0.24	0.24
49	0.21	2.38	8.57	33.66	2.06	16.39	0.28	0.28
48	0.21	2.38	9.60	33.54	2.03	16.15	0.31	0.31
47	0.22	2.38	10.60	33.43	2.01	15.92	0.34	0.34
46	0.22	2.38	11.57	33.32	1.98	15.70	0.37	0.37
45	0.22	2.38	12.52	33.21	1.96	15.48	0.40	0.40
44	0.22	2.38	13.43	33.10	1.93	15.27	0.43	0.43
43	0.22	2.38	14.32	32.99	1.91	15.06	0.46	0.46
42	0.23	2.38	15.18	32.89	1.89	14.85	0.48	0.48
41	0.23	2.38	16.02	32.78	1.87	14.65	0.51	0.51
40	0.24	2.38	16.84	32.68	1.85	14.46	0.54	0.54
39	0.19	2.38	14.01	36.30	1.42	18.15	0.40	0.40
38	0.19	2.38	14.62	36.30	1.41	18.15	0.41	0.41
37	0.19	2.38	15.20	36.30	1.39	18.15	0.43	0.43
36	0.19	2.38	15.78	36.24	1.37	18.15	0.45	0.45
35	0.19	2.38	16.33	36.11	1.36	18.15	0.46	0.46
34	0.20	2.38	16.87	35.99	1.35	18.15	0.48	0.48
33	0.20	2.38	17.40	35.86	1.33	18.15	0.50	0.50
32	0.20	2.38	17.91	35.74	1.32	18.15	0.51	0.51
31	0.20	2.38	18.40	35.62	1.30	18.15	0.53	0.53
30	0.20	2.38	18.89	35.50	1.29	18.15	0.54	0.54
29	0.20	2.38	19.36	35.38	1.28	18.15	0.56	0.56
28	0.21	2.38	19.81	35.27	1.27	18.15	0.57	0.57
27	0.21	2.38	20.26	35.16	1.25	18.15	0.59	0.59
26	0.21	2.38	20.69	35.05	1.24	18.15	0.60	0.60
25	0.21	2.38	21.11	34.94	1.24	18.15	0.62	0.62
24	0.22	2.38	21.54	34.83	1.23	18.15	0.63	0.63
23	0.22	2.38	21.95	34.73	1.22	18.15	0.64	0.64
22	0.22	2.38	22.35	34.62	1.21	18.15	0.66	0.66
21	0.22	2.38	22.74	34.52	1.19	18.15	0.67	0.67
20	0.22	2.38	23.13	34.42	1.18	17.93	0.68	0.68
19	0.22	2.38	23.50	34.32	1.17	17.73	0.70	0.70
18	0.23	2.38	23.86	34.22	1.16	17.53	0.71	0.71
17	0.23	2.38	24.21	34.13	1.15	17.33	0.72	0.72
16	0.23	2.38	24.55	34.03	1.15	17.14	0.73	0.73
15	0.23	2.38	24.88	33.94	1.14	16.95	0.74	0.74
14	0.23	2.38	25.21	33.85	1.13	16.76	0.76	0.76
13	0.24	2.38	25.53	33.76	1.12	16.58	0.77	0.77
12	0.24	2.38	25.83	33.67	1.11	16.40	0.78	0.78

MUSCO SPORTS LIGHTING, LLC

Analysis in accordance with AASHTO 2001 Standard Specification for Structural Supports
for Highway Signs, Luminaires, and Traffic Signals

Actual and Allowable Stresses (continued)								
Elev. (ft)	f_a (ksi)	F_a (ksi)	f_b (ksi)	F_b (ksi)	f_v (ksi)	F_v (ksi)	CSR	CSR/ ASI
11	0.24	2.38	26.13	33.58	1.10	16.22	0.79	0.79
10	0.36	2.38	26.43	33.49	1.09	16.04	0.80	0.80
9	0.37	2.38	26.72	33.41	1.08	15.87	0.82	0.82
8	0.37	2.38	27.00	33.32	1.08	15.71	0.83	0.83
7	0.37	2.38	27.27	33.24	1.07	15.54	0.84	0.84
6	0.37	2.38	27.54	33.16	1.06	15.38	0.85	0.85
5	0.37	2.38	27.80	33.08	1.05	15.22	0.86	0.86
4	0.37	2.38	28.05	33.00	1.05	15.06	0.87	0.87
3	0.37	2.38	28.29	32.92	1.04	14.91	0.88	0.88
2	0.37	2.38	28.53	32.84	1.03	14.76	0.88	0.88

MUSCO SPORTS LIGHTING, LLC

Analysis in accordance with AASHTO 2001 Standard Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals

Ground Forces & Controlling Stress Ratios:

		w/ 1.45 Factor		Actual Forces	
Shear at Ground	=	5.900	kips	4.069	kips
Total Moment at Ground	=	279.743	ft-k	192.926	ft-k
Precast Base Allowable Moment	=	343.469	ft-k	236.875	ft-k
P-delta Moment at Ground	=	6.890	ft-k	4.752	ft-k
Axial at Ground	=	8.293	kips	5.719	kips
Torque at Ground	=	9.776	ft-k	6.742	ft-k

Group Load II: (DL + W)

Pole Max. Combined Stress Ratio	CSR	=	0.885
	CSR/ASI	=	0.885
Precast Base Combined Stress Ratio		=	0.814

MUSCO SPORTS LIGHTING, LLC

Analysis in accordance with AASHTO 2001 Standard Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals

Deflections				
Elev. (ft)	Rel. Θ (deg)	Rel. Δ (in)	Glo. Θ (deg)	Glo. Δ (in)
60.276	0.00	0.218	3.77	28.20
60	0.00	0.790	3.77	27.98
59	0.00	0.789	3.76	27.19
58	0.00	0.789	3.76	26.40
57	0.01	0.787	3.76	25.61
56	0.01	0.786	3.75	24.82
55	0.01	0.783	3.74	24.04
54	0.02	0.780	3.73	23.25
53	0.02	0.775	3.71	22.48
52	0.03	0.770	3.69	21.70
51	0.03	0.764	3.66	20.93
50	0.04	0.756	3.63	20.17
49	0.04	0.748	3.59	19.41
48	0.05	0.739	3.55	18.66
47	0.05	0.729	3.50	17.92
46	0.05	0.718	3.45	17.19
45	0.06	0.707	3.40	16.47
44	0.06	0.694	3.34	15.77
43	0.06	0.681	3.28	15.07
42	0.07	0.668	3.22	14.39
41	0.07	0.654	3.15	13.72
40	0.07	0.639	3.08	13.07
39	0.06	0.626	3.02	12.43
38	0.06	0.613	2.96	11.81
37	0.06	0.600	2.89	11.19
36	0.07	0.586	2.83	10.59
35	0.07	0.572	2.76	10.01
34	0.07	0.557	2.69	9.434
33	0.07	0.543	2.62	8.877
32	0.07	0.528	2.55	8.334
31	0.07	0.512	2.48	7.807
30	0.08	0.497	2.41	7.295
29	0.08	0.481	2.33	6.798
28	0.08	0.464	2.26	6.317
27	0.08	0.448	2.18	5.853
26	0.08	0.431	2.10	5.405
25	0.08	0.415	2.02	4.974
24	0.08	0.398	1.94	4.559
23	0.08	0.380	1.86	4.161
22	0.08	0.363	1.77	3.781
21	0.08	0.345	1.69	3.418
20	0.08	0.328	1.61	3.072
19	0.09	0.310	1.52	2.745
18	0.09	0.292	1.44	2.435
17	0.09	0.274	1.35	2.143
16	0.09	0.255	1.26	1.869
15	0.09	0.237	1.18	1.614
14	0.09	0.219	1.09	1.377
13	0.09	0.200	1.00	1.158
12	0.09	0.181	0.91	0.958

MUSCO SPORTS LIGHTING, LLC

Analysis in accordance with AASHTO 2001 Standard Specification for Structural Supports for Highway Signs, Luminaires, and Traffic Signals

Deflections (continued)				
Elev. (ft)	Rel. Θ (deg)	Rel. Δ (in)	Glo. Θ (deg)	Glo. Δ (in)
11	0.09	0.162	0.82	0.777
10	0.09	0.144	0.73	0.615
9	0.09	0.125	0.64	0.471
8	0.09	0.106	0.55	0.346
7	0.09	0.087	0.46	0.241
6	0.09	0.067	0.37	0.154
5	0.09	0.048	0.28	0.087
4	0.09	0.029	0.18	0.039
3	0.09	0.010	0.09	0.010
2	0.00	0.000	0.00	0.000

CRETEX CONCRETE PRODUCTS NORTH, INC.

SCOPE: Analysis of an annular prestressed concrete pole member based on compatible strain procedure per ACI-318-05* with an ultimate concrete strain of 0.003.

PROJECT: Musco Standard Pole Base
 DATE: Sep-17-2007 4:55 PM
 POLE TYPE: 6B
 PROGRAM VERSION 2.0

USER DEFINED INPUTS

CROSS-SECTION OUTER DIAMETER = D_o =	D_o	=	20.50 in	[52.07 cm]
HOLLOW CORE INSIDE DIAMETER = D_i =	D_i	=	10.25 in	[26.04 cm]
TENDON CIRCLE DIAMETER = D_t =	D_t	=	17.25 in	[43.82 cm]
NUMBER OF TENDONS = N (56 or less and even)	N	=	22	
TENDON DIAMETER = d_t =	d_t	=	0.5 in	[1.27 cm]
NOMINAL TENDON AREA = A_{ps} =	A_{ps}	=	0.153 in ²	[0.988 cm ²]
ULTIMATE TENDON STRENGTH = f_{pu} =	f_{pu}	=	270 ksi	[1860 MPa]
TENDON YIELD STRENGTH = f_{py} =	f_{py}	=	230 ksi	[1590 MPa]
CONCRETE COMPRESSIVE STRENGTH = F'_c =	F'_c	=	9500 psi	[65.5 MPa]
MODULUS OF ELASTICITY - STEEL = E_s =	E_s	=	29000 ksi	[200000 MPa]
INITIAL PRESTRESS FACTOR = IPF =	IPF	=	0.64	
PRESTRESS LOSS FACTOR = PLF =	PLF	=	0.82	
*PHI FACTOR CALCULATED PER ACI 318 1999 OR 2005:	ACI 1999			

OUTPUT

PHI FACTOR =	ϕ	=	0.90	
PRESTRESSING STRAIN IN TENDON	ϵ_{ps}	=	0.005	
CONCRETE SERVICE STRESS DUE TO PRESTRESS		=	1928 psi	[13.29 MPa]
CROSS SECTIONAL AREA		=	248 in ²	[1600 cm ²]
GROSS MOMENT OF INERTIA		=	8127 in ⁴	[338000 cm ⁴]
DISTANCE TO NEUTRAL AXIS FROM COMP. SIDE	c	=	8.18 in	[20.8 cm]
CONCRETE COMPRESSIVE FORCE	C_c	=	537 kips	[2390 kN]
AREA OF BONDED REINFORCEMENT		=	3.37 in ²	[21.7 cm ²]
MINIMUM BONDED REINF. AREA (ACI 18.9.2)		=	0.50 in ²	[3.23 cm ²]
SATISFIED				
REINFORCEMENT RATIO	ρ	=	0.014	
REINFORCEMENT INDEX	ω	=	0.305	
MAXIMUM REINFORCEMENT INDEX (ACI 318-99, 18.8.1)		=	0.234	
EXCEEDED				
STRAND DEVELOPMENT LENGTH	l_d	=	54 in	[137 cm]

RESULTS

NOMINAL MOMENT CAPACITY	M_n	=	421 ft-k	[571 kN-m]
DESIGN MOMENT CAPACITY	ϕM_n	=	379 ft-k	[514 kN-m]
CRACKING LOAD MOMENT (ACI 18.8.2)	M_{cr}	=	176 ft-k	[239 kN-m]
SATISFIED				

CONFIDENTIAL: The information contained in this design is proprietary to The Cretex Companies, Inc., and is being furnished for the use of the designer in connection with this particular project. The information contained herein is not to be transmitted to any other organization unless specifically authorized in writing by The Cretex Companies, Inc.

MUSCO SPORTS LIGHTING, LLC
 Drilled Pier Foundation Design

In accordance with the following:
 INTERNATIONAL BUILDING CODE, 2006 Edition
 Chapter 18, Sections 1804 & 1805

FOUNDATION FOR: F3 MUSCO PROJECT REFERENCE:
 Pole Class: LS60-F Weber State University Football Field;
 Fixture Configuration: (9+9+9+8) Ogden, Utah (#144554)

GEOTECHNICAL REFERENCE:
 Report No. 0959-001-09, Boring No. B-1
 GSH Geotechnical Consultants, Inc.

APPLIED LOADS:

M = 192.93 ft-k V = 4.069 kips M_{adj} = 201.06 ft-k

Assumed Embedment Depth (no greater than 12 feet)

d = 12 ft

User Define: Top Elevation of Each Zone			
Z _{top1} = 0.0 ft	Z _{top2} = 2.0 ft	Z _{top3} = 6.0 ft	Z _{top4} = 6.5 ft
User Define: Pier Diameter by Zone			
b ₁ = 1.73 ft	b ₂ = 4.00 ft	b ₃ = 4.00 ft	b ₄ = 4.00 ft
User Define: Lateral Pressure Contributed by Each Zone			
S ₁ = 0.000 ksf/ft	S ₂ = 0.100 ksf/ft	S ₃ = 0.200 ksf/ft	S ₄ = 0.171 ksf/ft

Zone Thickness			
Z ₁ = 2.0 ft	Z ₂ = 4.0 ft	Z ₃ = 0.5 ft	
Virtual Height of Horizontal Load (ft)			
h = 49.4 ft			

First Iteration: Lateral Pressure for 1/3 Depth of Embedment [Eq. 1]			
S ₁₁ = 0.000 ksf	S ₁₂ = 0.400 ksf	S ₁₃ = 0.800 ksf	S ₁₄ = 0.683 ksf
First Iteration: "A" Parameter [Eq. 2]			
A ₁ = 0.000 ft	A ₂ = 5.951 ft	A ₃ = 2.975 ft	A ₄ = 3.488 ft
First Iteration: Depth of Emb. Required, Each Zone Acting Alone [Eq. 3]			
d ₁ = NA ft	d ₂ = 21.124 ft	d ₃ = 14.234 ft	d ₄ = 15.560 ft
First Iteration: Adjust Depth Based on Assumed Embedment Depth Limit			
d _{1adj} = 12.000 ft	d _{2adj} = 12.000 ft	d _{3adj} = 12.000 ft	d _{4adj} = 12.000 ft

Second Iteration: Lateral Pressure for 1/3 Depth of Embedment [Eq. 1]			
S ₁₁ = 0.000 ksf	S ₁₂ = 0.400 ksf	S ₁₃ = 0.800 ksf	S ₁₄ = 0.683 ksf
Second Iteration: "A" Parameter [Eq. 2]			
A ₁ = 0.000 ft	A ₂ = 5.951 ft	A ₃ = 2.975 ft	A ₄ = 3.488 ft
Second Iteration: Depth of Emb. Required, Each Zone Acting Alone [Eq. 3]			
d ₁ = NA ft	d ₂ = 21.124 ft	d ₃ = 14.234 ft	d ₄ = 15.560 ft

Percent Contributed to Actual Embedment Depth by Each Zone			
ρ ₁ = 0.000	ρ ₂ = 0.189	ρ ₃ = 0.035	ρ ₄ = 0.776
Depth Contributed to Total Embedment Depth by Each Zone			
D ₁ = 2.000 ft	D ₂ = 4.000 ft	D ₃ = 0.500 ft	D ₄ = 12.067 ft

Total Embedment Depth Required	
D = 18.567 ft	

EQUATION REFERENCE:

Eq. 1: $S_1 = \frac{1}{3} * d * S$

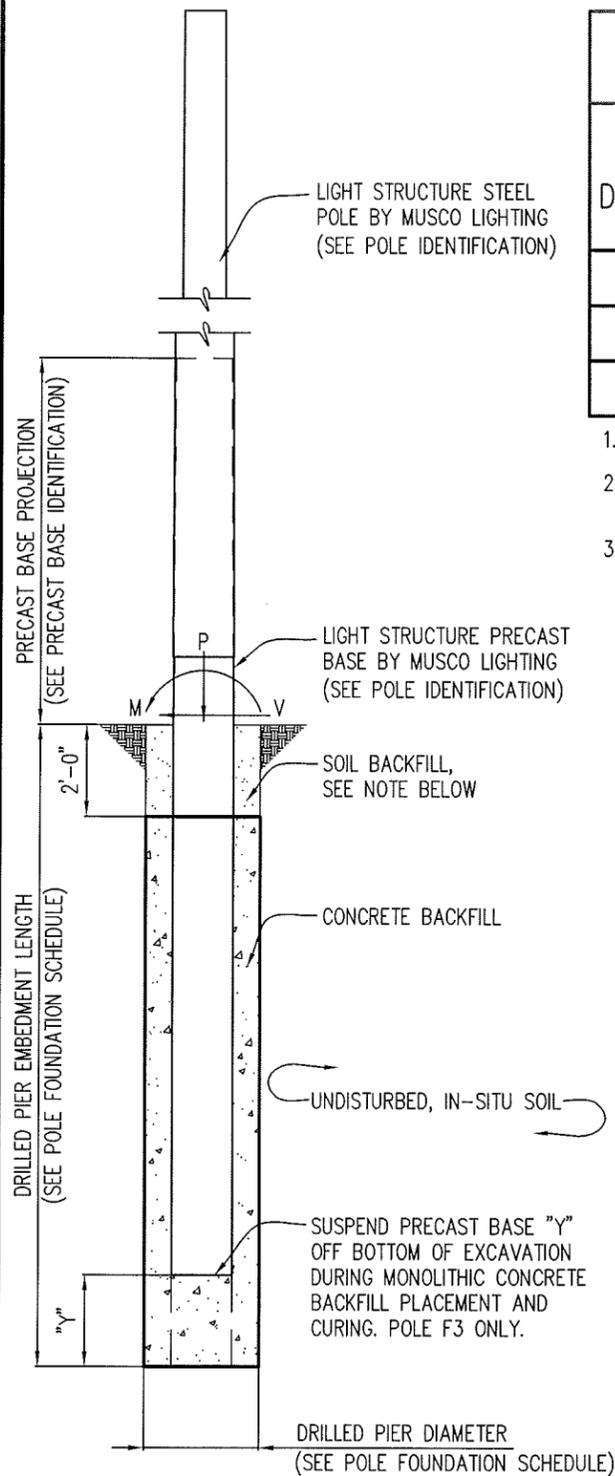
Eq. 2: $A = (2.34 * V) / (S_1 * b)$

Eq. 3: $d = \frac{1}{2} * A * (1 + (1 + 4.36 * h / A))$

PIER DETAILS:

Diameter = 48 in

Embedment Depth = 19 ft



POLE FOUNDATION ELEVATION

SCALE: NOT TO SCALE

SOIL BACKFILL NOTE:
THE TOP TWO FEET OF ANNULUS MAY BE BACKFILLED WITH SOIL, WITH A CLASSIFICATION OF CLASS 5 OR BETTER IN ACCORDANCE WITH IBC - TABLE 1804.2

POLE FOUNDATION SCHEDULE							
POLE DESIGNATION	FORCES			DRILLED PIER			
	MOMENT (M) FT-LBS	SHEAR (V) LBS	VERTICAL (P) LBS (1.)	DIAMETER INCHES	EMBEDMENT LENGTH	SUSPENSION "Y" (2.)	CONCRETE BACKFILL YD ³ (3.)
F1	157,953	3,415	4,819	48	18'-0"	NA	6.1
F2	171,229	3,725	5,434	48	18'-0"	NA	6.1
F3	192,926	4,069	5,719	48	19'-0"	1'-0"	6.6

1. WEIGHT OF POLE, FIXTURES AND ACCESSORIES.
2. SUSPEND PRECAST BASE "Y" AMOUNT OFF THE BOTTOM OF THE EXCAVATION DURING MONOLITHIC CONCRETE BACKFILL PLACEMENT AND CURING.
3. MINIMUM CONCRETE BACKFILL VOLUME, SITE CONDITIONS MAY REQUIRE ADDITIONAL BACKFILL.

PRECAST BASE IDENTIFICATION						
PRECAST BASE TYPE	PRECAST BASE WEIGHT	PRECAST BASE LENGTH	PROJECTION ABOVE GRADE	STANDARD EMBEDMENT	OUTSIDE DIAMETER	
6B	6,930	26'-1"	8'-1"	18'-0"	20.70"	

POLE IDENTIFICATION				
POLE DESIGNATION	POLE TYPE	PRECAST BASE TYPE	FIXTURE CONFIGURATION (FIX. PER XARM)	FIXTURE AND ACCESSORIES EPA (FT ²)
F1	LS60-F	6B	26 (9+8+8)	71.5
F2	LS60-F	6B	33 (8+8+8+7)	80.5
F3	LS60-F	6B	36 (9+9+9+8)	92.5

- POLES F1 & F3 EACH INCLUDE ONE QUARTZ FIXTURE MOUNTED AT 25'-0" AGL.
- POLE F2 INCLUDES TWO QUARTZ FIXTURES MOUNTED AT 25'-0" AGL.

GENERAL NOTES

WIND DESIGN PARAMETERS:

WIND: 100 MPH (EXP. C, I = 1.0) PER IBC CODE, 2006 EDITION (ASCE 7-05).
DESIGN WIND PARAMETERS ARE AS NOTED. ACTUAL WIND SPEED AND EXPOSURE MUST BE VERIFIED FOR THE SITE BY THE PROPER GOVERNING OFFICIAL.

SOIL DESIGN PARAMETERS:

ALLOWABLE END BEARING SOIL PRESSURE: 5,000 PSF (BELOW -10'-0")
ALLOWABLE LATERAL SOIL BEARING PRESSURE: 0 PSF/FT (GRADE TO -2'-0");
VARIES, SEE SOIL REPORT AND BORING LOGS (BELOW -2'-0")
IN ACCORDANCE WITH THE 2006 EDITION OF THE INTERNATIONAL BUILDING CODE, CHAPTER 18, SECTION 1804 AND 1805.

DESIGN SOIL PARAMETERS ARE AS NOTED. ACTUAL ALLOWABLE SOIL PARAMETERS MUST BE VERIFIED ON SITE. REFERENCE SOILS AND FOUNDATION REPORT, NO. 0959-001-09, PREPARED BY GORDON SPILKER HUBER GEOTECHNICAL CONSULTANTS, INC.; SALT LAKE CITY.

A GEOTECHNICAL ENGINEER OR REPRESENTATIVE OF IS RECOMMENDED (NOT REQUIRED) TO BE AVAILABLE AT THE TIME OF THE FOUNDATION INSTALLATION TO VERIFY THE SOIL DESIGN PARAMETERS AND TO PROVIDE ASSISTANCE IF ANY PROBLEMS ARISE IN FOUNDATION INSTALLATION.

ENCOUNTERING SOIL FORMATIONS THAT WILL REQUIRE SPECIAL DESIGN CONSIDERATIONS OR EXCAVATION PROCEDURES MAY OCCUR. POLE FOUNDATIONS WILL NEED TO BE ANALYZED ACCORDING TO THE SOIL CONDITIONS THAT EXIST. IF ANY DISCREPANCIES OR INCONSISTENCIES ARISE, NOTIFY THE ENGINEER OF SUCH DISCREPANCIES. FOUNDATIONS WILL THEN BE REVISED ACCORDINGLY. REVISIONS WILL BE ANALYZED PER RECOMMENDATIONS DIRECTED BY A REGISTERED ENGINEER.

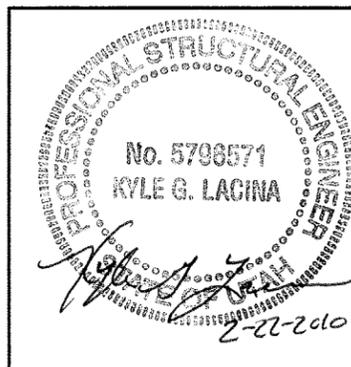
ALL EXCAVATIONS MUST BE FREE OF WATER, LOOSE SOIL AND DEBRIS PRIOR TO FOUNDATION INSTALLATION AND CONCRETE BACKFILL PLACEMENT. TEMPORARY CASINGS OR DRILLERS SLURRY MAY BE USED TO STABILIZE THE EXCAVATION DURING INSTALLATION. CASINGS MUST BE REMOVED DURING CONCRETE BACKFILL PLACEMENT.

CONCRETE SHALL BE AIR-ENTRAINED AND HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF 3,000 PSI. ALL PIERS AND THE CONCRETE BACKFILL MUST BEAR ON AND AGAINST FIRM UNDISTURBED SOIL. CONCRETE BACKFILL INSTALLATION LIMITED TO MAXIMUM FREE DROP OF 6'-0", TREMIE OR PUMPING TECHNIQUES SHOULD BE UTILIZED.

CONTRACTOR MUST BE FAMILIAR WITH THE COMPLETE SOIL INVESTIGATION REPORT AND BORINGS, AND CONTACT THE GEOTECHNICAL FIRM (IF NECESSARY) TO UNDERSTAND THE SOIL CONDITIONS AND THE POSSIBILITY OF GROUND WATER PUMPING AND EXCAVATION STABILIZATION OR BRACING DURING PRECAST BASE INSTALLATION AND PLACEMENT OF CONCRETE BACKFILL.

FIXTURES MUST BE LOCATED TO MAINTAIN 10'-0" MINIMUM HORIZONTAL CLEARANCE FROM ANY OBSTRUCTION.

POLES, FIXTURES, PRECAST BASES, ELECTRICAL ITEMS AND INSTALLATION PER MUSCO LIGHTING.



I HEREBY CERTIFY THAT THIS ENGINEERING DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF UTAH.

KYLE G. LACINA - NO. 5798571
LICENSE RENEWAL DATE: MARCH 31, 2011

DRAWING NO. COVERED BY THIS SEAL: C1

STRUCTURAL
ENGINEERS, P.C.
114 NICHOLAS DRIVE
MARSHALLTOWN, IOWA 50158
TELEPHONE NUMBER: 641-752-6334
EMAIL: MSL.INFO@SEPC.BIZ

MUSCO
SPORTS LIGHTING, LLC.
2107 STEWART ROAD
MUSCATINE, IOWA 52761
563-263-2281

WEBER STATE
UNIVERSITY
FOOTBALL FIELD
OGDEN, UTAH

DRAWING TITLE: SCALE: SEE PLAN
POLE SUPPORT FOUNDATION

PROJECT NO.
144554

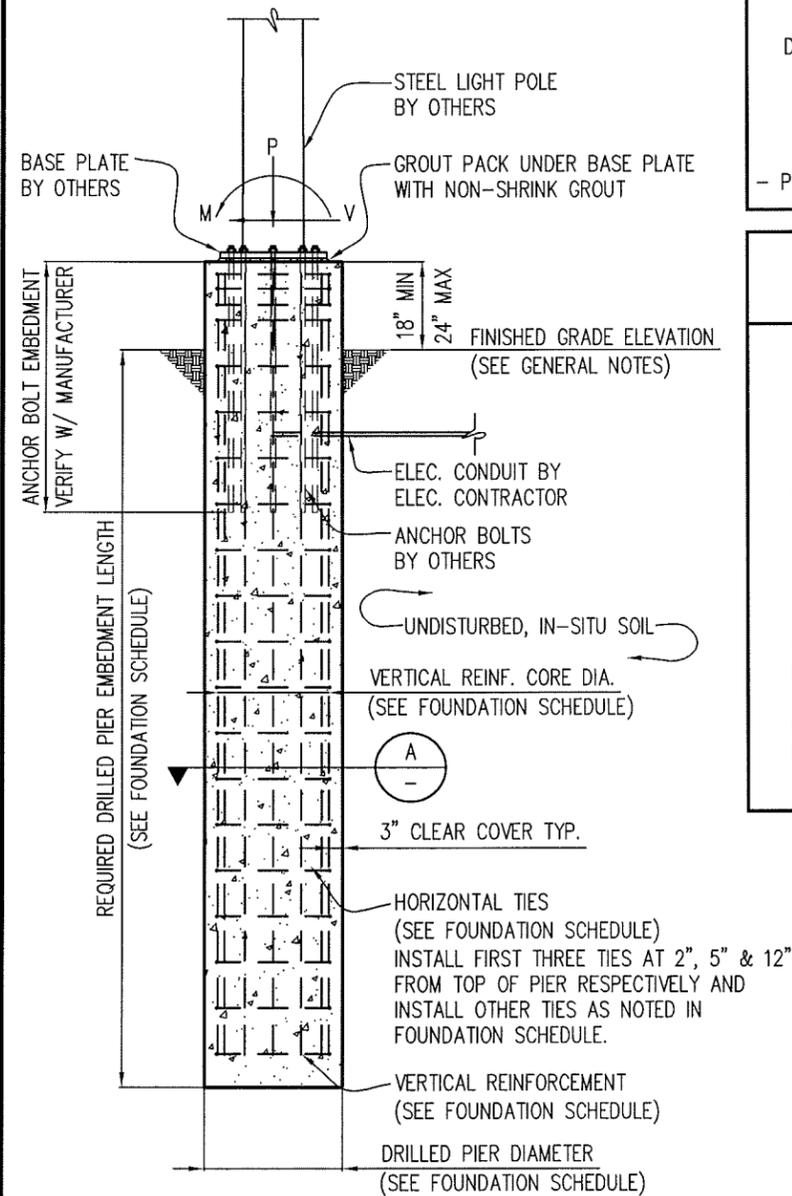
DATE
FEBRUARY 22, 2010

DRAWING NO.
C1
OF ONE

POLE FOUNDATION SCHEDULE

POLE DESIGNATION	FORCES			DRILLED PIER		REINFORCING		
	MOMENT (M) FT-LBS	SHEAR (V) LBS	VERTICAL (P) LBS (1.)	DIAMETER INCH	EMBEDMENT LENGTH	CORE DIAMETER INCH (2.)	VERTICAL REINFORCING	HORIZONTAL TIES
F4	863,470	9,860	15,227	66	31'-0"	59	28 - #8	#4 @ 12"
F6	733,155	8,623	12,824	66	29'-0"	59	28 - #8	#4 @ 12"

1. WEIGHT OF POLE, FIXTURES AND ACCESSORIES.
2. CORE DIAMETER EQUAL TO INSIDE DIAMETER OF TIES.



POLE FOUNDATION ELEVATION

SCALE: NOT TO SCALE

POLE IDENTIFICATION

POLE DESIGNATION	POLE TYPE	PRECAST BASE TYPE	FIXTURE CONFIGURATION (FIX. PER XARM)	FIXTURE AND ACCESSORIES EPA (FT ²)
F4	130FT VALMONT	NA	36 (9+9+9+8)	97.5
F6	130FT VALMONT	NA	26 (9+8+8)	75.8

- POLES F4 & F6 EACH INCLUDE ONE QUARTZ FIXTURE MOUNTED AT 100'-0" AGL.

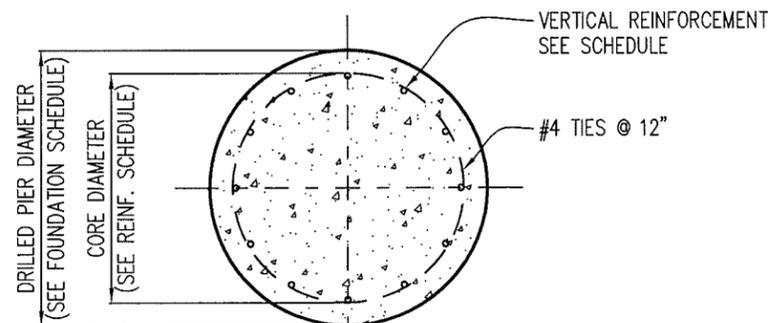
CONCRETE/REINFORCEMENT NOTES

CONCRETE SHALL COMPLY WITH THE FOLLOWING ASTM STANDARDS MIXTURE WITH ASTM C-94, PORTLAND CEMENT WITH ASTM C-150 TYPE I-A, AGGREGATES WITH ASTM C-33, AND BE IN CONFORMANCE WITH ACI 318-05. CONCRETE SHALL BE AIR-ENTRAINED (COMPLY WITH ASTM C-260) AND HAVE A MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS OF 4,000 PSI. DESIGN SLUMP LIMITS ARE 4" MINIMUM AND 6" MAXIMUM. THE JOB SITE SLUMP MAY BE INCREASED BY USE OF A WATER REDUCING AGENT MEETING ASTM C494-92.

CONCRETE REINFORCEMENT SHALL COMPLY WITH ASTM A615 GRADE 60, EXCEPT TIES CAN BE OF GRADE 40 AND BE IN CONFORMANCE WITH ACI 315 & 318.

CONCRETE DRILLED PIERS MUST ATTAIN 3,000 PSI STRENGTH PRIOR TO POLE INSTALLATION AND FIXTURE MOUNTING.

MAXIMUM FREE DROP OF CONCRETE LIMITED TO 6'-0". CONCRETE MUST BE PLACED BY TREMIE OR PUMPING TECHNIQUES. THE TOP 12'-0" SHOULD BE THOROUGHLY CONSOLIDATED BY MECHANICAL VIBRATION DURING PLACEMENT.



PIER DETAIL

SCALE: NOT TO SCALE

GENERAL NOTES

WIND DESIGN PARAMETERS:

WIND: 100 MPH (EXP. C, I = 1.0) PER IBC CODE, 2006 EDITION (ASCE 7-05). DESIGN WIND PARAMETERS ARE AS NOTED. ACTUAL WIND SPEED AND EXPOSURE MUST BE VERIFIED FOR THE SITE BY THE PROPER GOVERNING OFFICIAL.

SOIL DESIGN PARAMETERS:

ALLOWABLE END BEARING SOIL PRESSURE: 5,000 PSF (BELOW -10'-0")
 ALLOWABLE LATERAL SOIL BEARING PRESSURE: 0 PSF/FT (GRADE TO -2'-0"); VARIES, SEE SOIL REPORT AND BORING LOGS (BELOW -2'-0")
 IN ACCORDANCE WITH THE 2006 EDITION OF THE INTERNATIONAL BUILDING CODE, CHAPTER 18, SECTION 1804 AND 1805.

DESIGN SOIL PARAMETERS ARE AS NOTED. ACTUAL ALLOWABLE SOIL PARAMETERS MUST BE VERIFIED ON SITE. REFERENCE SOILS AND FOUNDATION REPORT, NO. 0959-001-09, PREPARED BY GORDON SPILKER HUBER GEOTECHNICAL CONSULTANTS, INC.; SALT LAKE CITY.

A GEOTECHNICAL ENGINEER OR REPRESENTATIVE OF IS RECOMMENDED (NOT REQUIRED) TO BE AVAILABLE AT THE TIME OF THE FOUNDATION INSTALLATION TO VERIFY THE SOIL DESIGN PARAMETERS AND TO PROVIDE ASSISTANCE IF ANY PROBLEMS ARISE IN FOUNDATION INSTALLATION.

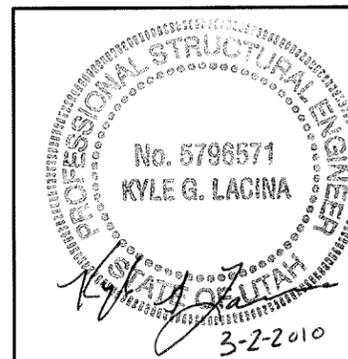
ENCOUNTERING SOIL FORMATIONS THAT WILL REQUIRE SPECIAL DESIGN CONSIDERATIONS OR EXCAVATION PROCEDURES MAY OCCUR. POLE FOUNDATIONS WILL NEED TO BE ANALYZED ACCORDING TO THE SOIL CONDITIONS THAT EXIST. IF ANY DISCREPANCIES OR INCONSISTENCIES ARISE, NOTIFY THE ENGINEER OF SUCH DISCREPANCIES. FOUNDATIONS WILL THEN BE REVISED ACCORDINGLY. REVISIONS WILL BE ANALYZED PER RECOMMENDATIONS DIRECTED BY A REGISTERED ENGINEER.

ALL EXCAVATIONS MUST BE FREE OF WATER, LOOSE SOIL AND DEBRIS PRIOR TO FOUNDATION INSTALLATION AND CONCRETE BACKFILL PLACEMENT. TEMPORARY CASINGS OR DRILLERS SLURRY MAY BE USED TO STABILIZE THE EXCAVATION DURING INSTALLATION. CASINGS MUST BE REMOVED DURING CONCRETE BACKFILL PLACEMENT.

FIXTURES MUST BE LOCATED TO MAINTAIN 10'-0" MINIMUM HORIZONTAL CLEARANCE FROM ANY OBSTRUCTION.

POLES, BASE PLATES, ANCHOR BOLTS AND FORCES PROVIDED BY POLE MANUFACTURER, VALMONT INDUSTRIES, INC. FIXTURES AND ELECTRICAL ITEMS PER MUSCO LIGHTING.

TOP OF FOUNDATION SHOULD BE A MINIMUM OF 18" AND A MAXIMUM OF 24" ABOVE GRADE. ANY FOUNDATION PROJECTION OUTSIDE THIS RANGE MUST BE APPROVED BY OWNER AND MUSCO LIGHTING, LLC.



I HEREBY CERTIFY THAT THIS ENGINEERING DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT PERSONAL SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF UTAH.

KYLE G. LACINA - NO. 5796571
 LICENSE RENEWAL DATE: MARCH 31, 2009

DRAWING NO. COVERED BY THIS SEAL: C2

STRUCTURAL ENGINEERS, P.C.
 114 NICHOLAS DRIVE
 MARSHALLTOWN, IOWA 50158
 TELEPHONE NUMBER: 641-752-6334
 EMAIL: MSL.INFO@SEPC.BIZ

MUSCO
 SPORTS LIGHTING, LLC.
 2107 STEWART ROAD
 MUSCATINE, IOWA 52761
 563-263-2281

WEBER STATE UNIVERSITY
 FOOTBALL FIELD
 OGDEN, UTAH

DRAWING TITLE: POLE SUPPORT FOUNDATION
 SCALE: SEE PLAN
 NOTES:

PROJECT NO. 144554

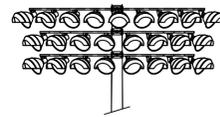
DATE MARCH 2, 2010

DRAWING NO. C2
 OF ONE

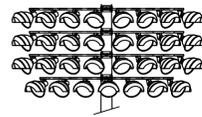
REVISIONS:

DATE	BY	DESCRIPTION
02/22/10	BH	Added future fixture note
02/23/10	AM	ADD INCREASED FOOT CANDLE CONFIGS.
02/23/10	UG	ADD F5 TOWER CONFIGURATIONS

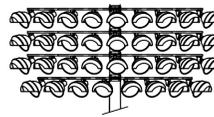
JOB NUMBER: 144554
DRAWN BY: A.MULLEN
CHECK BY:
REPRESENTATIVE:
SCALE: 1:120
DATE: 02/22/10
DRAWING NUMBER: 144554X1
1 OF 1 SHEETS



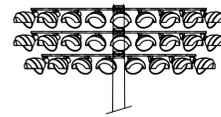
25 FIXTURE 100FC CONFIG.



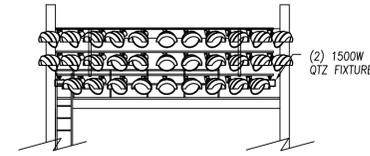
31 FIXTURE 100FC CONFIG.



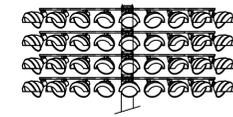
35 FIXTURE 100FC CONFIG.



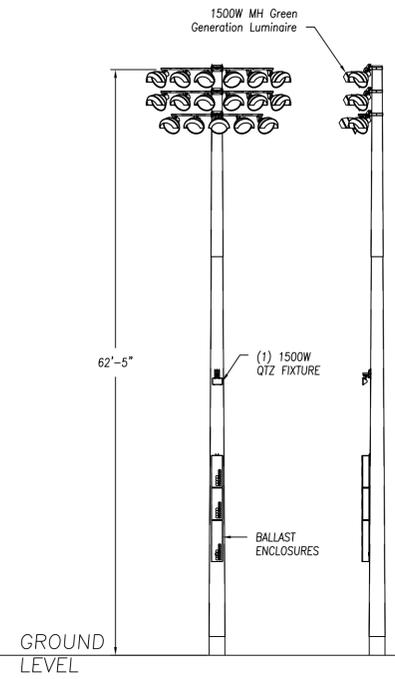
26 FIXTURE 100FC CONFIG.



31 FIXTURE 100FC CONFIG.
+2 1500W QUARTZ FIXTURES

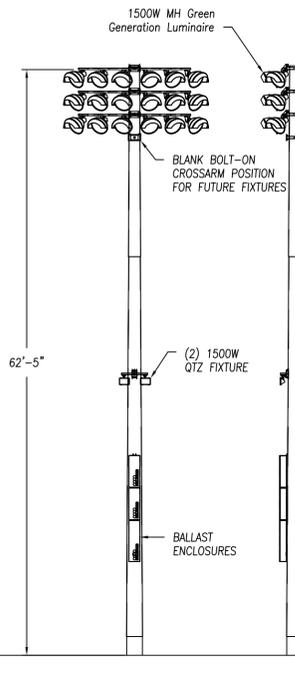


36 FIXTURE 100FC CONFIG.



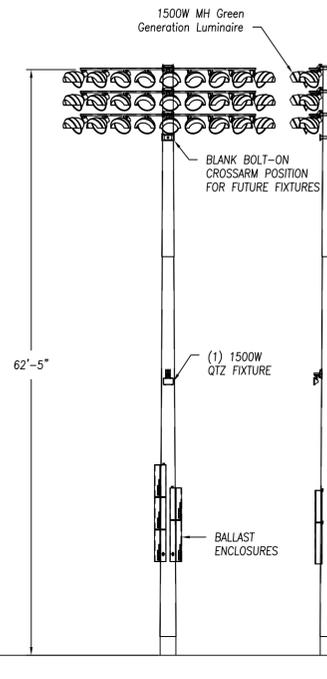
F1 POLE

17 FIXTURE 85 FC CONFIG
1 1500W QIZ FIXTURE
MUSCO 60F LIGHT-STRUCTURE
Pole sized for additional future fixtures for 100FC lighting



F2 POLE

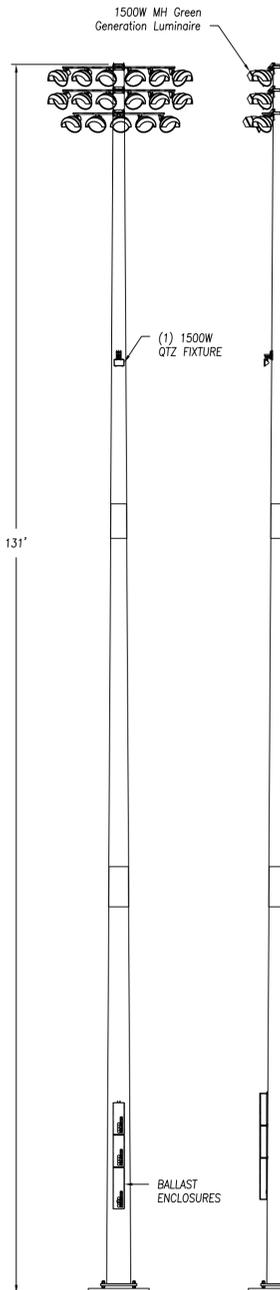
18 FIXTURE 85 FC CONFIG
2 1500W QIZ FIXTURE
MUSCO 60F LIGHT-STRUCTURE
Pole sized for additional future fixtures for 100FC lighting



F3 POLE

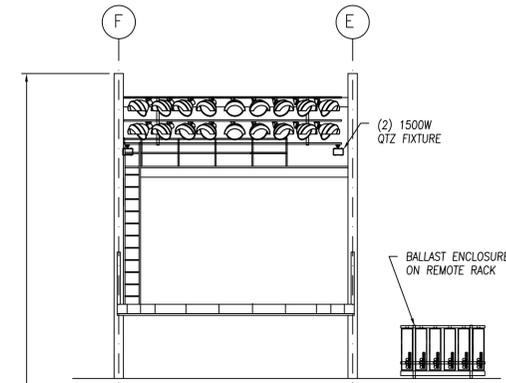
27 FIXTURE 85 FC CONFIG
1 1500W QIZ FIXTURE
MUSCO 60F LIGHT-STRUCTURE
Pole sized for additional future fixtures for 100FC lighting

+76' ELEVATION



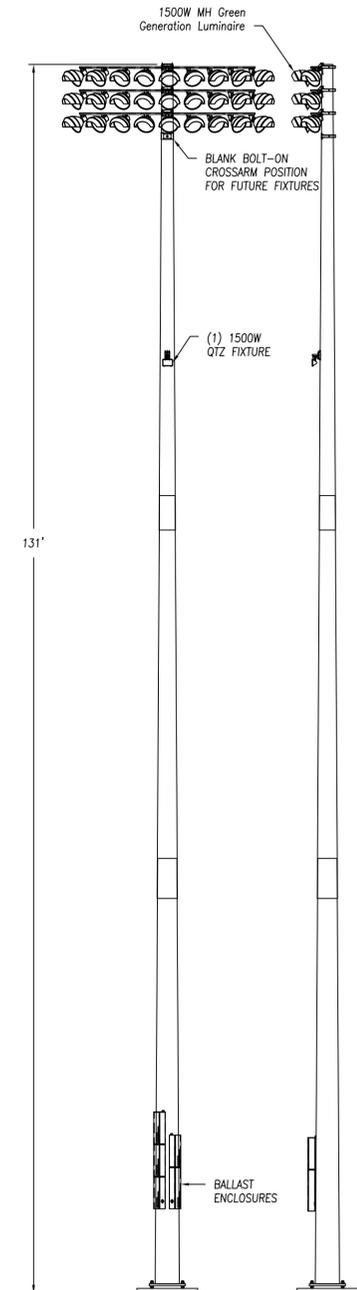
F6 POLE

17 FIXTURE CONFIG. 85 FC CONFIG.
1 1500W QIZ FIXTURE
VALMONT 130' BASEPLATE POLE
Pole sized for additional future fixtures for 100FC lighting



F5 POLE

18 FIXTURE CONFIG. 85 FC CONFIG.
2 1500W QIZ FIXTURE
LIGHT RACK ON EXISTING TOWER
Rack sized for additional future fixtures for 100FC lighting



F4 POLE

27 FIXTURE CONFIG. 85 FC CONFIG.
1 1500W QIZ FIXTURE
VALMONT 130' BASEPLATE POLE
Pole sized for additional future fixtures for 100FC lighting

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/36 FIXTURES

FOLDER: MUSC148 FILE: 36FIX130

ELEVATION OF FOUNDATION ABOVE SURROUNDING TERRAIN = 0.0 (FT)
 STEPS INCLUDED ? NO

IMPORTANCE FACTOR: 1.00 EXPOSURE CATEGORY: C
 WIND VELOCITY = 100 MPH CRITERIA: IBC 2006 (MOD W/AASHTO)
 ICE INCLUDED ? NO

DESIGN SUMMARY
 POLE

HEIGHT (FT)	POLE SHAFT WEIGHT (LBS)	GROUND LINE DIAMETER (IN)	TOP DIAMETER (IN)
130.00	11435	31.00	14.05

SECTION JOINTS	JOINT 1	JOINT 2
HEIGHT	45.34 FT	84.03 FT
TYPE	Slip Joint	Slip Joint
OVERLAP LENGTH	51.2 IN	44.1 IN

SECTION CHARACTERISTICS	SECTION 1	SECTION 2	SECTION 3
SHAPE	16 C-C	ROUND	ROUND
BASE DIAMETER (IN)	31.00	26.00	21.00
TOP DIAMETER (IN)	24.65	19.99	14.05
THICKNESS (IN)	0.37500	0.37500	0.25000
LENGTH (FT)	45.34	42.96	49.64
WEIGHT (LBS)	5094	3977	2364
TAPER (IN/FT)	0.1400	0.1400	0.1400
YIELD STRENGTH (KSI)	65	55	55
MATERIAL	S22 - 65	S220 - 55	S220 - 55
BEND RADIUS (IN)	4.00		

BASE PLATE (ROUND)

MATERIAL	= S12 - 50 ksi
DIAMETER	= 46.00 IN
THICKNESS	= 2.250 IN
YIELD STRENGTH	= 50 KSI

ANCHOR BOLTS

MATERIAL	= S100 - 55 ksi
BOLT DIAMETER	= 2.25 IN
BOLT CIRCLE	= 38.00 IN
QUANTITY	= 10
ULTIMATE STRENGTH	= 75 KSI

Projection = 2.25" ± 0.25"

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/36 FIXTURES

FOLDER: MUSC148 FILE: 36FIX130

ELEVATION OF FOUNDATION ABOVE SURROUNDING TERRAIN = 0.0 (FT)
 STEPS INCLUDED ? NO

IMPORTANCE FACTOR: 1.00 EXPOSURE CATEGORY: C
 WIND VELOCITY = 100 MPH CRITERIA: IBC 2006 (MOD W/AASHTO)
 ICE INCLUDED ? NO

DESCRIPTION OF EPA LOADING *

=====

POSITION OF LOAD	MOUNTING** HEIGHT (FT)	DISTANCE TO CENT. FROM POLE (FT)	WEIGHT (LBS)	EFFECTIVE PROJECTED AREA SQ. (FT)
POLE	129.67	0.00	360	24.30
POLE	127.21	0.00	360	24.30
POLE	124.75	0.00	360	24.30
POLE	122.30	0.00	320	21.60
POLE	100.00	0.00	15	1.50
POLE	15.00	0.00	1750	38.50

* THE VALUES SHOWN IN THIS TABLE MUST NOT BE EXCEEDED WITHOUT CONSULTING VALMONT. ANY SIZES OR OTHER DIMENSIONS NOT PROVIDED BY THE SPECIFYING AGENCY HAVE BEEN ESTIMATED BY VALMONT.

** THESE HEIGHTS ARE ABOVE BOTTOM OF BASE PLATE OR TRANSFORMER BASE.

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/36 FIXTURES

FOLDER: MUSC148 FILE: 36FIX130

R E S U L T S S U M M A R Y

MAXIMUM COMBINED STRESS RATIO
IN EACH MAJOR COMPONENT
====(GROUPS I,II & III)====

POLE (AT 0.00 (FT)) = 0.91
BASE PLATE = 0.58
ANCHOR BOLTS = 0.82

MAXIMUM REACTIONS APPLIED TO FOUNDATION
=====

BENDING MOMENT = 863470 FT-LBS
TORSION = 0 FT-LBS
SHEAR FORCE = 9860 LBS
AXIAL FORCE = 15227 LBS

MAXIMUM BENDING + AXIAL DEAD WT. STRESS
=====

POLE = 0.40 KSI

RESULTANT DEFLECTION OF POLE TOP
CAUSED BY DEAD WEIGHT
=====

0.00 DEGREES

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/36 FIXTURES

FOLDER: MUSC148 FILE: 36FIX130

POLE PROPERTIES

HEIGHT (FT)	DIAMETER* (IN)	WALL THK. (IN)	ROUNDNESS RATIO %	D/T*	MOMENTS OF INERTIA (IN ⁴)	PLASTIC SECT. MOD. (IN ³)	AREA (IN ²)
130.00	14.050	0.2500	100.00	56.20	257.66	47.57	10.84
129.67	14.096	0.2500	100.00	56.38	260.26	47.89	10.87
127.21	14.441	0.2500	100.00	57.76	280.16	50.30	11.14
125.00	14.750	0.2500	100.00	59.00	298.89	52.52	11.38
124.75	14.785	0.2500	100.00	59.14	301.06	52.77	11.41
122.30	15.128	0.2500	100.00	60.51	322.88	55.29	11.68
120.00	15.450	0.2500	100.00	61.80	344.30	57.71	11.93
115.00	16.150	0.2500	100.00	64.60	394.09	63.15	12.48
110.00	16.850	0.2500	100.00	67.40	448.46	68.83	13.03
105.00	17.550	0.2500	100.00	70.20	507.61	74.76	13.58
100.00	18.250	0.2500	100.00	73.00	571.76	80.93	14.13
95.00	18.950	0.2500	100.00	75.80	641.09	87.35	14.68
90.00	19.650	0.2500	100.00	78.60	715.81	94.01	15.23
85.00	20.350	0.2500	100.00	81.40	796.12	100.91	15.78
84.03	20.485	0.2500	100.00	81.94	812.30	102.28	15.89
84.03	19.985	0.3750	100.00	53.29	1109.06	144.08	23.10
80.36	20.500	0.3750	100.00	54.67	1198.63	151.74	23.70
80.00	20.550	0.3750	100.00	54.80	1207.65	152.50	23.76
75.00	21.250	0.3750	100.00	56.67	1337.76	163.27	24.59
70.00	21.950	0.3750	100.00	58.53	1476.90	174.40	25.41
65.00	22.650	0.3750	100.00	60.40	1625.36	185.90	26.23
60.00	23.350	0.3750	100.00	62.27	1783.45	197.77	27.06
55.00	24.050	0.3750	100.00	64.13	1951.47	210.00	27.88
50.00	24.750	0.3750	100.00	66.00	2129.73	222.61	28.71
45.34	25.402	0.3750	100.00	67.74	2305.27	234.68	29.48
45.34	24.652	0.3750	98.70	65.74	2082.27	219.71	28.61
45.00	24.700	0.3750	98.70	65.87	2094.53	220.57	28.67
41.08	25.249	0.3750	98.69	67.33	2238.65	230.58	29.31
40.00	25.400	0.3750	98.68	67.73	2279.33	233.36	29.48
35.00	26.100	0.3750	98.67	69.60	2474.68	246.51	30.30
30.00	26.800	0.3750	98.65	71.47	2680.89	260.02	31.12
25.00	27.500	0.3750	98.64	73.33	2898.25	273.90	31.94
20.00	28.200	0.3750	98.62	75.20	3127.05	288.13	32.76
15.00	28.900	0.3750	98.61	77.07	3367.59	302.72	33.58
10.00	29.600	0.3750	98.60	78.93	3620.15	317.68	34.40
5.00	30.300	0.3750	98.59	80.80	3885.04	332.99	35.22
0.00	31.000	0.3750	98.57	82.67	4162.43	348.66	36.04

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/36 FIXTURES

FOLDER: MUSC148 FILE: 36FIX130

POLE PROPERTIES

=====

HEIGHT	DIAMETER*	WALL	ROUNDNESS		MOMENTS OF	PLASTIC	
(FT)	(IN)	THK.	RATIO	D/T*	INERTIA	SECT. MOD.	AREA
		(IN)	%		(IN^4)	(IN^3)	(IN^2)

* DIAMETER IS MEASURED ACROSS CORNERS FOR POLYGON SHAPES
SECTION MODULUS IS BASED ON ACROSS-FLATS DIMENSION

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/36 FIXTURES

FOLDER: MUSC148 FILE: 36FIX130

WIND and WEIGHT FORCE DATA - GROUP LOAD 2

```
=====
```

ELEVATION TOP OF SEGMENT (FT)	CENTROID ABOVE BASE (FT)	WEIGHT FORCE (LBS)	PROJECTED AREA (FT^2)	DRAG COEFF	VELOCITY RESPONSE PRESSURE (PSF)	WIND FORCE (LBS)
ATTCHMT. 1	129.67	360.00	24.30	1.00	39.01	948.0
ATTCHMT. 2	127.21	360.00	24.30	1.00	38.86	944.2
ATTCHMT. 3	124.75	360.00	24.30	1.00	38.70	940.3
ATTCHMT. 4	122.30	320.00	21.60	1.00	38.53	832.4
ATTCHMT. 5	100.00	15.00	1.50	1.00	36.94	55.4
ATTCHMT. 6	15.00	1750.00	38.50	1.00	24.77	953.8
130.00	129.83	12.19	0.39	0.67	39.02	10.0
129.67	128.44	92.14	2.93	0.67	38.93	75.7
127.21	126.10	84.70	2.69	0.67	38.78	69.3
125.00	124.88	9.70	0.31	0.67	38.70	7.9
124.75	123.52	96.27	3.05	0.67	38.62	78.4
122.30	121.15	92.41	2.93	0.67	38.46	74.9
120.00	117.48	207.73	6.58	0.67	38.21	167.3
115.00	112.48	217.08	6.88	0.67	37.86	173.1
110.00	107.48	226.43	7.17	0.67	37.50	178.7
105.00	102.48	235.78	7.46	0.67	37.13	184.1
100.00	97.48	245.13	7.75	0.67	36.74	189.3
95.00	92.48	254.48	8.04	0.67	36.33	194.3
90.00	87.49	263.83	8.33	0.67	35.91	199.0
85.00	84.52	52.21	1.64	0.67	35.65	39.0
84.03	82.19	833.26	6.20	0.67	35.44	146.1
80.36	80.18	29.07	0.62	0.67	35.26	14.4
80.00	77.49	411.29	8.71	0.67	35.01	202.7
75.00	72.49	425.31	9.00	0.67	34.52	206.6
70.00	67.49	439.34	9.29	0.67	34.00	210.1
65.00	62.49	453.37	9.58	0.67	33.46	213.2
60.00	57.49	467.40	9.87	0.67	32.87	215.9
55.00	52.49	481.42	10.17	0.67	32.25	218.0
50.00	47.66	461.65	9.73	0.67	31.60	204.6
45.34	45.17	137.34	0.70	0.67	31.25	14.6
45.00	43.03	1594.63	8.17	0.67	30.93	167.9
41.08	40.54	107.71	2.27	0.67	30.54	46.2
40.00	37.49	508.64	10.73	0.67	30.04	214.4
35.00	32.49	522.58	11.02	0.67	29.15	213.7
30.00	27.49	536.52	11.31	0.67	28.15	211.7

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/36 FIXTURES

FOLDER: MUSC148 FILE: 36FIX130

WIND and WEIGHT FORCE DATA - GROUP LOAD 2

=====

ELEVATION TOP OF SEGMENT (FT)	CENTROID ABOVE BASE (FT)	WEIGHT FORCE (LBS)	PROJECTED AREA (FT^2)	DRAG COEFF	VELOCITY RESPONSE PRESSURE (PSF)	WIND FORCE (LBS)
25.00	22.49	550.46	11.60	0.67	26.98	208.2
20.00	17.49	564.40	11.90	0.67	25.59	202.4
15.00	12.49	578.35	12.19	0.67	24.77	200.8
10.00	7.49	592.29	12.48	0.67	24.77	205.6
5.00	2.49	605.33	12.77	0.67	24.77	210.4

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/36 FIXTURES

FOLDER: MUSC148 FILE: 36FIX130

ANALYSIS OF POLE: FORCES AND MOMENTS - GROUP LOAD 2

SECTION HEIGHT* (FT)	GROUP LOAD NO.	FORCES (LBS)		MOMENTS (FT-LBS)		
		AXIAL	SHEAR	PRIMARY	SECONDARY	TOTAL
130.00	2	0	0	0	0	0
129.67	2	131	1020	2	0	2
127.21	2	342	2120	2452	178	2630
125.00	2	427	2208	6900	513	7412
124.75	2	560	3217	7412	553	7965
122.30	2	769	4202	14847	1123	15971
120.00	2	875	4295	23918	1827	25745
115.00	2	1109	4501	44242	3509	47751
110.00	2	1363	4711	65418	5391	70809
105.00	2	1636	4923	87473	7458	94931
100.00	2	1929	5192	110435	9690	120125
95.00	2	2237	5405	134608	12072	146680
90.00	2	2562	5616	159740	14567	174307
85.00	2	2872	5840	185855	17142	202997
84.03	2	2925	5887	191016	17646	208662
84.03	2	2952	5874	191016	17646	208662
80.36	2	3471	6094	210989	19681	230670
80.00	2	3532	6095	212976	19891	232867
75.00	2	4008	6324	241111	22899	264010
70.00	2	4501	6549	270269	26034	296303
65.00	2	5013	6771	300469	29259	329729
60.00	2	5542	6988	331728	32536	364264
55.00	2	6088	7199	364059	35824	399883
50.00	2	6648	7405	397475	39080	436555
45.34	2	7115	7657	429590	42046	471636
45.34	2	7155	7620	429590	42046	471636
45.00	2	7260	7608	431985	42260	474245
41.08	2	8101	7812	459841	44741	504582
40.00	2	8263	7812	467607	45418	513024
35.00	2	8869	7971	504321	48407	552728
30.00	2	9490	8119	542113	51100	593213
25.00	2	10125	8254	580974	53445	634419
20.00	2	10776	8373	620890	55386	676276
15.00	2	13166	9475	661831	56870	718702
10.00	2	13755	9691	708550	58068	766618
5.00	2	14459	9761	756285	58601	814886

ANALYSIS OF VALMONT INDUSTRIES LIGHTING STRUCTURE
 IN ACCORDANCE WITH IBC 2006 (MOD W/AASHTO) RQMTS. (FINAL DEFLECTED POSITION)
 BY MLS 02/17/2010 VERSION Fuse 1.9.0.363 Page: 9

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/36 FIXTURES

FOLDER: MUSC148 FILE: 36FIX130

ANALYSIS OF POLE: FORCES AND MOMENTS - GROUP LOAD 2

=====

SECTION HEIGHT* (FT)	GROUP LOAD NO.	FORCES (LBS)		MOMENTS (FT-LBS)		
		AXIAL	SHEAR	PRIMARY	SECONDARY	TOTAL
0.00	2	15177	9823	805059	58411	863470

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/36 FIXTURES

FOLDER: MUSC148 FILE: 36FIX130

ANALYSIS OF POLE: STRESSES - GROUP LOAD 2

=====

SECTION HEIGHT* (FT)	GROUP LOAD NO.	COMB. STR. RATIO	APPLIED STRESS (KSI)			REQ STRGTH (LBS / FT-LBS)		
			AXIAL	BEND.	SHEAR	AXIAL	BEND.	SHEAR
130.00	2	0.00	0.00	0.00	0.00	356849	120495	174173
129.67	2	0.00	0.01	0.00	0.19	358044	121244	173897
127.21	2	0.02	0.03	0.81	0.38	366950	126907	171885
125.00	2	0.06	0.04	2.19	0.39	374951	132102	170136
124.75	2	0.06	0.05	2.35	0.56	375856	132696	169941
122.30	2	0.12	0.07	4.49	0.72	384725	138589	168069
120.00	2	0.18	0.07	6.93	0.72	393052	144237	166367
115.00	2	0.31	0.09	11.74	0.72	411153	156899	162838
110.00	2	0.42	0.10	15.96	0.72	429255	170089	159524
105.00	2	0.52	0.12	19.69	0.72	447356	183806	156404
100.00	2	0.62	0.14	23.01	0.73	465457	198051	153460
95.00	2	0.70	0.15	26.01	0.74	483559	212822	150676
90.00	2	0.77	0.17	28.71	0.74	501660	228122	148039
85.00	2	0.84	0.18	31.13	0.74	519761	243949	145535
84.03	2	0.86	0.18	31.57	0.74	523259	247067	145066
84.03	2	0.57	0.13	22.56	0.51	760641	367894	402033
80.36	2	0.60	0.15	23.67	0.51	780592	385956	397148
80.00	2	0.61	0.15	23.78	0.51	782547	387749	396679
75.00	2	0.65	0.16	25.16	0.51	809699	413075	390330
70.00	2	0.68	0.18	26.42	0.52	836851	439191	384276
65.00	2	0.71	0.19	27.57	0.52	864003	466099	378495
60.00	2	0.75	0.20	28.62	0.52	891155	493798	372966
55.00	2	0.77	0.22	29.57	0.52	918307	522288	367673
50.00	2	0.80	0.23	30.44	0.52	945459	551570	362599
45.34	2	0.82	0.24	31.18	0.52	970754	579560	358056
45.34	2	0.77	0.25	33.74	0.54	1113542	622678	366712
45.00	2	0.77	0.25	33.79	0.53	1115723	624987	366369
41.08	2	0.78	0.28	34.38	0.54	1140748	651777	362512
40.00	2	0.79	0.28	34.53	0.53	1147616	659228	361474
35.00	2	0.81	0.29	35.21	0.53	1179510	694376	356770
30.00	2	0.82	0.30	35.81	0.53	1211403	730431	352245
25.00	2	0.84	0.32	36.34	0.52	1243296	767393	347887
20.00	2	0.85	0.33	36.81	0.51	1275190	805261	343687

* THESE HEIGHTS ARE ABOVE THE POLE BASE PLATE.

ANALYSIS OF VALMONT INDUSTRIES LIGHTING STRUCTURE
 IN ACCORDANCE WITH IBC 2006 (MOD W/AASHTO) RQMTS. (FINAL DEFLECTED POSITION)
 BY MLS 02/17/2010 VERSION Fuse 1.9.0.363 Page: 11

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/36 FIXTURES

FOLDER: MUSC148 FILE: 36FIX130

ANALYSIS OF POLE: STRESSES - GROUP LOAD 2

=====

SECTION HEIGHT* (FT)	GROUP LOAD NO.	COMB. STR. RATIO	APPLIED STRESS (KSI)			REQ STRGTH (LBS / FT-LBS)		
			AXIAL	BEND.	SHEAR	AXIAL	BEND.	SHEAR
15.00	2	0.86	0.39	37.23	0.57	1307083	844037	339636
10.00	2	0.88	0.40	37.83	0.57	1338977	883718	335724
5.00	2	0.90	0.41	38.35	0.56	1370870	924307	331945
0.00	2	0.91	0.42	38.80	0.55	1402751	965786	328291

* THESE HEIGHTS ARE ABOVE THE POLE BASE PLATE.

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/36 FIXTURES

FOLDER: MUSC148 FILE: 36FIX130

BASE PLATE (ROUND)

```
=====
DIAMETER                =          46.00 IN
THICKNESS               =          2.250 IN
YIELD STRENGTH         =          50 KSI
STATIC COMBINED STRESS RATIO =          0.58
```

ANALYSIS OF BASE PLATE

```
=====
COMBINED STRESS RATIO    =          0.58
GROUP LOAD NUMBER       =           2
CRITICAL WIND DIRECT.*  =          41.25 DEGREES
ALIGNMENT OF THE BEND LINE =          236.25 DEGREES
  BOLT FORCES:
                        =          105400 LBS
                        =          105106 LBS
BOLT-TO-BEND LINE MOMENT ARM =          2.75 IN
                        =          3.21 IN
WIDTH OF BENDING SECTION =          34.22 IN
APPLIED BENDING STRESS  =          21.72 KSI
ALLOWABLE BENDING STRESS =          37.50 KSI
```

ANCHOR BOLTS

```
=====
QUANTITY                =           10
BOLT DIAMETER           =           2.25 IN
BOLT CIRCLE             =           38.00 IN
INITIAL BOLT ANGLE     =           0.00 DEGREES
BOLT LENGTH             =           89 IN
YIELD STRENGTH         =          55.00 KSI
ULTIMATE STRENGTH      =          75.00 KSI
STATIC COMBINED STRESS RATIO =          0.82
```

ANALYSIS OF ANCHOR BOLTS

```
=====
```

GROUP LOAD NO.	CRITICAL WIND DIRECT* (DEG)	MAX. COMB. STRESS RATIO	AXIAL FORCE (LBS)	SHEAR FORCE (LBS)	APPLIED		ALLOWABLE	
					STRESS (KSI) =====	SHEAR	STRESS (KSI) =====	SHEAR
2	61	0.82	110509	974	34.00	0.30	37.50	22.50

* THESE ARE DIRECTIONS TOWARD WHICH THE WIND IS FLOWING.

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/36 FIXTURES

FOLDER: MUSC148 FILE: 36FIX130

POLE DEFLECTION INFORMATION - GROUP LOAD 2

```
=====
```

ELEVATION FT	ROTATION DEGREES	SLOPE IN/FT	DEFLECTION FT	DEFLECTION IN
130.00	8.80	1.88	10.96	131.57
129.67	8.80	1.88	10.91	130.96
127.21	8.80	1.88	10.54	126.47
125.00	8.79	1.88	10.20	122.44
124.75	8.78	1.88	10.17	121.99
122.30	8.75	1.87	9.79	117.53
120.00	8.70	1.86	9.45	113.37
115.00	8.52	1.82	8.70	104.43
110.00	8.27	1.76	7.98	95.71
105.00	7.97	1.70	7.27	87.27
100.00	7.61	1.62	6.60	79.17
95.00	7.22	1.53	5.95	71.46
90.00	6.80	1.44	5.35	64.16
85.00	6.36	1.35	4.78	57.30
84.03	6.27	1.33	4.67	56.03
84.03	6.27	1.33	4.67	56.03
80.36	6.02	1.27	4.28	51.33
80.00	5.99	1.27	4.24	50.88
75.00	5.65	1.19	3.73	44.80
70.00	5.29	1.12	3.26	39.09
65.00	4.94	1.04	2.81	33.75
60.00	4.57	0.96	2.40	28.78
55.00	4.21	0.89	2.02	24.19
50.00	3.85	0.81	1.67	19.98
45.34	3.51	0.74	1.37	16.40
45.34	3.51	0.74	1.37	16.40
45.00	3.48	0.73	1.35	16.15
41.08	3.16	0.66	1.12	13.43
40.00	3.08	0.65	1.06	12.72
35.00	2.68	0.56	0.81	9.71
30.00	2.28	0.48	0.59	7.11
25.00	1.89	0.40	0.41	4.92
20.00	1.51	0.32	0.26	3.14
15.00	1.12	0.24	0.15	1.76
10.00	0.75	0.16	0.07	0.78
5.00	0.37	0.08	0.02	0.20
0.00	0.00	0.00	0.00	0.00

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/26 FIXTURES

FOLDER: MUSC148 FILE: 26FIX130

ELEVATION OF FOUNDATION ABOVE SURROUNDING TERRAIN = 0.0 (FT)
 STEPS INCLUDED ? NO

IMPORTANCE FACTOR: 1.00 EXPOSURE CATEGORY: C
 WIND VELOCITY = 100 MPH CRITERIA: IBC 2006 (MOD W/AASHTO)
 ICE INCLUDED ? NO

DESIGN SUMMARY
 POLE

=====

HEIGHT (FT)	POLE SHAFT WEIGHT (LBS)	GROUND LINE DIAMETER (IN)	TOP DIAMETER (IN)
130.00	9946	31.00	13.93

SECTION JOINTS	JOINT 1	JOINT 2
HEIGHT	44.47 FT	83.15 FT
TYPE	Slip Joint	Slip Joint
OVERLAP LENGTH	51.4 IN	44.1 IN

SECTION CHARACTERISTICS	SECTION 1	SECTION 2	SECTION 3
SHAPE	16 C-C	ROUND	ROUND
BASE DIAMETER (IN)	31.00	26.00	21.00
TOP DIAMETER (IN)	24.77	19.99	13.93
THICKNESS (IN)	0.31300	0.31300	0.25000
LENGTH (FT)	44.47	42.96	50.53
WEIGHT (LBS)	4206	3342	2398
TAPER (IN/FT)	0.1400	0.1400	0.1400
YIELD STRENGTH (KSI)	65	55	55
MATERIAL	S22 - 65	S220 - 55	S220 - 55
BEND RADIUS (IN)	4.00		

BASE PLATE (ROUND)

MATERIAL	= S12 - 50 ksi
DIAMETER	= 46.00 IN
THICKNESS	= 2.250 IN
YIELD STRENGTH	= 50 KSI

ANCHOR BOLTS

=====

MATERIAL	= S100 - 55 ksi
BOLT DIAMETER	= 2.25 IN
BOLT CIRCLE	= 38.00 IN
QUANTITY	= 8
ULTIMATE STRENGTH	= 75 KSI

Projection = 8.25" ± 0.25"

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/26 FIXTURES

FOLDER: MUSC148 FILE: 26FIX130

ELEVATION OF FOUNDATION ABOVE SURROUNDING TERRAIN = 0.0 (FT)
 STEPS INCLUDED ? NO

IMPORTANCE FACTOR: 1.00 EXPOSURE CATEGORY: C
 WIND VELOCITY = 100 MPH CRITERIA: IBC 2006 (MOD W/AASHTO)
 ICE INCLUDED ? NO

DESCRIPTION OF EPA LOADING *

=====

POSITION OF LOAD	MOUNTING** HEIGHT (FT)	DISTANCE TO CENT. FROM POLE (FT)	WEIGHT (LBS)	EFFECTIVE PROJECTED AREA SQ. (FT)
POLE	129.67	0.00	360	25.20
POLE	127.21	0.00	320	22.40
POLE	124.75	0.00	320	22.40
POLE	100.00	0.00	15	1.50
POLE	15.00	0.00	1250	27.50

* THE VALUES SHOWN IN THIS TABLE MUST NOT BE EXCEEDED WITHOUT CONSULTING VALMONT. ANY SIZES OR OTHER DIMENSIONS NOT PROVIDED BY THE SPECIFYING AGENCY HAVE BEEN ESTIMATED BY VALMONT.

** THESE HEIGHTS ARE ABOVE BOTTOM OF BASE PLATE OR TRANSFORMER BASE.

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/26 FIXTURES

FOLDER: MUSC148 FILE: 26FIX130

R E S U L T S S U M M A R Y

MAXIMUM COMBINED STRESS RATIO
IN EACH MAJOR COMPONENT
====(GROUPS I,II & III)====

MAXIMUM REACTIONS APPLIED TO FOUNDATION
=====

POLE (AT 0.00 (FT)) = 0.94
BASE PLATE = 0.49
ANCHOR BOLTS = 0.93

BENDING MOMENT = 733155 FT-LBS
TORSION = 0 FT-LBS
SHEAR FORCE = 8623 LBS
AXIAL FORCE = 12824 LBS

MAXIMUM BENDING + AXIAL DEAD WT. STRESS
=====

POLE = 0.40 KSI

RESULTANT DEFLECTION OF POLE TOP
CAUSED BY DEAD WEIGHT
=====

0.00 DEGREES

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/26 FIXTURES

FOLDER: MUSC148 FILE: 26FIX130

POLE PROPERTIES

```
=====
```

HEIGHT (FT)	DIAMETER* (IN)	WALL THK. (IN)	ROUNDNESS RATIO %	D/T*	MOMENTS OF INERTIA (IN^4)	PLASTIC SECT. MOD. (IN^3)	AREA (IN^2)
130.00	13.926	0.2500	100.00	55.70	250.78	46.72	10.74
129.67	13.972	0.2500	100.00	55.89	253.33	47.03	10.77
127.21	14.317	0.2500	100.00	57.27	272.88	49.42	11.04
125.00	14.626	0.2500	100.00	58.50	291.29	51.62	11.29
124.75	14.661	0.2500	100.00	58.64	293.42	51.87	11.31
120.00	15.326	0.2500	100.00	61.30	335.94	56.77	11.84
115.00	16.026	0.2500	100.00	64.10	384.94	62.17	12.39
110.00	16.726	0.2500	100.00	66.90	438.48	67.80	12.94
105.00	17.426	0.2500	100.00	69.70	496.78	73.69	13.49
100.00	18.126	0.2500	100.00	72.50	560.02	79.82	14.04
95.00	18.826	0.2500	100.00	75.30	628.42	86.19	14.59
90.00	19.526	0.2500	100.00	78.10	702.17	92.81	15.13
85.00	20.226	0.2500	100.00	80.90	781.48	99.67	15.68
83.15	20.485	0.2500	100.00	81.94	812.30	102.28	15.89
83.15	19.985	0.3130	100.00	63.85	934.47	121.02	19.34
80.00	20.426	0.3130	100.00	65.26	998.70	126.51	19.77
79.47	20.500	0.3130	100.00	65.50	1009.79	127.44	19.84
75.00	21.126	0.3130	100.00	67.50	1106.64	135.47	20.46
70.00	21.826	0.3130	100.00	69.73	1222.09	144.73	21.15
65.00	22.526	0.3130	100.00	71.97	1345.31	154.30	21.84
60.00	23.226	0.3130	100.00	74.20	1476.53	164.18	22.52
55.00	23.926	0.3130	100.00	76.44	1616.03	174.37	23.21
50.00	24.626	0.3130	100.00	78.68	1764.05	184.86	23.90
45.00	25.326	0.3130	100.00	80.91	1920.84	195.66	24.59
44.47	25.400	0.3130	100.00	81.15	1937.93	196.82	24.66
44.47	24.774	0.3130	98.70	79.15	1777.21	186.14	24.06
40.19	25.374	0.3130	98.68	81.07	1910.29	195.32	24.64
37.59	25.737	0.3130	98.68	82.23	1993.98	200.98	25.00
35.00	26.100	0.3130	98.67	83.39	2080.07	206.72	25.35
30.00	26.800	0.3130	98.65	85.62	2252.98	218.03	26.04
25.00	27.500	0.3130	98.64	87.86	2435.22	229.63	26.72
20.00	28.200	0.3130	98.62	90.10	2627.03	241.54	27.41
15.00	28.900	0.3130	98.61	92.33	2828.66	253.74	28.09
10.00	29.600	0.3130	98.60	94.57	3040.35	266.25	28.77
5.00	30.300	0.3130	98.59	96.81	3262.34	279.06	29.46
0.00	31.000	0.3130	98.57	99.04	3494.81	292.16	30.14

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/26 FIXTURES

FOLDER: MUSC148 FILE: 26FIX130

POLE PROPERTIES

=====

HEIGHT (FT)	DIAMETER* (IN)	WALL THK. (IN)	ROUNDNESS RATIO %	D/T*	MOMENTS OF INERTIA (IN^4)	PLASTIC SECT. MOD. (IN^3)	AREA (IN^2)
----------------	-------------------	----------------------	-------------------------	------	---------------------------------	---------------------------------	----------------

* DIAMETER IS MEASURED ACROSS CORNERS FOR POLYGON SHAPES
SECTION MODULUS IS BASED ON ACROSS-FLATS DIMENSION

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/26 FIXTURES

FOLDER: MUSC148 FILE: 26FIX130

WIND and WEIGHT FORCE DATA - GROUP LOAD 2

ELEVATION TOP OF SEGMENT (FT)	CENTROID ABOVE BASE (FT)	WEIGHT FORCE (LBS)	PROJECTED AREA (FT^2)	DRAG COEFF	VELOCITY RESPONSE PRESSURE (PSF)	WIND FORCE (LBS)
ATTCHMT. 1	129.67	360.00	25.20	1.00	39.01	983.1
ATTCHMT. 2	127.21	320.00	22.40	1.00	38.86	870.4
ATTCHMT. 3	124.75	320.00	22.40	1.00	38.70	866.8
ATTCHMT. 4	100.00	15.00	1.50	1.00	36.94	55.4
ATTCHMT. 5	15.00	1250.00	27.50	1.00	24.77	681.3
130.00	129.83	12.08	0.38	0.67	39.02	10.0
129.67	128.44	91.32	2.90	0.67	38.93	75.1
127.21	126.10	83.97	2.67	0.67	38.78	68.7
125.00	124.88	9.61	0.31	0.67	38.70	7.9
124.75	122.36	187.11	5.93	0.67	38.54	152.1
120.00	117.48	206.07	6.53	0.67	38.21	166.0
115.00	112.48	215.42	6.82	0.67	37.86	171.8
110.00	107.48	224.77	7.12	0.67	37.50	177.4
105.00	102.48	234.12	7.41	0.67	37.13	182.9
100.00	97.48	243.48	7.70	0.67	36.74	188.1
95.00	92.48	252.83	7.99	0.67	36.33	193.1
90.00	87.49	262.18	8.28	0.67	35.91	197.8
85.00	84.07	99.47	3.14	0.67	35.61	74.4
83.15	81.57	694.63	5.30	0.67	35.39	124.7
80.00	79.73	118.47	0.90	0.67	35.22	21.2
79.47	77.22	306.52	7.75	0.67	34.98	180.3
75.00	72.49	353.95	8.95	0.67	34.52	205.4
70.00	67.49	365.66	9.24	0.67	34.00	208.9
65.00	62.49	377.37	9.53	0.67	33.46	212.1
60.00	57.49	389.07	9.82	0.67	32.87	214.7
55.00	52.49	400.78	10.12	0.67	32.25	216.9
50.00	47.49	412.49	10.41	0.67	31.58	218.5
45.00	44.74	44.35	1.12	0.67	31.18	23.2
44.47	42.32	1455.72	8.95	0.67	30.82	183.5
40.19	38.89	219.04	5.52	0.67	30.28	111.2
37.59	36.29	222.17	5.60	0.67	29.84	111.1
35.00	32.49	437.18	11.02	0.67	29.15	213.7
30.00	27.49	448.82	11.31	0.67	28.15	211.7
25.00	22.49	460.45	11.60	0.67	26.98	208.2
20.00	17.49	472.09	11.90	0.67	25.59	202.4

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/26 FIXTURES

FOLDER: MUSC148 FILE: 26FIX130

WIND and WEIGHT FORCE DATA - GROUP LOAD 2

=====

ELEVATION TOP OF SEGMENT (FT)	CENTROID ABOVE BASE (FT)	WEIGHT FORCE (LBS)	PROJECTED AREA (FT^2)	DRAG COEFF	VELOCITY RESPONSE PRESSURE (PSF)	WIND FORCE (LBS)
15.00	12.49	483.73	12.19	0.67	24.77	200.8
10.00	7.49	495.36	12.48	0.67	24.77	205.6
5.00	2.49	506.71	12.77	0.67	24.77	210.4

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/26 FIXTURES

FOLDER: MUSC148 FILE: 26FIX130

ANALYSIS OF POLE: FORCES AND MOMENTS - GROUP LOAD 2

```
=====
```

SECTION HEIGHT* (FT)	GROUP LOAD NO.	FORCES (LBS)		MOMENTS (FT-LBS)		
		AXIAL	SHEAR	PRIMARY	SECONDARY	TOTAL
130.00	2	0	0	0	0	0
129.67	2	135	1052	2	0	2
127.21	2	336	2068	2537	170	2707
125.00	2	421	2155	6897	476	7373
124.75	2	545	3081	7400	513	7913
120.00	2	743	3271	21450	1555	23005
115.00	2	967	3476	37035	2849	39884
110.00	2	1207	3685	53464	4341	57805
105.00	2	1463	3897	70767	6019	76786
100.00	2	1737	4168	88970	7871	96841
95.00	2	2023	4384	108378	9890	118268
90.00	2	2324	4600	128738	12046	140784
85.00	2	2623	4825	150076	14316	164392
83.15	2	2724	4916	158230	15181	173411
83.15	2	2748	4902	158230	15181	173411
80.00	2	3150	5084	172412	16735	189147
79.47	2	3240	5101	174839	17011	191850
75.00	2	3598	5296	195761	19399	215160
70.00	2	4010	5515	220128	22159	242286
65.00	2	4437	5731	245530	24981	270512
60.00	2	4880	5943	271985	27835	299820
55.00	2	5337	6151	299508	30684	330192
50.00	2	5810	6354	328109	33494	361602
45.00	2	6266	6579	357799	36225	394024
44.47	2	6311	6607	360999	36508	397507
44.47	2	6346	6573	360999	36508	397507
40.19	2	7078	6831	387422	38805	426226
37.59	2	7353	6907	403807	40164	443971
35.00	2	7619	6994	420483	41460	461943
30.00	2	8123	7176	453450	43759	497210
25.00	2	8660	7326	487488	45754	533242
20.00	2	9209	7462	522579	47398	569977
15.00	2	11083	8192	558696	48644	607341
10.00	2	11578	8406	599228	49607	648835
5.00	2	12172	8496	640776	50007	690783
0.00	2	12779	8581	683364	49791	733155

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/26 FIXTURES

FOLDER: MUSC148 FILE: 26FIX130

ANALYSIS OF POLE: STRESSES - GROUP LOAD 2

=====

SECTION HEIGHT* (FT)	GROUP LOAD NO.	COMB. STR. RATIO	APPLIED STRESS (KSI)			REQ STRGTH (LBS / FT-LBS)		
			AXIAL	BEND.	SHEAR	AXIAL	BEND.	SHEAR
130.00	2	0.00	0.00	0.00	0.00	353643	118493	174918
129.67	2	0.00	0.01	0.00	0.20	354837	119237	174639
127.21	2	0.02	0.03	0.85	0.37	363743	124853	172602
125.00	2	0.06	0.04	2.22	0.38	371744	130007	170831
124.75	2	0.06	0.05	2.37	0.54	372649	130597	170634
120.00	2	0.17	0.06	6.30	0.55	389845	142049	167016
115.00	2	0.26	0.08	9.96	0.56	407947	154618	163447
110.00	2	0.35	0.09	13.23	0.57	426048	167714	160096
105.00	2	0.43	0.11	16.16	0.58	444149	181338	156943
100.00	2	0.50	0.12	18.81	0.59	462251	195489	153969
95.00	2	0.57	0.14	21.26	0.60	480352	210167	151159
90.00	2	0.63	0.15	23.49	0.61	498453	225373	148496
85.00	2	0.69	0.17	25.53	0.62	516555	241106	145969
83.15	2	0.71	0.17	26.24	0.62	523259	247067	145066
83.15	2	0.58	0.14	22.25	0.51	636891	301165	256695
80.00	2	0.61	0.16	23.21	0.51	651160	313914	253997
79.47	2	0.61	0.16	23.37	0.51	653562	316086	253552
75.00	2	0.65	0.18	24.64	0.52	673823	334700	249883
70.00	2	0.69	0.19	25.96	0.52	696486	356147	245962
65.00	2	0.72	0.20	27.18	0.53	719149	378254	242220
60.00	2	0.76	0.22	28.30	0.53	741812	401021	238643
55.00	2	0.79	0.23	29.33	0.53	764475	424448	235220
50.00	2	0.82	0.24	30.29	0.53	787137	448536	231940
45.00	2	0.84	0.25	31.17	0.54	809800	473284	228794
44.47	2	0.85	0.26	31.26	0.54	812195	475937	228469
44.47	2	0.78	0.26	33.47	0.55	936381	517614	233461
40.19	2	0.80	0.29	34.19	0.56	959194	541940	230773
37.59	2	0.81	0.29	34.61	0.56	973001	556934	229191
35.00	2	0.82	0.30	35.00	0.56	986809	572131	227641
30.00	2	0.84	0.31	35.71	0.55	1013429	602005	224739
25.00	2	0.86	0.32	36.35	0.55	1040049	632636	221945
20.00	2	0.87	0.34	36.93	0.55	1066669	664023	219252
15.00	2	0.89	0.39	37.45	0.59	1093290	696168	216656

* THESE HEIGHTS ARE ABOVE THE POLE BASE PLATE.

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/26 FIXTURES

FOLDER: MUSC148 FILE: 26FIX130

ANALYSIS OF POLE: STRESSES - GROUP LOAD 2

=====

SECTION HEIGHT* (FT)	GROUP LOAD NO.	COMB. STR. RATIO	APPLIED STRESS (KSI)			REQ STRGTH (LBS / FT-LBS)		
			AXIAL	BEND.	SHEAR	AXIAL	BEND.	SHEAR
10.00	2	0.91	0.40	38.12	0.59	1119910	729069	214149
5.00	2	0.92	0.41	38.71	0.58	1146530	762727	211727
0.00	2	0.94	0.42	39.23	0.57	1173141	797129	209387

* THESE HEIGHTS ARE ABOVE THE POLE BASE PLATE.

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/26 FIXTURES

FOLDER: MUSC148 FILE: 26FIX130

BASE PLATE (ROUND)

```
=====
DIAMETER                =          46.00 IN
THICKNESS                =          2.250 IN
YIELD STRENGTH          =          50 KSI
STATIC COMBINED STRESS RATIO =          0.49
```

ANALYSIS OF BASE PLATE

```
=====
COMBINED STRESS RATIO    =          0.49
GROUP LOAD NUMBER        =          2
CRITICAL WIND DIRECT.*   =          51.25 DEGREES
ALIGNMENT OF THE BEND LINE =          225.00 DEGREES
  BOLT FORCES:
                        =          109493 LBS
                        =          107561 LBS
BOLT-TO-BEND LINE MOMENT ARM =          2.48 IN
                        =          2.48 IN
WIDTH OF BENDING SECTION =          34.74 IN
APPLIED BENDING STRESS   =          18.36 KSI
ALLOWABLE BENDING STRESS =          37.50 KSI
```

ANCHOR BOLTS

```
=====
QUANTITY                 =          8
BOLT DIAMETER            =          2.25 IN
BOLT CIRCLE              =          38.00 IN
INITIAL BOLT ANGLE       =          22.50 DEGREES
BOLT LENGTH              =          89 IN
YIELD STRENGTH           =          55.00 KSI
ULTIMATE STRENGTH        =          75.00 KSI
STATIC COMBINED STRESS RATIO =          0.93
```

ANALYSIS OF ANCHOR BOLTS

```
=====
GROUP   CRITICAL   MAX.   AXIAL   SHEAR   APPLIED   ALLOWABLE
LOAD    WIND       COMB.  FORCE    FORCE    STRESS (KSI) STRESS (KSI)
NO.     DIRECT*    STRESS  (LBS)  (LBS)  =====  =====
        (DEG)    RATIO  (LBS)  (LBS)  AXIAL  SHEAR  AXIAL  SHEAR

      2         71     0.93   117337   1064   36.10   0.33   37.50  22.50
```

* THESE ARE DIRECTIONS TOWARD WHICH THE WIND IS FLOWING.

SUBJECT: MUSCO, 130' WEBER STATE SPORTS POLE W/26 FIXTURES

FOLDER: MUSC148 FILE: 26FIX130

POLE DEFLECTION INFORMATION - GROUP LOAD 2

```
=====
```

ELEVATION FT	ROTATION DEGREES	SLOPE IN/FT	DEFLECTION FT	DEFLECTION IN
130.00	8.37	1.79	10.73	128.75
129.67	8.37	1.79	10.68	128.18
127.21	8.37	1.79	10.33	123.91
125.00	8.35	1.78	10.01	120.07
124.75	8.35	1.78	9.97	119.64
120.00	8.27	1.76	9.29	111.44
115.00	8.11	1.73	8.58	102.93
110.00	7.90	1.68	7.88	94.60
105.00	7.65	1.63	7.21	86.52
100.00	7.36	1.56	6.56	78.71
95.00	7.03	1.49	5.94	71.22
90.00	6.69	1.42	5.34	64.08
85.00	6.32	1.34	4.77	57.30
83.15	6.18	1.31	4.57	54.88
83.15	6.18	1.31	4.57	54.88
80.00	5.97	1.26	4.24	50.89
79.47	5.94	1.26	4.19	50.24
75.00	5.63	1.19	3.74	44.84
70.00	5.28	1.11	3.26	39.14
65.00	4.93	1.04	2.82	33.81
60.00	4.57	0.96	2.40	28.85
55.00	4.21	0.89	2.02	24.26
50.00	3.84	0.81	1.67	20.06
45.00	3.48	0.73	1.35	16.23
44.47	3.44	0.72	1.32	15.85
44.47	3.44	0.72	1.32	15.85
40.19	3.10	0.65	1.08	12.91
37.59	2.89	0.61	0.94	11.29
35.00	2.69	0.56	0.81	9.77
30.00	2.30	0.48	0.60	7.16
25.00	1.90	0.40	0.41	4.96
20.00	1.52	0.32	0.26	3.17
15.00	1.13	0.24	0.15	1.78
10.00	0.75	0.16	0.07	0.79
5.00	0.37	0.08	0.02	0.20
0.00	0.00	0.00	0.00	0.00

**GEOTECHNICAL INVESTIGATION
STATE OF UTAH DFCM
WEBER STATE FOOTBALL STADIUM EXPANSION
DFCM PROJECT # 99220810**

PREPARED FOR:

**STATE OF UTAH
DIVISION OF FACILITIES CONSTRUCTION & MANAGEMENT
4110 STATE OFFICE BUILDING
SALT LAKE CITY, UTAH 84114**

**SUBMITTED:
August 7, 2000**

PREPARED BY:

**C. A. CARTWRIGHT ASSOCIATES
350 WEST 800 NORTH, SUITE 202
SALT LAKE CITY, UTAH 84103**

CAC JOB# 300031

GEOTECHNICAL ENGINEERING INVESTIGATION

PROJECT NAME:

**WEBER STATE UNIVERSITY
FOOTBALL STADIUM ADDITION
OGDEN, UTAH**

FOR:

**STATE OF UTAH DFCM
4110 STATE OFFICE BUILDING
SALT LAKE CITY, UTAH 84114**

Bryan N. Roberts

Bryan N. Roberts, E.I.T.
Project Engineer



Phillip T. Pack, P.E.
Project Manager

Prepared by:

C.A. Cartwright Associates
350 West 800 North, Suite 202
Salt Lake City, Utah 84103
(801) 538-5999 Office
(801) 538-2739 Fax

1.0 INTRODUCTION

1.1 General

C.A. Cartwright and Associates (CAC) was retained by the State of Utah Division of Facilities Construction and Management to conduct a geotechnical engineering investigation for the proposed Weber State University football stadium expansion. The proposed expansion structures will be placed onto the back of the existing west seating structure and will extend approximately 60 feet west of the existing structure and 80 feet above ground. The addition has the potential to be a 6-story structure with rooms and floor levels tying into the existing structure. The top two stories will consist of box seating with a press platform above. According to the State Division of Facilities Construction and Management (DFCM) the addition will be bid as a design-build project. Therefore, information for foundation loading is presently limited. The site is currently covered with asphalt for parking and roadway access. A Vicinity Map and Project Site with Borehole Location Map can be seen in **Figures 1 and 2**, respectively, included in the Appendix.

On Thursday July 20 and 21, 2000 CAC personnel were on-site and completed three (3) boreholes at the site for geotechnical sampling as per authorization by Mr. Blake Court of the Utah DFCM. The first borehole was completed to a depth of 51 feet 6 inches on the south end west of approximately the south 15-yard line. The remaining two (2) boreholes were completed to a depth of 46 feet 6 inches below grade west of roughly the 50-yard line and the north 15-yard line. The boreholes were generally located by Jerry Jones of Campus Planning. Please note that we will store the samples for 30 days after which time they will be discarded unless you request otherwise.

1.2 Scope and Purpose

The purpose of this study was to determine and describe the subsurface conditions by drilling three boreholes, analyze and evaluate field and laboratory test data, and provide information to assist in foundation design and construction of the proposed new addition. The scope of work was outlined during a preliminary discussion with DFCM representative Blake Court and a meeting with Campus Planning representatives Jerry Jones and Jim Cox.

1.3 Proposed Construction

Preliminary information indicates that the addition has the potential to be a 6-story structure with rooms and floor levels tying into the existing structure. The top two stories will consist of box seating with a press platform above. The addition will extend roughly 60 feet west of the existing structure and approximately 80 feet above ground to the press platform base. According to the State Division of Facilities Construction and Management (DFCM) the addition will be bid as a design-build project. Due to current limited design, the foundation loading information is presently limited. We estimate that center column loads at ground level with center to center spacing of 30 could be as high as 930,000 lbs or more. The site area currently consists of paved parking and access roadway.

We expect the addition to be constructed using conventional spread and continuous footings for light loading and deep foundations (drilled piers/driven piles) for higher loading design.

1.4 Limitations

The design information provided herein was developed by evaluating information obtained from the three boreholes. The borehole data reflects the subsurface conditions only at the specific location at the particular

time designated on the borehole logs. Soil and ground water conditions may differ from conditions encountered at the actual borehole locations. The nature and extent of any variation in the boreholes may not become evident until during the course of construction. If variations do appear, it may become necessary to re-evaluate design information given in this report after we have observed the variation. Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

2.0 FIELD AND LABORATORY INVESTIGATION

2.1 Field Investigation

The general subsurface conditions were investigated by drilling three (3) boreholes (B-1 through B-3) at the locations shown on **Figure 2**, included in the Appendix. Borehole B-1 was completed to a depth of 51 feet 6 inches below grade and boreholes B-2 & B-3 were completed to a depth of 46 feet 6 inches below grade. The site currently consists of paved parking and roadway access.

Soil samples were obtained from the boreholes at minimum five (5) foot intervals or change of strata and in general accordance with ASTM D-420. The subsurface conditions disclosed by the field investigation are discussed in Section 3.3.

Log of Borehole charts for boreholes B-1 through B-3, including a description of all soil strata sampled, are presented in **Figures 3 through 5** in the Appendix. Sampling information and other pertinent field data and observations are also included. In addition, a Soil Classification Chart defining the terms and symbols used on the logs, is provided as **Figure 6** in the Appendix.

2.2 Laboratory Investigation

Samples obtained during the field investigation were returned to the laboratory, inspected, tested, and classified in accordance with the Unified Soil Classification System. To determine the soil classification and soil characteristics with respect to engineering design, selected laboratory tests were performed on representative soil samples.

<u>Test Conducted</u>	<u>Specification</u>	<u>To Determine</u>
Moisture Content	ASTM D 2216	% moisture representative of field conditions
Unit weight	ASTM D 2937	In-Situ unit weight representative of field conditions.
Atterberg Limits	ASTM D 4318	Plasticity and workability
% Pass #200 Sieve	ASTM D 1140	% fines in sample

Laboratory Summary of Test Data charts are presented in **Figures 7 through 9** in the Appendix. The results of these tests are reflected in design considerations and the final soil classifications are illustrated in the borehole logs in the Appendix.

3.0 SITE CONDITIONS

3.1 General

The site currently consists of asphalt paved parking and access roadway. We understand that the addition will extend the west stadium seating structure roughly 60 feet to the west across the full length. Preliminary information indicates that the addition has the potential to be a 6-story structure with rooms and floor levels tying into the existing structure. The top two stories will consist of box seating with a press platform above. (see **Figure 2A**). The proposed structure will likely be constructed primarily of concrete and steel.

3.2 Geologic Setting

According to the U.S. Geological Survey Geologic 7.5 minute series topographical map for the South Ogden Quadrangle, the site is mapped in the **Qlg₃** region belonging to the Bonneville regressive phase (between about 14,500 and 10,000 years), comprising lacustrine gravel, gravelly sand and sand deposited in high-energy lacustrine environments, generally on beaches and near shore. However, our finding did not correlate with this as we encountered CLAY, SILT and fine SAND layers predominately in the form of lenses (generally 1/4 to 4 inches thick). Clay was found in the highest abundance overall. This would indicate a low energy deposition.

3.3 Sub-Surface Soils

3.3.1 Borehole B-1

Borehole B-1 was completed to a depth of 51 feet 6 inches below existing grade at the south end of the proposed addition. The surface consisted of approximately 2 inches of asphalt underlain by roughly 22 inches of a granular material to a depth of 2 feet below grade. From 2 feet to 43 feet below grade there exists brown, medium stiff, silty CLAY with fine sand. Some mottling was seen within this layer. The soil is layered with alternating CLAY and SILT with fine SAND, However, CLAY was the primary soil type. From 43 feet to full depth explored (51 feet 6 inches below grade) a brown, fine sandy SILT with clay lenses was encountered. For a more detailed description please refer to **Figure 3** in the appendix.

Groundwater was allowed to stabilize within the borehole and measured at 39 feet below existing grade.

3.3.2 Borehole B-2

Borehole B-2 was completed to a depth of 45 feet 6 inches below grade within the middle portion of the addition footprint. Surficial conditions consist of 2 inches of asphalt pavement underlain by approximately 4 inches of granular material to a depth of 6 inches below grade. From 6 inches to 4 feet below grade brown, medium dense, fine sandy SILT with clay lenses was encountered. From 4 feet to 23 feet below grade there exists brown, medium stiff, fine sandy CLAY with intermittent silt lenses throughout the layer. From 23 feet to 32 feet below grade brown, medium dense, fine sandy SILT with clay lenses throughout the layer was encountered. From 32 feet to 39 feet below grade there exists brown, soft, fine sandy CLAY with fine silty

sand lenses. From 39 feet to full depth explored (46 feet 6 inches below grade) a brown, medium dense, fine sandy SILT was encountered. For a more detailed description please refer to **Figure 4** in the appendix.

Groundwater was allowed to stabilize within the borehole and measured at 41 feet below existing grade.

3.3.3 Borehole B-3

Borehole B-3 was completed to a depth of 46 feet 6 inches below grade within the north end of the addition footprint. Surficial conditions consisted of 2 inches of asphalt underlain by roughly 10 inches of granular material to a depth of 1 foot below grade. From 1 foot to 23 feet below grade there exists brown, stiff, fine sandy CLAY with silt lenses throughout the layer. Sand content was seen decreasing with depth to approximately 20 feet below grade. From 23 feet to 27 feet below grade clayey, medium dense, mottled, fine SAND was encountered. From 27 feet to 34 feet below grade there exists brown, fine, sandy CLAY with fine sand and silt lenses. From 34 feet to full depth explored (36 feet 6 inches below grade) a brown, saturated, medium dense, fine sandy, SILT with intermittent clay lenses was encountered. For a more detailed description please refer to **Figure 5** in the appendix. Groundwater was allowed to stabilize within the borehole and measured at 34 feet 4 inches below existing grade.

3.3.4 Overall Soil Profile

Information obtained from our field and laboratory investigation indicates that the soil profile for the site predominately consists of layered CLAYS and SILTS with fine SANDS. The clays and silts were generally in a medium stiff condition. For a more detailed description of the subsurface soils please refer to the borehole logs in **Figures 3 through 5** in the appendix.

3.4 Groundwater

Local topography would indicate that groundwater would flow in a westerly to northwesterly direction. Groundwater was encountered between the depths of 34 feet and 41 feet.

3.5 Liquefaction and Faulting

Liquefaction is typically defined as the state where saturated soils behave as a viscous liquid rather than a solid due to earthquake ground shaking. Liquefaction hazards are generally related to water-saturated sandy soils within 30 feet of the ground surface. According to a Geologic Hazards map compiled by the Utah Geological Survey the site sits near the border of a moderate probability area and a very low probability area of liquefaction potential.

Our findings for liquefaction potential were low according to the Standard Penetration blowcounts and soil types encountered.

No surface or other faulting was noted during our investigation. However, the nearest active fault is approximately within 1/2 mile east of the site. According to the U. S. Geological Survey "Map of Earthquakes In Utah ,1884 to 1989", there have been two significant earthquakes near the site between magnitudes 4 and 6 prior to 1974.

4.0 DESIGN PARAMETERS AND CONSTRUCTION RECOMMENDATIONS

4.1 General

The following recommendations have been developed on the basis of the previously described project characteristics and subsurface conditions. If actual loads are greater than anticipated or if there is any change in project criteria, a technical design review should be made by this office.

4.2 Foundations

We understand that the new addition will likely be rigidly tied into the existing structure and extend to the west. **This would require minimal tolerance for settlement of the new addition.**

4.2.1 General

General estimated site soil properties for in-situ soils are given below in **Table 1**.

Table 1. Subsurface Soil Properties

In-Situ Soil Types	Ave Est. In-Situ Unit Weight (pcf)	Cohesion (tsf/psf)	Friction Angle ϕ (Deg)	Lateral Coefficients (Act./Pass)
CLAY	110 _(note1)	0.35/700	0	1/1
SILT	112 _(note1)	0/0	27	0.38/2.66
SAND	111 _(note1)	0/0	30	0.33/3.0

1. Does not account for buoyant weights.

4.2.2 Conventional Spread Footings and Continuous Wall Foundations

Spot and continuous footings should only be used for maximum loads of 40,000 lbs and 5,000 lbs respectively, provided that the recommendation given below are followed. UBC seismic coefficients C_a and C_v may be assumed as 0.36 and 0.54 respectively.

The subsurface soils located at the foundation bearing strata consist of over-consolidated fine grained materials. We recommend that spread and continuous footings be placed at a minimum of 5 feet below existing grade. A net bearing pressure of **1.8 kips/ft²** may be used for shallow foundation design provided the following recommendations are observed:

- A minimum of 5 feet of native soil is excavated.
- Footing dimensions shall be designed for the allowable bearing capacity noted above.
- 24 inches of compacted granular fill material be placed below all bearing wall and column spread footings and shall extend 24 inches beyond all footing edges.

Handwritten notes: 2.2 } 2.3 Sept. 12
 30" →
 AUG 24. 00 Bryan Roberts
 say spread foots ok if new not attached to old

- The granular fill should be placed on undisturbed soils only. Any disturbed, loose, or soft material must be removed and replaced with compacted granular fill.

The allowable bearing pressure may be increased by 1/3 for temporary loads such as wind or seismic forces. We expect approximately 70 percent of potential settlement to take place during construction.

4.2.3 Pier Foundation Parameters

We recommend a deep foundation system be used for column loads and wall loads, which are higher than the maximum values outlined in section 4.2.2 above.

The dominant soil type from the surface to 40 feet was a medium stiff CLAY. Below 40 feet a loose to medium dense, fine sandy SILT was encountered. Therefore, we will conservatively present the values for clay only to a depth of 40 feet below grade. From 40 feet to 50 feet below grade the presented values will represent a fine sandy SILT.

The following pier/soil values given in Table 2 are based on the assumption that the pier will extend a minimum of 15 feet below the ground surface and have a minimum diameter of 4 feet.

Table 2. Pier Skin Friction and Horizontal Modulus Values

Depth Below Grade (ft)	Downward Skin Friction (psf)	Uplift Skin Friction (psf)	End Bearing (psf)	Horiz. Const. "Kz" ^(note 1) (pci)
0-5	0	0	See section 4.2.2	0
5-15	385	255	See section 4.2.2	75
15-40	385	255	2550	75
40-50	900	600	3.0	85

1. Kz is the constant of modulus of horizontal subgrade reaction.

Resistance to uplift should include the weight of the drilled pier foundations. The lateral capacity may be calculated using the horizontal modulus values indicated above.

4.3 Drainage

Adequate surface drainage should be provided at the site to minimize any increase in moisture content near the foundation soils and prevent water from migrating under the structure. We recommend a minimum slope of 6 inches in the first 10 feet away from the structure.

Drainage water should not be allowed to pond adjacent to the foundations.

4.4 Foundation Installation

Prior to placement of the foundation, all areas supporting foundation loads should be inspected to insure that all loose, soft or otherwise undesirable material is removed and that the structure will bear on satisfactory material.

All imported granular fill supporting foundation loads should be compacted to at least 95 percent of the Modified Proctor maximum density (ASTM D 1557) provided the foundation is designed as outlined in Section 4.2. Compaction tests should be taken on each lift to insure the required compaction is being achieved.

All foundation excavations should be protected against any detrimental change in condition such as disturbance, rain and freezing. Surface runoff should be directed away from the excavation and not allowed to pond. If possible, all footing concrete should be poured the same day as the excavation is made. If this is not practical, the foundation excavation should be adequately protected and foundation placement should take place as soon as possible.

The fine-grained in-situ soils are not suitable as fill material under structural elements and should not, under any circumstances, be replaced into excavations as bearing soil after they have been disturbed. If, during the course of construction, the site becomes soft, the disturbed soils must be excavated and replaced with granular imported fill material and compacted in accordance with the recommendations described in sections 4.7 below.

We recommend that the foundation concrete be designed and placed in a manner to maximize density and decrease cracking/permeability by utilizing a low water cement ratio, proper consolidation, and adequate curing.

4.5 Excavations

Sidewalls of construction excavations more than 4 feet but less than 12 feet deep must be sloped no steeper than 1 and 1/2 half horizontal to 1 vertical for safety reasons. Excavations in unstable or saturated soils may also require special considerations such as shoring, bracing, and/or dewatering. It is not expected that the proposed structure will require excavations of more than 12 feet below grade.

4.6 Fill Material

4.6.1 Granular Fill

Granular soils free of organics or other deleterious materials are recommended for use as granular fill at this site. All material imported to the site for use as granular fill should be free of debris and should consist of a sand and fractured gravel material with between 5 and 15 percent passing the #200 sieve meeting the Unified Soil Classifications GP, GM, GC, GW-GM, GW-GC, GP-GM or GP-GC. No particles shall be greater than approximately 3 inches in maximum dimension.

4.6.2 Roadbase

If in the event a road is to be constructed requiring roadbase material then we recommend a roadbase material consisting of 3/4 inch minus, well-graded granular soils free of organics or other deleterious materials and debris. We recommend a sand and fractured gravel material with between 5 and 12 percent passing the #200 sieve and no particles greater than approximately 1 inches in maximum dimension.

4.6.3 Non-Structural Fill

On-site soils are suitable to be used for non-structural site grading and landscaping fill. We recommend stockpiling excavated soil near the site, in flat or lower elevated areas, to prevent erosion and runoff into excavations due to possible precipitation.

4.7 Fill Compaction

All structural fill supporting foundations, pavements, and sidewalks should be compacted to at least 95 percent of the Modified Proctor maximum density (ASTM D 1557).

The compaction should be accomplished by placing the fill in maximum 8-inch loose lifts and mechanically compacting each lift to the specified minimum density. Field density tests should be performed on each lift as necessary to insure that compaction is being achieved. Our office can conduct these testing services upon requests.

4.8 Floor Slabs

We recommend that all slabs-on-grade be underlain by three inches of free-draining material such as clean gravel, with no material passing the 1/2-inch sieve. This material may be placed over properly prepared native soils or structural fill to provide a capillary break, which should limit moisture penetration into the slabs.

4.9 Quality Control

Our recommendations made in this report are based on the assumption that adequate quality control testing and observations will be conducted during construction to verify compliance. This may include but not necessarily be limited to the following:

4.9.1 Field observations

Observations during all phases of construction such as site preparation, foundation excavation, structural fill placement and concrete placement.

4.9.2 Fill Compaction

Compaction testing is required for all imported fill materials. Maximum Dry Density (Proctor-ASTM 1557) tests should be requested by the contractor immediately after delivery of any granular fill materials. Field density testing should be performed on every lift of fill and at a high frequency to well-define the compaction effort at every fill location. For pipe and footing trenches, this typically requires 1 test over 50 lineal feet or fraction thereof; 1 test per spot footing; and 1 test per 1000 square feet for slab and pavement areas.

4.9.3 Concrete Quality

We recommend that freshly mixed concrete be tested in accordance with ASTM designations as follows:

- Slump, Temperature, Unit Weight, and Yield testing should be conducted a minimum of every delivery truck (ASTM C 138 and C 143).
- Entrained Air testing should also be conducted a minimum of every truck if concrete is air entrained (ASTM C 231).
- Test cylinders should be taken a minimum of every 50 cubic yards. Cylinder compressive strength tests should be conducted at 7 and 28 days from the placement date (ASTM C 31).

The above quality control services may be provided by our office upon your request. Any additional information regarding scope and cost of these services are available from our office.

5.0 REFERENCES

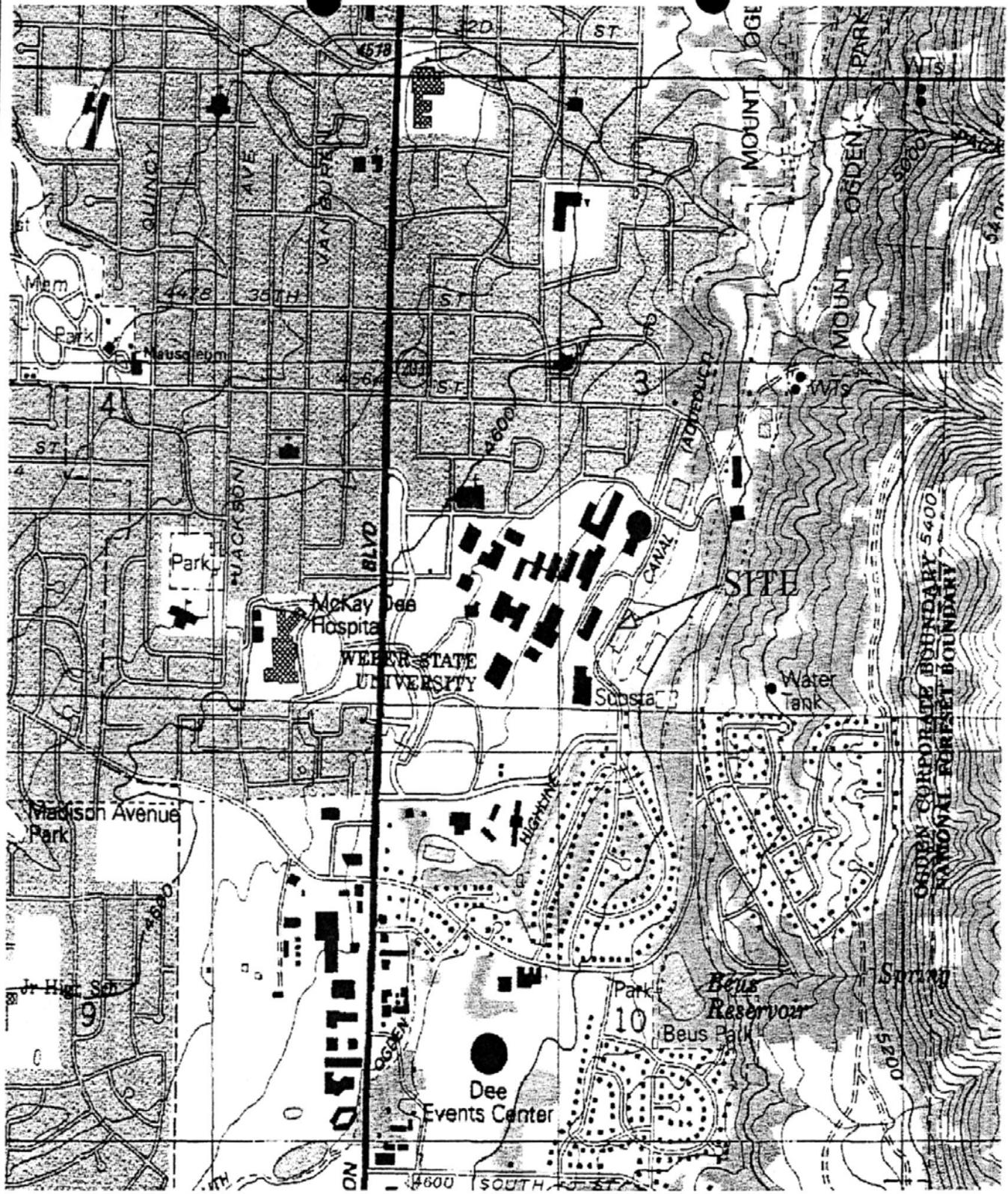
American Society for Testing and Materials, 1998 Annual Book of ASTM Standards, Section 4, Volumes 4.08 and 4.09 (Soil and Rock).

W. Adof York, Mike Love, Unpublished manuscript, 1998, Geologic 7.5 minute series topographical map for the South Ogden Quadrangle, Utah: U.S. Geological Survey Scale 1:2400.

Suzan K Goter, 1990, Earthquakes In Utah, 1884-1989: U. S. Geological Survey National Earthquake Information Center, Scale 1:500,000.

L.R. Anderson, J.R. Keaton, and J.E. Bischoff, 1994, Liquefaction Potential and Faulting Map for Utah County, Utah: Utah Geological Survey Contract Report 94-3, scale 1:48,000.

APPENDIX



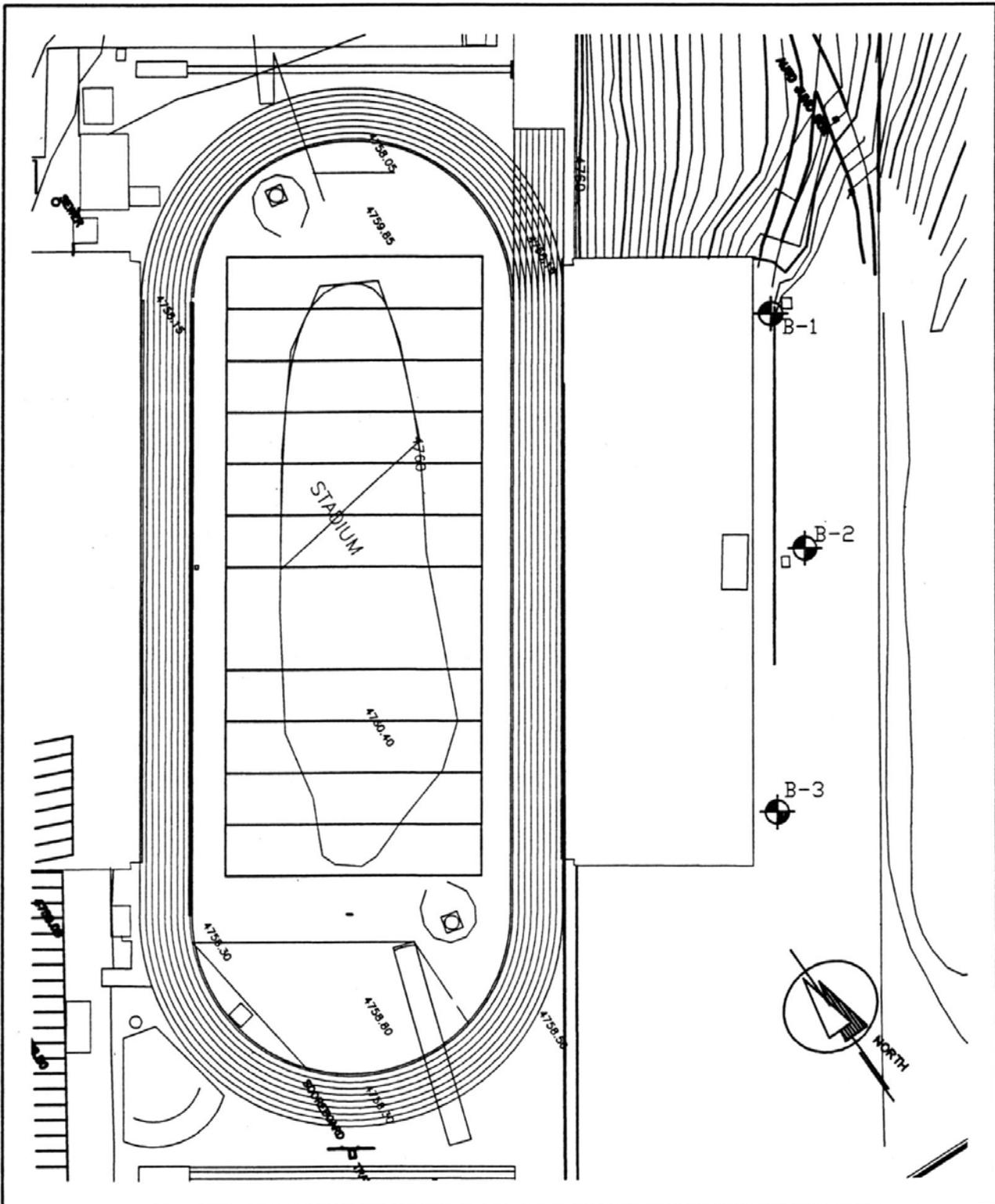
SITE NAME: PROPOSED FOOTBALL STADIUM ADDITION	
LOCATION: WEBER STATE UNIVERSITY	
CLIENT: UTAH STATE DFCM	DATE: JULY 26, 2000
SECTION, TOWNSHIP, RANGE: 3, T5N , R1W	
QUADRANGLE / YEAR: OGDEN/1992	



C.A. CARTWRIGHT ASSOCIATES

PROJECT VICINITY MAP

FIGURE 1



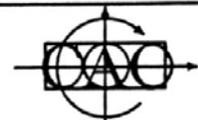
SITE NAME: W. S. U. STADIUM BOREHOLE LOCATIONS

LOCATION: AS SHOWN

CLIENT: UTAH DFCM

DATE: AUGUST 2, 2000

PROJECT SITE MAP



C.A. CARTWRIGHT ASSOCIATES

FIGURE 2



WSU

ELIZABETH DEE SHAW STEWART STADIUM

WEBER STATE UNIVERSITY

BUILDING SECTION SCENARIO 2
NO SCALE

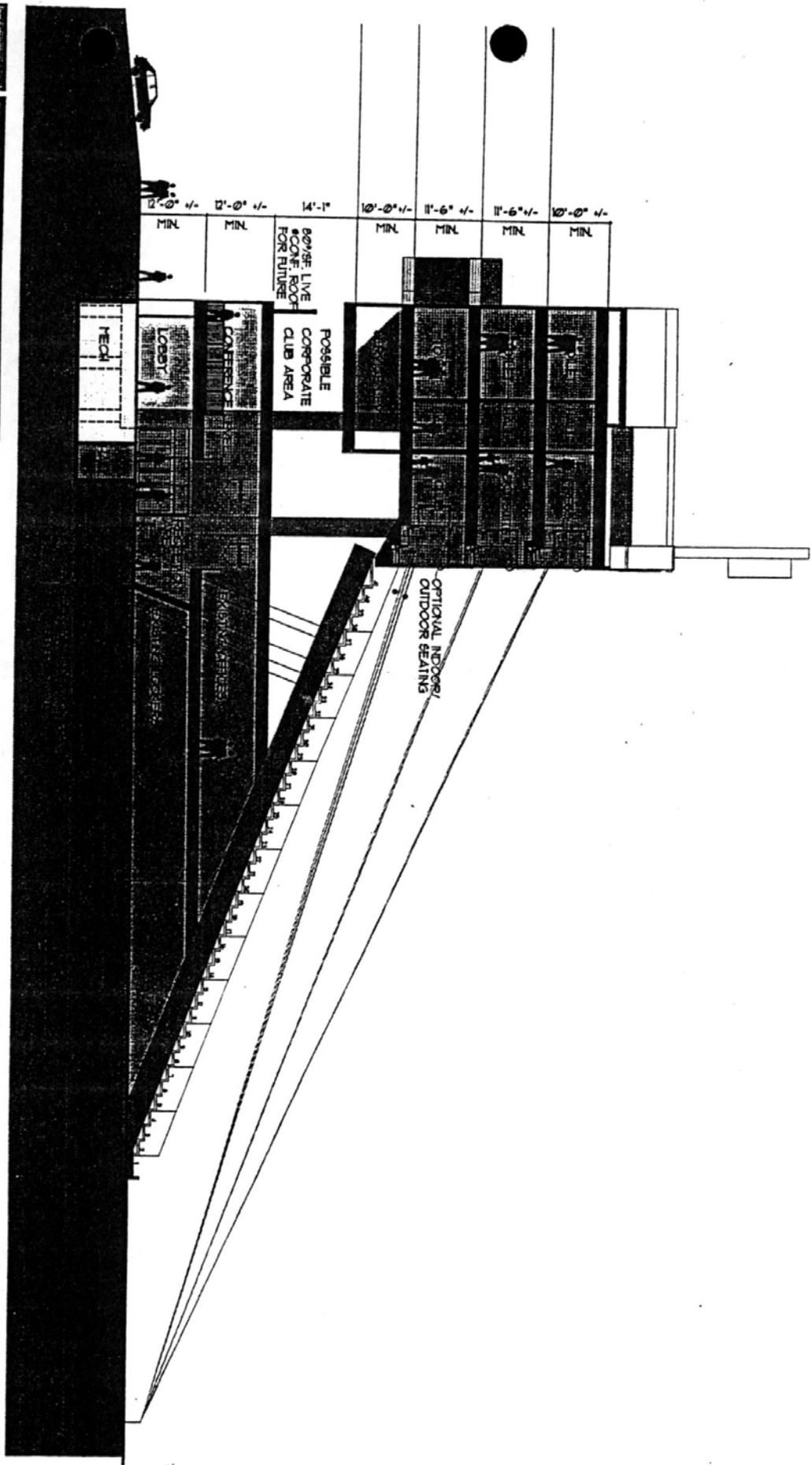


Figure 2A



C.A. CARTWRIGHT ASSOC.

BORING LOG

Utah DFCM
4110 State Office Building S. L. C., Utah 84114

BORING No. : 1 JOB No. : 300031 DATE : July 28, 2000 SHEET 1 OF 1

PROJECT : WSU Football Stadium Expansion
DFCM Project #99220810 SURF. EL. : - BORE DIA. : 6" DEPTH : 51'6"
WATER EL. : - COORDINATES:

BORING TYPE : Hollow stem auger CAD FILE : WSub-1

DEPTH, Ft.	GRAPHIC LOG	SAMPLE	SOIL DESCRIPTION	% FINER No. 200 SIEVE	BLOWS/Ft.	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH, TSF			IN-SITU UNIT WT., lb./cu.ft.
									MINIATURE VANE	RESIDUAL MINIATURE VANE	POCKET PENETROMETER	
0			0' to 2'; Pavement section consisting of 2" of asphalt and 22' of what appears to be granular fill.									
5			2' to 43': Brown, silty CLAY with fine sand; Some mottling seen throughout the soil layer; The soil is layered with alternating lenses of CLAY, SILT, and fine SAND with the predominate material being CLAY; Moist, becoming saturated just above 39'; medium stiff; CL.		35	27.5	16.6	15				
10				41	36.6	17.1	15.4					
15				88.1	26		18.3	⊗			116.5	
20				85.4	22		17					
25				79.7	28		20.1	⊗			105	
30				23	33.7	18	15.8					
35				78	16		26.9	⊗		110.8		
40				50.7	25	34.8	22.5	28.2				
45			43' to 51' 6"; Brown, fine sandy SILT with some intermittent clay lenses; Fine sands also found in intermittent lenses; Saturated; Medium dense; ML.	78.2	11			29.7				
50			END OF BOREHOLE AT 50' 6"	72.9	16			29.4				
REMARKS :				REMARKS :								
FIELD ENG.: Bryan N. Roberts				WTR DEPTH @ COMPL. : 39'								
				COMPLETION DATE : July 21, 2000								

FIGURE 3



C.A. CARTWRIGHT ASSOC.

BORING LOG

Utah DFCM
4110 State Office Building S. L. C., Utah 84114

BORING No. : 2 JOB No. : 300031 DATE : July 28, 2000 SHEET 1 OF 1

PROJECT : WSU Football Stadium Expansion
DFCM Project #99220810 SURF. EL. : - BORE DIA. : 6" DEPTH : 45'6"

BORING TYPE : Hollow stem auger CAD FILE : WSub-2 WATER EL. : - COORDINATES:

DEPTH, Ft.	GRAPHIC LOG	SAMPLE	SOIL DESCRIPTION	% FINER NO. 200 SIEVE	BLOWS/Ft.	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT, %	SHEAR STRENGTH, TSF			IN-SITU UNIT WT., lb./cu.ft.
									●	○	⊗	
									(OPEN SYMBOLS REPRESENT REMOLDED TESTS.)			
									.5	1	1.5	
			2" of asphalt uderlain by approximately 4" of granular material.									
5			6" to 4'; Brown, fine sandy SILT with clay lenses; Medium dense; Moist; ML.	63.6	26			17.5				104
10			4' to 23'; Brown, fine sandy CLAY with intermittent silt lenses throughout layer; Moist; Medium stiff; Moderately plastic; CL.	73	27			18.8				
15				80.6	22	30.1	17.9	18.3				
20					19			20.5			⊗	
25			23' to 32'; Brown, fine sandy SILT with significant clay lenses throughout layer; Medium dense; Moist; ML.	66	20			21.8				118
30					25			19.2				
35			32' to 39'; Brown, fine sandy CLAY with fine silty sand lense up to 2 inches thick; Soft; Moist; CL.	65.1	12	34.6	15.5	24.9	⊗			
40			39' to 46' 6"; Brown, Fine sandy SILT; Saturated; Medium dense; ML.	62	16			25.8				
45				70	12			31.1				
			END OF BOREHOLE									

REMARKS :

REMARKS :

WTR DEPTH @ COMPL. : 41'

FIELD ENG.: Bryan N. Roberts

COMPLETION DATE : July 20, 2000

FIGURE 4

UNIFIED SOIL CLASSIFICATION SYSTEM

FIELD IDENTIFICATION PROCEDURES		GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS	
GRAVELS More than half of coarse fraction is larger than No. 4 sieve size. (For visual classifications, the 1/4" size may be used as equivalent to the No. 4 sieve size.)	CLEAN GRAVELS (Little or no fines)		GW	Well graded gravels, gravel-sand mixtures, little or no fines.	
	GRAVELS WITH FINES (Appreciable amount of fines)		GP	Poorly graded gravels, gravel-sand mixtures, little or no fines.	
SANDS More than half of coarse fraction is smaller than No. 4 sieve size. (For visual classifications, the 1/4" size may be used as equivalent to the No. 4 sieve size.)	CLEAN SANDS (Little or no fines)		GM	Silty gravels, poorly graded gravel-sand-silt mixtures.	
	SANDS WITH FINES (Appreciable amount of fines)		GC	Clayey gravels, poorly graded gravel-sand-clay mixtures.	
COARSE GRAINED SOILS More than half of material is larger than No. 200 sieve size.	CLEAN SANDS (Little or no fines)		SW	Well graded sands, gravelly sands, little or no fines.	
	SANDS WITH FINES (Appreciable amount of fines)		SP	Poorly graded sands, gravelly sands, little or no fines.	
FINE GRAINED SOILS More than half of material is smaller than No. 200 sieve size. (The No. 200 sieve size is about the smallest particle visible to the naked eye)	SANDS AND SILTS Liquid limit less than 50		SM	Silty sands, poorly graded sand-silt mixtures.	
	SILTS AND CLAYS Liquid limit greater than 50		SC	Clayey sands, poorly graded sand-clay mixtures.	
HIGHLY ORGANIC SOILS Readily identified by color, odor, spongy feel and frequently by fibrous texture.	IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN No. 40 SIEVE SIZE				
	DRY STRENGTH (CRUSHING CHARACTERISTICS)	DELAYANCY (REACTION TO SHAKING)	TOUGHNESS (CONSISTENCY NEAR PLASTIC LIMIT)		
	None to slight	Quick to slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sand with slight plasticity.
	Medium to high	None to very slow	Medium	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
	Slight to medium	Slow	Slight	OL	Organic silts and organic silt-clays of low plasticity.
	Slight to medium	Slow to none	Slight to medium	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
	High to very high	None	High	CH	Inorganic clays of high plasticity, fat clays.
	Medium to high	None to very slow	Slight to medium	OH	Organic clays of medium to high plasticity.
				Pt	Peat and other highly organic soils.

† Boundary classifications:—Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW-GC, well graded gravel-sand mixture with clay binder.
 ‡ All sieve sizes on this chart are U.S. standard.

FIGURE 6

SUMMARY OF TEST DATA

HOLE NO./ SAMPLE NO.	DEPTH BELOW GROUND SURFACE	STANDARD PENETRATION BLOWS PER FOOT	IN-SITU		GRADATION			POCKET PEN TONS/FT. ²	ATTERBERG LIMITS			SOIL CLASSIFICATION UNIFIED SYSTEM
			UNIT WEIGHT LB./FT. ³	MOISTURE PERCENT	% SAND	% GRAVEL	% PASSING NO. 200 SIEVE		L.L.	P.L.	P.I.	
1/1	5-6.5'	35		15					27.5	16.6	10.9	CL
1/2	10-11.5'	41		15.4					36.6	17.1	19.5	CL
1/3	15-16.5'	26	116.5	18.3			88.1	1.5				CL
1/4	20-21.5'	22		17			85.4					CL
1/5	25-26.5'	28	105	20.1			79.7	2.5				CL
1/6	30-31.5'	23		15.8					33.7	18.0	15.7	CL
1/7	35-36.5'	16	11.8	26.9			78	1				CL
1/8	40-41.5'	25		28.2			50.7		34.8	22.5	12.3	CL
1/9	45-46.5'	11		29.7			78.2					ML
1/10	50-51.5'	16		29.4			72.9					ML

**Weber State University Stadium Addition
Ogden, Utah**

SUMMARY OF TEST DATA

HOLE NO./ SAMPLE NO.	DEPTH BELOW GROUND SURFACE	STANDARD PENETRATION BLOWS PER FOOT	IN-SITU		GRADATION			POCKET PEN TONS/FT. ²	ATTERBERG LIMITS			SOIL CLASSIFICATION UNIFIED SYSTEM
			UNIT WEIGHT LB./FT. ³	MOISTURE PERCENT	% SAND	% GRAVEL	% PASSING NO. 200 SIEVE		L.L.	P.L.	P.I.	
2/1	5-6.5'	26	104	17.5			63.6					ML
2/2	10-11.5'	27		18.8			73					CL
2/3	15-16.5'	22		18.3			80.6	30.1	17.9	12.2		CL
2/4	20-21.5'	19		20.5				2				CL
2/5	25-26.5'	20	118	21.8			66					ML
2/6	30-31.5'	25		19.2								ML
2/7	35-36.5'	12		24.9			65.1	34.6	15.5	19.1		CL
2/8	40-41.5'	16		25.8			62					ML
2/9	45-46.5'	12		31.1			70					ML

**Weber State University Stadium Addition
Ogden, Utah**

FIGURE 8

SUMMARY OF TEST DATA

HOLE NO./ SAMPLE NO.	DEPTH BELOW GROUND SURFACE	STANDARD PENETRATION BLOWS PER FOOT	IN-SITU		GRADATION			POCKET PEN TONS/FT. ²	ATTERBERG LIMITS			SOIL CLASSIFICATION UNIFIED SYSTEM *
			UNIT WEIGHT LB./FT. ³	MOISTURE PERCENT	% SAND	% GRAVEL	% PASSING NO. 200 SIEVE		L.L.	P.L.	P.I.	
3/1	5-6.5'	23		16.9								CL
3/2	10-11.5'	18		22.7					41.0	17.3	23.7	CL
3/3	15-16.5'	19		23.2				1.75	40.6	19.2	21.4	CL
3/4	20-21.5'	16	111.7	21.8					37.1	21.4	15.7	CL
3/5	25-26.5'	17	111	9.8					39.3	20.6	18.7	SC
3/6	30-31.5'	20	113	18.9								CL
3/7	35-36.5'	23		26								CL
3/8	40-41.5'	22		28								ML
3/9	45-46.5'	11		32.4								ML

**Weber State University Stadium Addition
Ogden, Utah**

FIGURE 9

**REPORT
GEOTECHNICAL STUDY
PROPOSED NEW EAST LIGHTING
FOOTBALL STADIUM
WEBER STATE UNIVERSITY CAMPUS
OGDEN, UTAH**

Submitted To:

E.C.E. INC.
939 South West Temple Street
Salt Lake City, Utah 84101

Submitted By:

Gordon Spilker Huber Geotechnical Consultants, Inc.
4426 South Century Drive, Suite 100
Salt Lake City, Utah 84123

November 9, 2009

Job No. 0959-001-09

November 9, 2009
Job No. 0959-001-09

E.C.E. INC.
939 South West Temple Street
Salt Lake City, Utah 84101

Attention: Mr. Akbar Matonkhah

Gentlemen:

Re: Report
Geotechnical Study
Proposed New East Lighting
Football Stadium
Weber State University Campus
Ogden, Utah

1. INTRODUCTION

1.1 GENERAL

This report presents the results of our geotechnical study performed at the site of the proposed new east lighting for the football stadium on the Weber State University Campus in Ogden, Utah. The general location of the site with respect to major topographic features and existing facilities, as of 1998, is presented on Figure 1, Vicinity Map. A more detailed layout of the site on an aerial based map showing the proposed locations of the new light poles, the existing stadium, and the borings drilled in conjunction with this study is presented on Figure 2, Site Plan.

During the course of this study, many of the findings were presented to the design team.

1.2 OBJECTIVES AND SCOPE

The objectives and scope of our study were planned in discussions between Mr. Akbar Matonkhah of E.C.E. INC.; Mr. Jim Harris of Weber State University; and Mr. Bryan Roberts of Gordon Spilker Huber Geotechnical Consultants, Inc. (GSH).

In general, the objectives of this study were to:

1. Accurately define and evaluate the subsurface soil and groundwater conditions in the area of the three light pole locations.
2. Provide recommendations and parameters for drilled pier foundations and provide geoseismic information to be utilized in the design and construction of the proposed new stadium east lighting.

In accomplishing these objectives, our scope has included the following:

1. A field program consisting of the drilling, logging, and sampling of three borings.
2. A laboratory testing program.
3. An office program consisting of the correlation of available data, engineering analyses, and the preparation of this summary report.

1.3 AUTHORIZATION

Authorization was provided by returning a signed copy of our Professional Services Agreement No. 09-1002 dated October 2, 2009 and executed on October 6, 2009.

1.4 PROFESSIONAL STATEMENTS

Supporting data upon which our recommendations are based are presented in subsequent sections of this report. Recommendations presented herein are governed by the physical properties of the soils encountered in the exploration borings, projected groundwater conditions, and the layout and design data discussed in Section 2., Proposed Construction, of this report. If subsurface conditions other than those described in this report are encountered and/or if design and layout changes are implemented, GSH must be informed so that our recommendations can be reviewed and amended, if necessary.

Our professional services have been performed, our findings developed, and our recommendations prepared in accordance with generally accepted engineering principles and practices in this area at this time.

2. PROPOSED CONSTRUCTION

The project is to consist of replacing the three existing steel lattice light towers and associated spread foundations along the east side of the Weber State football stadium with three steel monopole light poles. The new monopoles will be on the order of 50-feet tall and support updated lighting. Each monopole will be supported on a drilled concrete pier system near the existing light tower locations.

Site development will require a minimal amount of earthwork in the form of site grading and will predominately be impacted by construction access.

3. SITE INVESTIGATIONS

3.1 FIELD PROGRAM

In order to define and evaluate the subsurface soil and groundwater conditions at the site, 3 borings were explored to depths ranging from 6.5 to 21.5 feet below existing grade. Due to access issues and the existing sloped conditions, the borings were drilled using a small track-mounted Geoprobe 7730 DT equipped with hollow-stem augers. Locations of the borings are presented on Figure 2.

The field portion of our study was under the direct control and continual supervision of an experienced member of our geotechnical staff. Auger refusal was encountered in Boring B-1 at a depth of four and one-half feet due to very stiff soils, the angle of the slope with relation to the probe boom, and the subsequent low available down pressure for drilling. Sampling was extended to a depth of six and one-half feet where very stiff, silty clay/clayey silt was encountered. Several attempts were made by slightly moving the drill rig and re-drilling, which encountered similar shallow refusal. However, this writer does not believe that this would reflect substantial difficulty for drilling with larger drilled pier drilling equipment.

During the course of the drilling operations, a continuous log of the subsurface conditions encountered was maintained. In addition, samples of the typical soils encountered were obtained for subsequent laboratory testing and examination. The soils were classified in the field based upon visual and textural examination. These classifications have been supplemented by subsequent inspection and testing in our laboratory. Detailed graphical representation of the subsurface conditions encountered is presented on Figures 3A through 3C, Log of Borings. Soils were classified in accordance with the nomenclature described on Figure 4, Unified Soil Classification System.

A 3.25-inch outside diameter, 2.42-inch inside diameter drive sampler (Dames & Moore) was utilized in the majority of the subsurface sampling at the site. Additionally, a 2.0-inch outside diameter, 1.38-inch inside diameter drive sampler (SPT) was utilized at select locations and depths. The blow-counts recorded on the boring logs were those required to drive the sampler 12 inches with a 140-pound hammer dropping 30 inches.

Following completion of drilling operations, one and one-quarter-inch diameter slotted PVC pipe was installed in Boring B-2 in order to provide a means of monitoring future groundwater fluctuations.

3.2 LABORATORY TESTING

3.2.1 General

In order to provide data necessary for our engineering analyses, a laboratory testing program was performed. The program included moisture, density, partial gradation, laboratory vane shear, and chemical tests. The following paragraphs describe the tests and summarize the test data.

3.2.2 Moisture and Density Tests

To aid in classifying the soils and to help correlate other test data, moisture and density tests were performed on selected samples. The results of these tests are presented on the boring logs, Figures 3A through 3C.

3.2.3 Partial Gradation Test

To aid in classifying the granular soils, partial gradation tests were performed. Results of the tests are tabulated below:

Boring No.	Depth (feet)	Percent Passing No. 200 Sieve	Soil Classification
B-1	5.5	90.8	CL/ML
B-2	13.5	24.8	SM
B-3	8.5	25.7	SM
B-3	10.5	23.5	SM

3.2.4 Laboratory Vane Shear Tests

To determine the undrained shear strength of the clay soils encountered at the site, a laboratory vane shear test was performed. The results of the test are tabulated below:

Test Pit No.	Depth (feet)	Soil Type	In-Situ Moisture Content (percent)	Dry Density (pcf)	Ultimate Shear Strength (psf)
B-2	4.5	CL	16.7	110	5,000+*

* Limit of Vane Shear Apparatus

3.2.5 Chemical Tests

To determine if the site soils will react detrimentally with concrete, chemical tests were performed on a representative sample of the silty clay and silty sand soils encountered in Borings B-2 and B-3. The results of the chemical tests are tabulated below:

Boring No.	Depth (feet)	pH	Total Water Soluble Sulfate (mg/kg-dry)
B-2	4.5	8.7	<6.0*
B-3	10.5	8.5	<5.5*

* Below reporting limit of test.

4. SITE CONDITIONS

4.1 SURFACE

The site is located immediately east of the Weber State University football stadium east bleachers.

Directly above the seating area is a flat, narrow, paved asphalt concrete roadway with a roughly four-foot concrete retaining wall to the east. Above the retaining wall, the natural ground slopes upward on the order of three horizontal to one vertical. The new monopoles will be placed on this slope.

The present natural slope is covered with a moderate growth of various grasses and weeds to waist height and occasional scrub oak. A chain-link fence bounds the site to the east with vacant land beyond, and similar undeveloped slope existing to the north and south.

4.2 SUBSURFACE SOIL AND GROUNDWATER

General subsurface soil conditions encountered within the borings were similar. The upper two to three inches contain a major root mat (topsoil). Below the topsoil in Boring B-1 to the full depth penetrated, six and one-half feet, silty clay with thin clay silt layers was encountered, which was very stiff, moist, and brown. As previously mentioned, auger refusal was encountered in Boring B-1 due to issues with the existing slope, stiff soils, and equipment limitations. Based on our experience in the area, it is anticipated that the natural sands will be encountered within a few feet of the explored depth in Boring B-1.

In Boring B-2, a thin one-foot thick layer of clayey fine sand was encountered below the topsoil underlain by two feet of silty sand. These upper sands are loose, moist, and light brown in color.

From three feet to six feet in Boring B-2 is a layer of silty clay with occasional layers up to two inches thick of sand and sandy silt, which is very stiff, moist, and brown with light brown mottling. From six feet to the full depth penetrated, 21.5 feet, silty fine sand with occasional to numerous layers of silty clay/sandy clay, one to two inches thick was encountered. The deeper silty sands are medium dense, moist, and brown.

In Boring B-3 is a surficial layer of non-engineered fill was encountered below the topsoil to a depth of roughly two and one-half feet. The non-engineered fills are comprised of fine to coarse sand with some fine to coarse gravel, which is medium dense, moist, and brown. Due to proximity of the existing light tower, trees, and utilities, Boring B-3 was completed within roughly five feet of the four-foot concrete retaining wall just east of the asphalt concrete pavement above the east bleachers. It is projected that the fill encountered is backfill behind the walls and tapers rapidly to natural soils upslope of the retaining wall.

Below the surficial fill at Boring B-3 is a layer of silty fine sand with occasional gravel to a depth of four and one-half feet underlain with clayey fine sand to a depth of six and one-half feet which are medium dense to dense, moist, and brown. From 6.5 to 14.0 feet is a layer of fine silty sand with occasional fine and coarse gravel which is very dense grading medium dense, slightly moist to moist, and brown grading light brown. From 14.0 feet to 17.5 feet is a layer of fine sandy silt/silty fine sand with trace to some gravel and occasional layers of silty clay up to 2.0 inches thick, which is medium dense/very stiff, moist, and light brown. From 17.5 feet to the full depth penetrated, 21.5 feet, is silty fine sand with occasional fine and coarse gravel was encountered, which was dense, moist, and brown.

Figures 3A through 3C present a detailed description of the subsurface soils encountered. The lines designating the interface between soil types on the boring logs generally represent approximate boundaries. In-situ, the transition between soil types may be gradual.

Groundwater was not encountered within the depths penetrated in the borings. However, isolated and random “perched” groundwater conditions in the near-surface sequence must be anticipated, especially during the late spring and early summer months.

5. DISCUSSIONS AND RECOMMENDATIONS

5.1 SUMMARY OF FINDINGS

The site is suitable for the proposed construction utilizing drilled pier foundations.

The most significant geotechnical aspect is the surficial layer of non-engineered fill encountered below the topsoil to a depth of roughly two and one-half feet in Boring B-3. Additionally, auger refusal was encountered at four and one-half feet in Boring B-1.

As previously mentioned, due to proximity of the existing light tower, trees, and utilities, Boring B-3 was completed within roughly five feet of the four-foot concrete retaining wall just

east of the asphalt concrete pavement directly above the east bleachers. It is projected that the fill is part of the wall backfill and tapers rapidly to natural soils upslope of the retaining wall.

In the following sections, detailed discussions pertaining to on-site soil parameters for drilled pier foundations, temporary excavations, utility trench backfill, and the geoseismic setting of the site are provided.

5.2 EXCAVATIONS

Temporary construction excavations, such as utility trenches etc., not exceeding four feet in depth and not encountering saturated soils or the groundwater table, may be constructed with near-vertical sideslopes. Temporary excavations up to eight feet deep in fine-grained cohesive soils, above or below the water table, may be constructed with sideslopes no steeper than one-half horizontal to one vertical. Excavations deeper than eight feet (excluding drilled piers) are not anticipated at the site.

For granular (cohesionless) soils, excavations up to eight feet and above the water table should be no steeper than one horizontal to one vertical. Excavations encountering saturated and/or loose cohesionless soils will be very difficult and will require very flat sideslopes and/or shoring and bracing.

All excavations must be inspected periodically by qualified personnel. If any signs of instability or excessive sloughing are noted, immediate remedial action must be initiated.

5.3 UTILITY TRENCHES

It is not anticipated that structures will be placed over utility trenches within the hillside in connection with the new monopoles. However, to maintain drainage and minimize trench settlements the trench backfill shall be compacted to a minimum of 90 percent of the maximum dry density as determined by the AASHTO¹ T-180 (ASTM² D-1557) compaction criteria.

Should utility trench excavation and backfill associated with the new monopoles be placed within structural areas, such as existing or proposed flatwork, roads, etc., then trench backfill shall be placed at a minimum 95 percent of the above criteria. If the surface of the backfill becomes disturbed during the course of construction, the backfill shall be proofrolled and/or properly compacted prior to subsequent work. Proofrolling may be performed by passing moderately loaded rubber tire-mounted construction equipment uniformly over the surface at least twice. If excessively loose or soft areas are encountered during proofrolling, they shall be removed to a maximum depth of two feet below design finish grade and replaced with structural fill.

¹ American Association of State Highway and Transportation Officials

² American Society for Testing and Materials

The natural soils may be re-utilized as trench backfill. However, it should be noted that unless moisture control is maintained near optimum, utilization of the natural on-site fine-grained silt and clay soils as trench backfill will be very difficult, if not impossible, during wet and cold periods of the year.

5.4 DRILLED PIER FOUNDATIONS

5.4.1 Design Parameters

A drilled pier foundation system will be used to support the proposed stadium lighting monopoles. We anticipate that drilled pier design will be governed by lateral loading and acceptable lateral deflections. There are multiple methods for analyzing lateral capacity. The program commonly used for the evaluation of lateral resistance and deflection of drilled piers and piles is LPILE. Soil Parameters presented in this report for lateral design is directed to the LPILE computer method. The primary parameter for evaluation of lateral pile and drilled pier capacity is the coefficient of lateral subgrade reaction (k). Additional parameters can be provided upon request.

In this report, recommended values for k are presented as k_{LPILE} for the different soil strata encountered within the borings. At pier locations, surficial fills, if encountered, shall be removed extending out a minimum of 5 feet from the pier edge and replaced with granular soils compacted to a minimum of 90 percent of the maximum dry density as determined by the AASHTO T-180 (ASTM D-1557) compaction criteria. Recommended soil parameter values for the soils encountered in the boring logs for lateral pier design are provided in the table below:

Boring No.	Depth (feet)	Soil Type*	Est. Effective Unit Weight (pcf)	Cohesion (psf)	Estimated ϕ	Static k_{LPILE} Recommended (pci)	$\epsilon_{.50}$
B-1	0-6.5	Silty clay/clayey silt	115	2,500	---	400*	.005
B-2	0-1	Clayey fine sand	105	100	29	25	---
B-2	1-3	Silty fine sand	100	---	30	25*	---
B-2	3-6	Silty clay	110	3,000	---	400	.005
B-2	6-21.5	Silty fine sand	105	---	32	100	---
B-3	0-2.5**	Silty sand fill**	105**	---	32**	100*, **	--
B-3	2.5-4.5	Silty fine sand	100	---	30	90	--
B-3	4.5-6.5	Clayey Fine sand	110	150	29	150	---
B-3	6.5-14; 17.5-21.5	Silty fine sand	105	--	32	150	---
B-3	14-17.5	Sandy silt/silty sand	110	100	29	125	---

* The values for the upper 18 inches of granular soils and 30 inches of cohesive soils at the surface should be reduced to half the value give for “k” due to soil weathering and seasonal effects.

** Surficial fill should be removed and replaced with structural fill to utilize these values.

Soil conditions below six and one-half feet in Boring B-1 are expected to be similar to those encountered in Borings B-2 and B-3. Therefore, for design purposes, it is recommended that values provided for Boring B-2 from 6.0 to 21.5 feet be used for Boring B-1. Drilled piers are anticipated to extend a minimum of 10 feet below the ground surface. Average values for bearing capacity and side friction of drilled piers may be taken from the following table. These values are based on the natural soil conditions encountered within the borings and should not be used in fill areas unless the fill is placed as structural fill. Additionally, these values are based on a clean pier excavation bearing on undisturbed soils.

Depth (feet)	End-Bearing (psf)*	Skin Friction (psf)	Uplift Friction (psf)
2.5-10.0*	5,000*	500	375
11.0-20.0	7,000	900	675

* End-bearing is based on a minimum pier depth of 10 feet.

5.4.2 Installation

Drilled piers shall be placed a minimum of 12 feet horizontally away from the existing retaining wall.

Each pier excavation shall be inspected to ensure they are clean of loose soil that may slough into the excavation. Each pier excavation should have a straight smooth side and not be allowed to flare near the ground surface. Each excavation shall be inspected for irregularities that may affect the pier performance to determine if the excavation meets the structural engineer's design tolerances. All piers should be reinforced their entire length. Concrete shall be placed immediately following drilling to reduce drying of the upper soils, to reduce any potential seepage of water into the bottom of the excavation, and to reduce the safety risk of the open excavation. Additionally, concrete shall be pumped or tremmied to the bottom of the excavation and not allowed to free fall more than three feet.

5.4.3 Settlements

Loading has not been provided at this time. However, it is anticipated that drilled pier design will be governed by lateral loading and acceptable deflections and that the vertical loads will be relatively light. Settlements of drilled piers designed with a minimum embedment depth of 10 feet are projected to be less than one inch. Once design loads become available, GSH should be notified to review settlements.

5.5 GEOSEISMIC SETTING

5.5.1 General

Utah municipalities adopted the International Building Code (IBC) 2006 on January 1, 2007. The IBC 2006 code determines the seismic hazard for a site based upon 2002 mapping of bedrock accelerations prepared by the United States Geologic Survey (USGS) and the soil site class. The USGS values are presented on maps incorporated into the IBC code and are also available based on latitude and longitude coordinates (grid points).

5.5.2 Faulting

Based on our review of available literature, no active faults pass directly through the site. However, mapped segments of the Weber portion of the Wasatch fault exist approximately 300 feet to the west (running north-south through the football field) and 350 feet to the east of the site.

The Wasatch fault zone is considered capable of generating earthquakes as large as magnitude 7.3³.

5.5.3 Soil Class

For dynamic structural analysis, the Site Class D - Stiff Soil Profile as defined in Table 1613.5.2, Site Class Definitions, of the IBC 2006 can be utilized.

5.5.4 Ground Motions

The IBC 2006 code is based on 2002 USGS mapping, which provides values of short and long period accelerations for the Site Class B-C boundary for the Maximum Considered Earthquake (MCE). This Site Class B-C boundary represents a hypothetical bedrock surface and must be corrected for local soil conditions. The following table summarizes the peak ground and short and long period accelerations for a MCE event and incorporates a soil amplification factor for a Site Class D soil profile in the second column. Based on the site latitude and longitude (41.1915 degrees north and 111.9392 degrees west, respectively), the values for this site are tabulated on the following page.

³ Arabasz, W.J., Pechmann, J.C., and Brown, E.D., 1992, Observational seismology and the evaluation of earthquake hazards and risk in the Wasatch Front area, Utah, in Gori, P.L., and Hays, W.W., eds., Assessment of regional earthquake hazards and risk along the Wasatch Front, Utah: U.S. Geological Survey Professional Paper 1500-D, 36 p.

Spectral Acceleration Value, T Seconds	Site Class B-C Boundary [mapped values] (% g)	Site Class D [adjusted for site class effects] (% g)
Peak Ground Acceleration	55.5	55.5
0.2 Seconds, (Short Period Acceleration)	$S_S = 138.7$	$S_{MS} = 138.7$
1.0 Seconds (Long Period Acceleration)	$S_1 = 57.6$	$S_{M1} = 86.3$

The IBC 2006 code design accelerations (S_{DS} and S_{D1}) are based on multiplying the above accelerations (adjusted for site class effects) for the MCE event by two-thirds ($\frac{2}{3}$).

5.5.5 Liquefaction

The site is located in an area that has been identified by the Earthquake Preparedness Information Center, Utah Division of Comprehensive Emergency Management, for Weber County as having a “low to moderate” liquefaction potential. Liquefaction is defined as the condition when saturated, loose, finer-grained sand-type soils lose their support capabilities because of excessive pore water pressure which develops during a seismic event. The soils encountered to the depths penetrated 6.5 to 21.5 feet, within the borings, were not saturated. Therefore, liquefaction of the site soils encountered in the borings is not anticipated to the extents explored.

5.6 CEMENT TYPES

Laboratory tests indicate that the site soils contain negligible amounts of water soluble sulfates. Therefore, all concrete which will be in contact with the site soils may be prepared using Type I or IA cement.

5.7 SITE OBSERVATIONS

A log of soils excavated should be recorded during drilling of the individual piers and compared to the design soils. It is recommended that a qualified geotechnical engineer observe the drilling to provide verification and further recommendations as needed.

E.C.E. INC.
Job No. 0959-001-09
Geotechnical Study
November 9, 2009



We appreciate the opportunity of providing this service for you. If you have any questions or require additional information, please do not hesitate to contact us.

Respectfully submitted,

GSH Geotechnical Consultants, Inc.

A handwritten signature in black ink that reads "Bryan N. Roberts".

Bryan N. Roberts, PE
State of Utah No. 276476
Project Geotechnical Engineer

Reviewed by:

A handwritten signature in black ink that reads "Michael S. Huber".

Michael S. Huber, PE
State of Utah No. 343650
Vice President/Senior Geotechnical Engineer

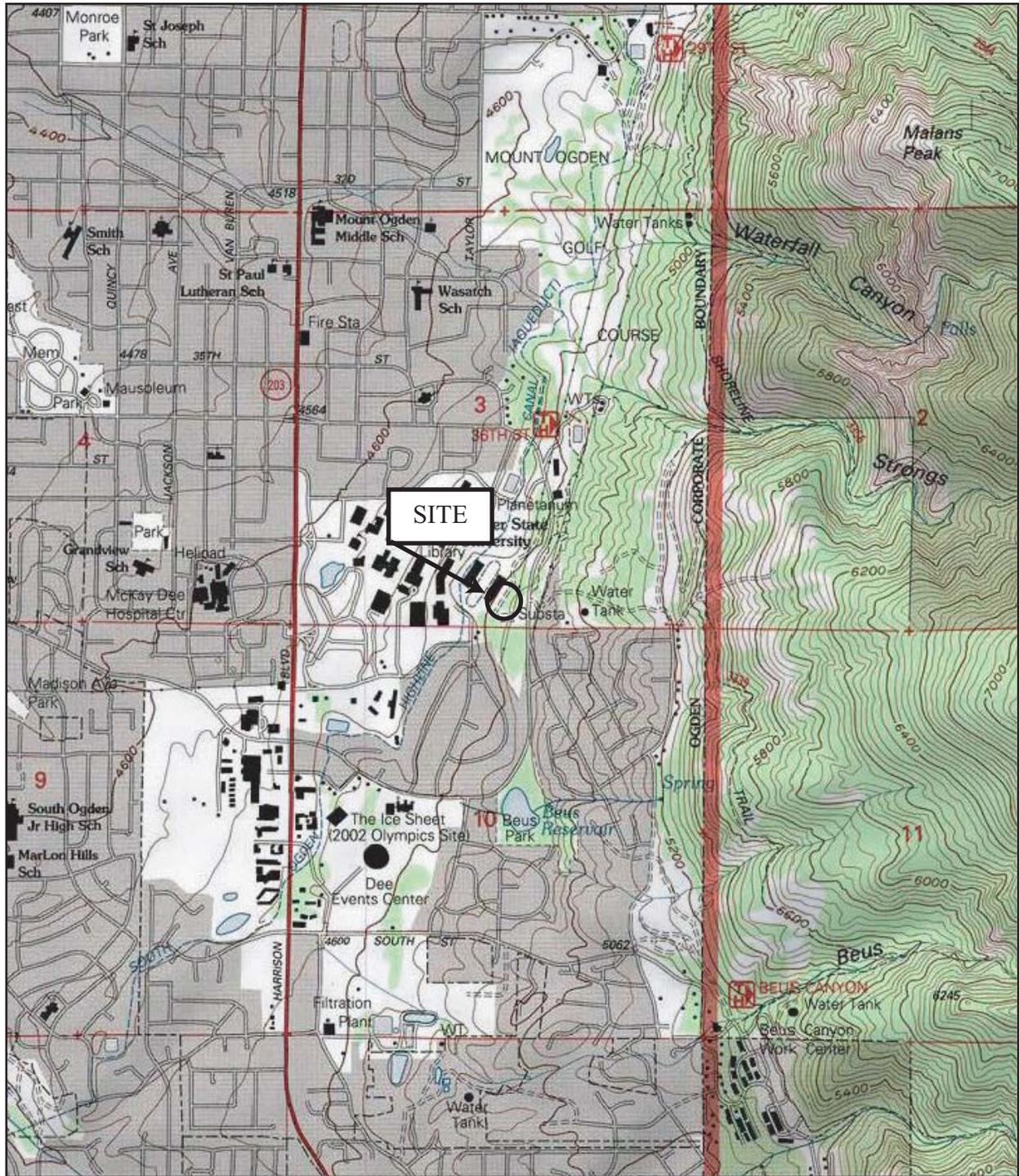
BNR/MSH:sn

Encl. Figure 1, Vicinity Map
Figure 2, Site Plan
Figures 3A through 3C, Log of Borings
Figure 4, Unified Soil Classification System

Addressee (3 + email)

c: Mr. Jeremy Achter (email only)
ARW Engineers
1594 West Park Circle
Ogden, Utah 84404

Mr. Jim Harris (email only)
Director of Community Development
Weber State University
2601 University Circle
Ogden, Utah 84408



REFERENCE:
USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE MAP
"OGDEN, UTAH"
DATED 1998

FIGURE 1
VICINITY MAP





REFERENCE:
ADAPTED FROM AERIAL PHOTOGRAPH
DOWNLOADED FROM 2009 GOOGLE EARTH

APPROXIMATE SCALE: 1" = 86'

FIGURE 2
SITE PLAN



Project Name: Prop. New East Lighting - Football Stadium
 Location: Weber State University Campus, Ogden, Utah
 Drilling Method: 3-3/4" ID Hollow-Stem Auger
 Elevation: - - -
 Remarks: _____

Project No.: 0959-001-09
 Client: E.C.E. INC.
 Date Drilled: 10-12-09 GSH Field Rep.: RJG
 Water Level: No groundwater encountered (10-12-09)

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								
		SILTY CLAY with trace to some fine sand and some to numerous thin layers of clayey silt; major roots (topsoil) to 2"-3"; light brown (CL)									loose to 3" moist very stiff
			19	|||	4.3	90.8					
			5		▲						sligth to moist moist
		Drilling refusal at 4.5'. Stopped sampling at 6.5'. No groundwater encountered at time of drilling.	10								
			15								
			20								
			25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3A

Project Name: Prop. New East Lighting - Football Stadium
 Location: Weber State University Campus, Ogden, Utah
 Drilling Method: 3-3/4" ID Hollow-Stem Auger
 Elevation: ---
 Remarks: _____

Project No.: 0959-001-09
 Client: E.C.E. INC.
 Date Drilled: 10-12-09 GSH Field Rep.: RJG
 Water Level: No groundwater encountered (10-12-09)

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								loose to 3" moist loose
		CLAYEY FINE SAND with trace organics; major roots (topsoil) up to 3"; light brown (SC)		18	▲	2.4		97			
		SILTY FINE SAND light brown (SM)									moist very stiff
		SILTY CLAY with occasional layers up to 2" thick and thin pockets of fine sand and sandy silt; mottling; brown (CL)	5	53	▲	16.7		110			
		SILTY FINE SAND with occasional to numerous layers of silty clay/sandy clay up to 2" thick; brown (SM)									moist medium dense
				39	▲						
		grades without clay layers	10								
				41	▲	8.0	24.8	97			
		grades with occasional layers up to 1" thick of silty clay with some fine sand	20								
				36	▲						
		Stopped drilling at 20.0'. Stopped sampling at 21.5'. No groundwater encountered at time of drilling. Installed 1-1/4" diameter slotted PVC pipe to 21.5'.	25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3B

Project Name: Prop. New East Lighting - Football Stadium

Project No.: 0959-001-09

Location: Weber State University Campus, Ogden, Utah

Client: E.C.E. INC.

Drilling Method: 3-3/4" ID Hollow-Stem Auger

Date Drilled: 10-12-09

GSH Field Rep.: RJG

Elevation: - - -

Water Level: No groundwater encountered (10-12-09)

Remarks:

Graphical Log	Water Level	DESCRIPTION	DEPTH FT.	BLOWS/FT	SAMPLE SYMBOL	MOISTURE (%)	% PASSING 200	DRY DENSITY (PCF)	Liquid Limit (%)	Plastic Limit (%)	REMARKS
		Ground Surface	0								loose to 2" moist medium dense
		SILTY FINE TO COARSE SAND, FILL with some fine and coarse gravel; brown (SM-FILL)									
		SILTY FINE SAND with occasional gravel; brown (SM)		13							slightly moist to moist very dense
		CLAYEY FINE SAND with occasional silty clay layers up to 1/2" thick; brown (SC)	5	63							
		SILTY FINE SAND with occasional fine and coarse gravel; brown (SM)		100+		4.3	25.7				
		grades brown and light brown	10	21		4.6	23.5				
		FINE SANDY SILT/SILTY FINE SAND with trace to some gravel and occasional to some layers of silty clay up to 2" thick; light brown (SM/ML)	15	28							medium dense/very stiff
		SILTY FINE SAND with occasional fine and coarse gravel; brown (SM)		20							moist dense
		Stopped drilling at 20.0'. Stopped sampling at 21.5'. No groundwater encountered at time of drilling.	25								

The discussion in the text under the section titled, SUBSURFACE CONDITIONS, is necessary for a proper understanding of the nature of the subsurface material.

FIGURE 3C

UNIFIED SOIL CLASSIFICATION SYSTEM

FIELD IDENTIFICATION PROCEDURES				GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS More than half of material is larger than No. 200 sieve size. \geq (The No. 200 sieve size is about the smallest particle visible to the naked eye)	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size. (For visual classifications, the 1/4" size may be used as equivalent to the No. 4 sieve size.)	CLEAN GRAVELS (Little or no fines)	Wide range in grain size and substantial amounts of all intermediate particle sizes.		GW	Well graded gravels, gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES (Appreciable amount of fines)	Predominantly one size or a range of sizes with some intermediate sizes missing.		GP	Poorly graded gravels, gravel-sand mixtures, little or no fines.
			Non-plastic fines (for identification procedures see ML below).		GM	Silty gravels, poorly graded gravel-sand-silt mixtures.
		SANDS More than half of coarse fraction is smaller than No. 4 sieve size. (For visual classifications, the 1/4" size may be used as equivalent to the No. 4 sieve size.)	CLEAN SANDS (Little or no fines)	Wide range in grain sizes and substantial amounts of all intermediate particle sizes.		SW	Well graded sands, gravelly sands, little or no fines.
	SANDS WITH FINES (Appreciable amount of fines)		Predominantly one size or a range of sizes with some intermediate sizes missing.		SP	Poorly graded sands, gravelly sands, little or no fines.
			Non-plastic fines (for identification procedures see ML below).		SM	Silty sands, poorly graded sand-silt mixtures.
	SANDS WITH FINES (Appreciable amount of fines)		Plastic fines (for identification procedures see CL below).		SC	Clayey sands, poorly graded sand-clay mixtures.

1 Boundary classifications: -Soils possessing characteristics of two groups are designated by combinations of group symbols. For example GW-GC, well graded gravel-sand mixture with clay binder.
2 All sieve sizes on this chart are U.S. standard.

GENERAL NOTES

- In general, Unified Soil Classification Designations presented on the logs were evaluated by visual methods only. Therefore, actual descriptions (based on laboratory testing) may differ.
- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.
- Logs represent general soil conditions observed at the point of exploration on the date indicated.
- No warranty is provided as to the continuity of soil conditions between individual sample locations.

LOG KEY SYMBOLS

	Bulk / Bag Sample		Thin Wall
	Standard Penetration Split Spoon Sampler		No Recovery
	Rock Core		3-3/4" ID D&M Sampler
	Water Level		3" ID D&M Sampler
			California Sampler

FINE - GRAINED SOIL		TORVANE		POCKET PENETROMETER		FIELD TEST
CONSISTENCY	SPT (blows/ft)	UNDRAINED SHEAR STRENGTH (tsf)	TORVANE	UNCONFINED COMPRESSIVE STRENGTH (tsf)	POCKET PENETROMETER	
Very Soft	<2	<0.125	<0.125	<0.25	<0.25	Easily penetrated several inches by Thumb. Squeezes through fingers.
Soft	2 - 4	0.125 - 0.25	0.125 - 0.25	0.25 - 0.5	0.25 - 0.5	Easily penetrated 1" by Thumb. Molded by light finger pressure.
Medium Stiff	4 - 8	0.25 - 0.5	0.25 - 0.5	0.5 - 1.0	0.5 - 1.0	Penetrated over 1/2" by Thumb with moderate effort. Molded by strong finger pressure.
Stiff	8 - 15	0.5 - 1.0	0.5 - 1.0	1.0 - 2.0	1.0 - 2.0	Indented about 1/2" by Thumb but penetrated only with great effort
Very Stiff	15 - 30	1.0 - 2.0	1.0 - 2.0	2.0 - 4.0	2.0 - 4.0	Readily indented by Thumb nail
Hard	>30	>2.0	>2.0	>4.0	>4.0	Indented with difficulty by Thumb nail

COARSE - GRAINDE SOIL

APPERENT DENSITY	SPT (blows/ft)	RELATIVE DENSITY (%)	FIELD TEST
Very Loose	<4	0 - 15	Easily penetrated with 1/2" reinforcing rod pushed by hand
Loose	4 - 10	15 - 35	Difficult to penetrated with 1/2" reinforcing rod pushed by hand
Medium Dense	10 - 30	35 - 65	Easily penetrated a foot with 1/2" reinforcing rod driven with 5-lb hammer
Dense	30 - 50	65 - 85	Difficult to penetrated a foot with 1/2" reinforcing rod driven with 5-lb hammer
Very Dense	>50	85 - 100	Penetrated only a few inches with 1/2" reinforcing rod driven with 5-lb hammer

STRATIFICATION

DESCRIPTION	THICKNESS
SEAM	1/16 - 1/2"
LAYER	1/2 - 12"
DESCRIPTION	THICKNESS
Occasional	One or less per foot of thickness
Frequent	More than one per foot of thickness

CEMENTATION

DESCRIPTION	DESCRIPTION
Weakly	Crumbles or breaks with handling of slight finger pressure
Moderately	Crumbles or breaks with considerable finger pressure
Strongly	Will not crumbles or breaks with finger pressure

MODIFIERS

DESCRIPTION	%
Trace	<5
Some	5 - 12
With	>12

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible water, usually soil below Water Table

FIGURE 4

SECTION 01100 - SUMMARY

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 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Project consists of removal and replacement of field lighting as shown.

1.3 CONSTRUCTION SCHEDULE – MANPOWER REQUIREMENTS

- A. Contractors shall provide adequate personnel and extend workdays and work weeks to comply with the schedule requirements of this project.

1.4 USE OF PREMISES

- A. General: The Contractor shall have full use of the construction area for operations.

1.5 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "MasterFormat" numbering system.
 - 1. Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 - 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

- a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not used)

END OF SECTION 01100

SECTION 01250 - CONTRACT MODIFICATION PROCEDURES

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 specifies administrative and procedural requirements for handling and processing Contract modifications.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. Within **7 days** after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
5. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: Use AIA Document G709 for Proposal Requests.

1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on **AIA Document G701**.

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: **Architect** may issue a Construction Change Directive on AIA Document G714. Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the **Construction** Change Directive.
1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used).

END OF SECTION 01250

SECTION 01290 - PAYMENT PROCEDURES

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 specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittals Schedule.
 - 2. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.
 - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
 - 4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 - 5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.

6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Allowances (if required): Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- B. Payment Application Forms: Use **AIA Document G702 and AIA Document G703 Continuation Sheets** as form for Applications for Payment.
- C. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- D. Transmittal: Submit 2 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- E. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
 1. Submit partial waivers on each item for amount requested, before deduction for retainage, on each item.
 2. When an application shows completion of an item, submit final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.

4. Waiver Delays: Submit each Application for Payment with Contractor's waiver of mechanic's lien for construction period covered by the application.
 - a. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- F. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
- G. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01290

SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

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 provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General project coordination procedures.
 - 2. Conservation.
 - 3. Coordination Drawings.
 - 4. Administrative and supervisory personnel.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Summary" for a description of the Work and responsibility for coordination activities not in this Section.
 - 2. Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
 - 3. Division 1 Section "Closeout Procedures" for coordinating Contract closeout.

1.3 COORDINATION

- A. Coordination: Contractor shall coordinate its construction operations with those of other contractors in separate phases where required, and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations of other contractors under this contract or others, 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.
- B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities 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. Preinstallation conferences.
 - 6. Project closeout activities.

- D. 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.

1.4 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
 - 1. Indicate relationship of components shown on separate Shop Drawings.
 - 2. Indicate required installation sequences.

- B. Staff Names: submit a list of the principal staff assignments, including superintendent and other personnel in attendance at Project site. 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.

- C. Project Administrative Submittal that must precede or coincide with starting the work include the following:
 - 1. List of subcontractors.
 - 2. Schedule of Values.
 - 3. Contractor's Construction Schedule .
 - 4. Products list.
 - 5. Schedule of unit prices
 - 6. Submittals Schedule
 - 7. List of Contractor's staff assignments.
 - 8. Copies of building permits.
 - 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 - 10. Initial progress report.
 - 11. Report of preconstruction conference.
 - 12. Certificates of insurance and insurance policies if not provided to Owner at contract signing.
 - 13. Performance and payment bonds.
 - 14. Initial settlement survey and damage report if required.

1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
 - 1. Include special personnel required for coordination of operations with sub-contractors.

1.6 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
 - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - 3. Minutes: The Architect will record significant discussions and agreements achieved and distribute the meeting minutes to everyone concerned, including Owner and Contractor, within 2 days of the meeting.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than **10** days after execution of the Agreement unless otherwise directed by Owner. Hold the conference at Project site. Conduct the meeting to review responsibilities and personnel assignments.
 - 1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing.
 - d. Designation of responsible personnel.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for processing Applications for Payment.
 - g. Distribution of the Contract Documents.
 - h. Submittal procedures.
 - i. Preparation of Record Documents.
 - j. Use of the premises.
 - k. Responsibility for temporary facilities and controls.
 - l. Parking availability.
 - m. Office, work, and storage areas.
 - n. Equipment deliveries and priorities.
 - o. First aid.
 - p. Security.
 - q. Site Upkeep.
 - r. Working hours.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before construction activities that requires coordination with other construction.

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

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related Change Orders.
 - d. Purchases.
 - e. Deliveries.
 - f. Submittals.
 - g. Review of mockups.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.
 - k. Weather limitations.
 - l. Manufacturer's written recommendations.
 - m. Warranty requirements.
 - n. Compatibility of materials.
 - o. Acceptability of substrates.
 - p. Temporary facilities and controls.
 - q. Space and access limitations.
 - r. Regulations of authorities having jurisdiction.
 - s. Testing and inspecting requirements.
 - t. Required performance results.
 - u. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements.
4. 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01310

SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION

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 for documenting the progress of construction during performance of the Work, including the following:
 - 1. Daily construction reports.
 - 2. Field condition reports.
 - 3. Special reports.
- B. Related Sections include the following:
 - 1. Division 1 Section "Payment Procedures" for submitting the Schedule of Values.
 - 2. Division 1 Section "Quality Requirements" for submitting a schedule of tests and inspections.
 - 3. Division 1 Section "Closeout Procedures" for submitting Project Record Documents at Project closeout.

1.3 SUBMITTALS

- A. Preliminary Construction Schedule: Submit **two** printed copies; one a single sheet of reproducible media, and one a print.
- B. Contractor's Construction Schedule:
- C. Daily Construction Reports: Submit one copy at end of each week of construction.
- D. Field Condition Reports: Submit one copy at time of discovery of differing conditions.
- E. Special Reports: Submit one copy at time of unusual event.

1.4 QUALITY ASSURANCE

- A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:
 - 1. Discuss constraints, including **phasing, storage areas**.
 - 2. Review time required for review of submittals and resubmittals.
 - 3. Review requirements for tests and inspections by independent testing and inspecting agencies, If required
 - 4. Review time required for completion and startup procedures.
 - 5. Review and finalize list of construction activities to be included in schedule.

6. Review submittal requirements and procedures.
7. Review procedures for updating schedule.

1.5 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 1. Secure time commitments for performing critical elements of the Work including delivery of equipment from parties involved.
 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. Time Frame: Extend schedule from date established for **commencement of the Work or the Notice to Proceed** to date of **Substantial Completion**.
- C. Activities: Treat each separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
 1. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 30 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 2. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 3. Startup and Testing Time: Include days for startup and testing as required by the Electrical Consultant.
 4. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
- D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 1. Phasing: Arrange list of activities on schedule by phase or separate areas of the work,
 2. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Uninterruptible services.

- c. Use of premises restrictions.
 - d. Provisions for future construction.
 - e. Seasonal variations.
 - f. Environmental control.
3. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
- a. Subcontract awards, if any.
 - b. Submittals.
 - c. Purchases.
 - d. Fabrication.
 - e. Sample testing.
 - f. Deliveries.
 - g. Installation.
 - h. Tests and inspections.
 - i. Adjusting.
 - j. Startup and placement into final use and operation.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, Percentage completion milestones and Final Completion.
- F. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis to demonstrate the effect of the proposed change on the overall project schedule.

2.2 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
1. List of subcontractors at Project site, if any.
 2. List of separate contractors at Project site where applicable
 3. Approximate count of personnel at Project site.
 4. High and low temperatures and general weather conditions.
 5. Accidents.
 6. Meetings and significant decisions.
 7. Unusual events (refer to special reports).
 8. Stoppages, delays, shortages, and losses.
 9. Emergency procedures.
 10. Orders and requests of authorities having jurisdiction.
 11. Change Orders received and implemented.
 12. Construction Change Directives received.
 13. Services connected and disconnected.
 14. Equipment or system tests and startups.
 15. Partial Completions.
 16. Substantial Completions.
- B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.3 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At weekly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one day before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect, Owner, sub-contractors, testing and inspecting agencies, if applicable and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01320

SECTION 01330 - SUBMITTAL PROCEDURES

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 for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.
- B. Related Sections include the following:
 - 1. Division 1 Section "Payment Procedures" for submitting Applications for Payment.
 - 2. Division 1 Section "Project Management and Coordination" for submitting Coordination Drawings.
 - 3. Division 1 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule
 - 4. Division 1 Section "Quality Requirements" for submitting test and inspection reports and Delegated-Design Submittals.
 - 5. Division 1 Section "Closeout Procedures" for submitting warranties Project Record Documents and operation and maintenance manuals.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's approval. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings will **not** be provided by Architect for Contractor's use in preparing submittals.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. **Architect reserves** the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

- C. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on **Architect's** receipt of submittal.
1. Initial Review: Allow 15 business days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Concurrent Review: Where concurrent review of submittals by Architect's consultants, Owner, or other parties is required, allow 21 business days for initial review of each submittal.
 3. Direct Transmittal to Consultant: Where the Contract Documents indicate that submittals may be transmitted directly to Architect's consultants, provide duplicate copy of transmittal to Architect. Submittal will be returned to Architect before being returned to Contractor.
 4. If intermediate submittal is necessary, process it in same manner as initial submittal.
 5. Allow 10 additional days for processing each resubmittal.
 6. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
- E. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately **4 by 5 inches (100 by 125 mm)** on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor, if any
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Unique identifier, including revision number.
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Other necessary identification.
- F. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
- G. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.

2. Additional copies submitted for maintenance manuals will **not** be marked with action taken and will be returned.
- H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will **return submittals, without review**, received from sources other than Contractor.
1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
 2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
 3. Transmittal Form: Provide locations on form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Submittal and transmittal distribution record.
 - i. Remarks.
 - j. Signature of transmitter.
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
1. Number of Copies: Submit **FOUR** copies of each submittal, unless otherwise indicated. Architect will return one copy. Mark up and retain copy as a Project Record Document.
 2. Modifications of the number required may be modified by the Architect to fit specific project needs where additional copies may be required for portions of the work.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:

- a. Manufacturer's written recommendations.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's installation instructions.
 - d. Standard color charts.
 - e. Manufacturer's catalog cuts.
 - f. Wiring diagrams showing factory-installed wiring.
 - g. Printed performance curves.
 - h. Operational range diagrams.
 - i. Standard product operating and maintenance manuals.
 - j. Compliance with recognized trade association standards.
 - k. Compliance with recognized testing agency standards.
 - l. Application of testing agency labels and seals.
 - m. Notation of coordination requirements.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shopwork manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.
 - j. Compliance with specified standards.
 - k. Notation of coordination requirements.
 - l. Notation of dimensions established by field measurement.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least **8-1/2 by 11 inches (215 by 280 mm)** but no larger than **30 by 40 inches (750 by 1000 mm)**.
 3. Number of Copies: Submit copies of each submittal, as follows:
 - a. Initial Submittal: Submit FOUR blue- or black-line prints. Architect, will return one print.
 - b. Final Submittal: Submit FOUR blue- or black-line prints, unless prints are required for operation and maintenance manuals. Submit nine prints where prints are required for operation and maintenance manuals. **Mark up and retain one returned print as a Project Record Drawing.**
- D. Coordination Drawings: Comply with requirements in Division 1 Section "Project Management and Coordination."
- E. Samples: Prepare physical units of materials or products, including the following:
1. Comply with requirements in Division 1 Section "Quality Requirements" for mockups.
 2. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 3. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of

- color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
4. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect's sample where so indicated. Attach label on unexposed side that includes the following:
 - a. Generic description of Sample.
 - b. Product name or name of manufacturer.
 - c. Sample source.
 5. Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, provide the following:
 - a. Size limitations.
 - b. Compliance with recognized standards.
 - c. Availability.
 - d. Delivery time.
 6. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
 - a. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
 7. Number of Samples for Initial Selection: Submit two full sets of available choices where establishment of a level of quality is required to be selected from manufacturer's product line. Architect will return submittal with options selected.
 8. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
- F. Product Schedule or List: Prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Type of product. Include unique identifier for each product.
 2. Location .
- G. Contractor's Construction Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for Construction Manager's action.
- H. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation."

- I. Application for Payment: Comply with requirements in Division 1 Section "Payment Procedures."
- J. Schedule of Values: Comply with requirements in Division 1 Section "Payment Procedures."
- K. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.

2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
 - 1. Number of Copies: Submit FOUR copies of each submittal, unless otherwise indicated. Architect will not return copies.
 - 2. Certificates and Certifications: Provide a notarized statement that includes signature of Contractor, testing agency, or design professional responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of the company.
 - 3. Test and Inspection Reports: Comply with requirements in Division 1 Section "Quality Requirements."
- B. Contractor's Construction Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation."
- C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- D. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.
- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
- H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.

- I. **Material Test Reports:** Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
- J. **Preconstruction Test Reports:** Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.
- K. **Field Test Reports:** Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.
- L. **Product Test Reports:** Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- M. **Research/Evaluation Reports:** Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- N. **Maintenance Data:** Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 1 Section "**Closeout Procedures.**"
- O. **Design Data:** Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable.
- P. **Manufacturer's Instructions:** Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
 - 1. Preparation of substrates.
 - 2. Required substrate tolerances.
 - 3. Sequence of installation or erection.
 - 4. Required installation tolerances.
 - 5. Required adjustments.
 - 6. Recommendations for cleaning and protection.
- Q. **Insurance Certificates and Bonds:** Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

- R. Material Safety Data Sheets: Submit information directly to Owner. If submitted to Architect, Architect will not review this information but will return it with no action taken.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect .
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. General: ARCHITECT WILL NOT REVIEW SUBMITTALS THAT DO NOT BEAR CONTRACTOR'S APPROVAL STAMP AND WILL RETURN THEM WITHOUT ACTION.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION 01330

SECTION 01400 - QUALITY CONTROL

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. General Quality Control
- B. Workmanship
- C. Manufacturer's Instructions
- D. Manufacturer's Certificates
- E. Manufacturer's Field Services
- F. Testing Laboratory Services

1.02 RELATED REQUIREMENTS

- A. Inspection and testing required by governing authorities.
- B. Section 01330 - Submittals:

1.03 QUALITY CONTROL - GENERAL

- A. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

1.04 WORKMANSHIP

- A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.
- B. Perform work by persons qualified to produce workmanship of specified quality.
- C. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.05 MANUFACTURERS' INSTRUCTIONS

- A. Comply with instructions in full detail, including each step in sequence. Should instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

1.06 MANUFACTURERS' CERTIFICATES

- A. When required by individual Specifications Section, submit manufacturer's certificate, in duplicate, that products meet or exceed specified requirements.

1.07 MANUFACTURERS' FIELD SERVICES

- A. When specified in respective Specification Sections, require supplier to provide qualified personnel to observe field conditions, quality of workmanship, as applicable, and to make appropriate recommendations.
- B. Representative shall submit written report to Engineer listing observations and recommendations.

1.08 TESTING LABORATORY SERVICES

- A. Owner will employ and pay for services of an Independent Testing Laboratory to perform inspections, tests, and other services required by individual Specification Sections.
- B. Services will be performed in accordance with requirements of local jurisdiction having authority and with specified standards.
- C. Reports will be submitted to Owner in duplicate giving observations and results of tests, indicating compliance or non-compliance with specified standards and with Contract Documents.
- D. Contractor shall cooperate with Testing Laboratory personnel; furnish tools, samples of materials, mix design, equipment, storage and assistance as requested.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTIONS

Not Used.

END OF SECTION

SECTION 01420 - REFERENCES

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 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": The term "approved," when used in conjunction with Architect's action on Contractor's submittals, applications, and requests, is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by Architect, requested by Architect, and similar phrases.
- D. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on Drawings; or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference.
- E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": The term "furnish" means to supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": The term "install" describes operations at Project site including unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.
- I. "Installer": An installer is Contractor or another entity engaged by Contractor, as an employee, subcontractor, or contractor of lower tier, to perform a particular construction operation, including installation, erection, application, and similar operations.
- J. The term "experienced," when used with the term "installer," means having successfully completed a minimum of **five** previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name,

such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

- K. "Project site" is the space available for performing construction activities, either exclusively or in conjunction with others performing other work as part of Project. The extent of Project site is shown on the Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. **Applicability of Standards:** Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. **Publication Dates:** Comply with standards in effect as of the date of the Contract Documents, unless otherwise indicated.
- C. **Conflicting Requirements:** Where compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
 - 1. **Minimum Quantity or Quality Levels:** The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to Architect for a decision before proceeding.
- D. **Copies of Standards:** Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from the publication source and make them available on request.
- E. **Abbreviations and Names:** Abbreviations and acronyms are frequently used in the Specifications and other Contract Documents to represent the name of a trade association, standards-developing organization, authorities having jurisdiction, or other entity in the context of referencing a standard or publication. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of these entities. Refer to Gale Research's "Encyclopedia of Associations" or Columbia Books' "National Trade & Professional Associations of the U.S.," which are available in most libraries.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01420

SECTION 01500 - CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.01 REQUIREMENTS INCLUDED

- A. Contractor shall provide all materials, labor, equipment, transportation, fees, permits and other items required to provide construction facilities and temporary controls as indicated or as required to accomplish Work of other sections of these specifications. All construction facilities and temporary controls shall be in accordance with applicable regulations and as specified herein.
- B. Construction facilities and temporary controls includes, but is not limited to the following:
 - 1. Temporary Utilities
 - 2. Barriers and Enclosures
 - 3. Security
 - 4. Temporary Controls
 - 5. Traffic Regulation

1.02 RELATED REQUIREMENTS

- A. Section 01770 - Contract Closeout: Final cleaning.

1.03 REFERENCES

- A. The applicable provisions of the latest editions of the References listed below shall govern the Work covered under this Section, unless there is a conflict between said References and the requirements of this Section. In the case of such a conflict, the requirements of this Section shall apply.
- B. American National Standards Institute (ANSI)
- C. American Society for Testing of Materials (ASTM)
- D. National Electrical Code (NEC)
- E. National Fire Protection Association (NFPA)
- F. Underwriters Laboratories (UL)
- G. Utah Occupational Safety and Health Division (UOSHD).
- H. American Association of State Highway and Transportation Officials (AASHTO)
- I. Utah Department of Transportation Standard Specifications for Roads and Bridges (UDOT)
- J. Manual of Uniform Traffic Control Devices (MUTCD)

1.4 USE CHARGES

- A. General: Cost or use charges for temporary facilities are not chargeable to Owner or Architect and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:
 - 1. Architect.
 - 2. Testing agencies.
 - 3. Personnel of authorities having jurisdiction.
- B. Water Service: Use water from hydrant mounted meter adjacent to site obtained by the Contractor.
- C. Electric Power Service: Use electric power from Owner's existing system without metering and without payment of use charges.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Contractor shall provide all materials for accomplishing the Work of this Section in accordance with applicable standards and regulations and as specified herein.
- B. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

2.2 EQUIPMENT

- A. General: Provide equipment suitable for use intended.
- B. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.
 - 1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.
- C. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

PART 3 - EXECUTION

3.01 TEMPORARY UTILITIES

- A. Provide service required for construction operations.

3.02 BARRIERS AND ENCLOSURES

- A. Provide as required to prevent public entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.
- B. New construction provide fence around construction site; equip with vehicular and pedestrian gates with locks. Construction: Contractor's option.
- C. Provide barricades as required by governing authorities for public rights-of-way.
- D. Provide barriers around trees and plants designated to remain. Protect against vehicular traffic, stored materials, dumping, chemically injurious materials, and puddling or continuous running water.

3.03 SECURITY

- A. Provide temporary protection for installed products. Control traffic in immediate area to minimize damage.
- B. Prohibit traffic on lawn and landscaped areas, except where landscaping is to be replaced.

3.04 TEMPORARY CONTROLS

- A. Surface Water, Erosion and Sediment Control:
1. Surface water shall be controlled so that the construction area is not allowed to become wet from runoff from adjacent areas. Surface water shall be directed away from these areas but not directed toward adjacent property, buildings, or any improvement that may be damaged by water. Surface water shall not be allowed to enter sanitary sewers.
 2. Maintain excavations free of water. Provide and operate pumping equipment.
 3. Prevent erosion and sedimentation.
 4. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
- B. Construction Cleaning
1. All public and private areas used as haul roads shall be continuously maintained and cleaned of all construction caused debris such as mud, sand, gravel, soils, pavement fragments, sod, etc. Care shall be taken to prevent spillage on haul routes. Any such spillage shall be removed immediately and the area cleaned.
 2. Public roads shall be maintained in accordance with applicable ordinances and regulations.
 3. Throughout all phases of construction, including suspension of work, and until final acceptance of the project, the Contractor shall keep the work site clean and shall remove daily all refuse, dirt, damaged materials, unusable materials, and all other trash or debris that he has created from his construction activities.
 4. Materials and equipment shall be removed from the site as soon as they are no longer necessary; and upon completion of the work and before final inspection, the entire worksite shall be cleared of equipment, unused materials, and rubbish so as to present a satisfactory clean and neat appearance. All cleanup costs shall be included in the Contractor's Bid.
- C. Dust Control:
1. Dust control measures shall be implemented by application of water to all work areas, storage areas, haul and access roads, or other areas affected by construction.
 2. All work shall be in compliance with the Federal, State, and local air pollution standards, and not cause a hazard or nuisance to personnel and the public in the vicinity of the work.
 3. Provide and operate at least 1 mobile tank sprinkling unit or other positive means to prevent air-borne dust from dispersing into atmosphere.
 4. Other methods of dust control for haul and access roads may include chemical treatment, light bituminous treatment or other method as approved by the Engineer.
 5. Execute work by methods to minimize raising dust from construction operations.

3.5 TRAFFIC REGULATION

- A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Owner's operations.
- B. Monitor parking of construction personnel's vehicles. Maintain vehicular access to and through parking areas.
- C. Prevent parking on or adjacent to access roads or in non-designated areas.
- D. Provide trained and equipped flagmen to regulate traffic when construction operations or traffic encroach on public traffic lanes. Provide control in accordance with local authority having jurisdiction.
- E. Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.
- F. Consult with authorities, establish public thoroughfares to be used for haul routes and site access.
- G. Confine construction traffic to haul routes and designated construction limits.
- H. Provide traffic control at critical areas of haul routes to regulate traffic, to minimize interference with public traffic.
- I. At approaches to site and on site, install at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
- J. Relocate as Work progresses, to maintain effective traffic control.
- K. Maintain traffic flow to private driveways during entire contract period.
- L. Post-mounted traffic control and informational signs, traffic cones and drums, flagman equipment: As approved by local jurisdictions.
- M. Where local jurisdictions have no requirements, construct and erect according to "Manual on Uniform Traffic Control Devices for Streets and Highways" (MUTCD).
- N. Remove equipment and devices when no longer required, confirm with owner prior to removal. Repair damage caused by installation. Remove post settings to a depth of 3 feet.

3.6 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 - 1. Locate sanitary facilities, and other temporary construction and support facilities for easy access.
 - 2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.
 - 1. Develop a waste management plan for Work performed on Project. Indicate types of waste materials Project will produce and estimate quantities of each type. Provide detailed information for on-site waste storage. Provide information on destination of each type of waste material and means to be used to dispose of all waste materials.

- C. Sanitary Facilities: Provide temporary toilets. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.
1. Disposable Supplies: Provide toilet tissue, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
 2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy. Use of existing facilities will not be permitted

END OF SECTION

SECTION 01600 - PRODUCT REQUIREMENTS

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 the following administrative and procedural requirements: selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties;
- B. Related Sections include the following:
 - 1. Division 1 Section "Closeout Procedures" for submitting warranties for contract closeout.
 - 2. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility]. Products salvaged or recycled from other projects are not considered new products.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor are allowed only before bid, and will not be considered in the course of Construction.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design", "Design Standard" or similar, including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.
- D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
- E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.4 SUBMITTALS

- A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
 2. Form: Tabulate information for each product under the following column headings:
 - a. Specification Section number and title.
 - b. Generic name used in the Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.
 - f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.
 - h. Identification of items that require early submittal approval for scheduled delivery date.
 3. Initial Submittal: Within 5 days after date of commencement of the Work, submit 8 copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 - a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
 4. Completed List: Within 7 days after date of commencement of the Work, submit 8 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
 5. Architect's Action: Architect will respond in writing to Contractor within 7 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement that products comply with the Contract Documents
 6. Substitution Requests: Will not be considered due to the limited construction time frame of this Project.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 1 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
 - 5. Store products to allow for inspection and measurement of quantity or counting of units.
 - 6. Store materials in a manner that will not endanger Project structure.
 - 7. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 - 9. Protect stored products from damage.
- B. Storage: Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.
1. Provide products complete with accessories, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
 7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures: Procedures for product selection include the following:
1. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.
 2. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.
 3. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
 4. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
 5. Available Products: Where Specification paragraphs or subparagraphs titled "Available Products" introduce a list of names of both products and manufacturers, provide one of the products listed or another product that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
 6. Available Manufacturers: Where Specification paragraphs or subparagraphs titled "Available Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
 7. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design Products" or "Design Standards" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are

based on the product named. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.

8. Visual Matching Specification: Where Specifications require matching an established Sample, select a product (and manufacturer) that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches satisfactorily.
9. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product (and manufacturer) that complies with other specified requirements.
 - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
 - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01600

SECTION 01700 - EXECUTION REQUIREMENTS

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 general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. General installation of products.
 - 2. Coordination of Owner-installed products.
 - 3. Progress cleaning.
 - 4. Protection of installed construction.
 - 5. Correction of the Work.
- B. Related Sections include the following:
 - 1. Division 1 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
 - 2. "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
 - 3. Division 1 Section "Closeout Procedures" for Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
 - 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services to avoid any interference with work of this Contract.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 2. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify **Architect/Owner** not less than **two** days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without **Owner's** written permission. Service interruption must be coordinated with times outside normal school hours and where required, of duration to permit reheating or cooling of the facility prior to time for occupancy.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 INSTALLATION

- A General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
- G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 PROGRESS CLEANING

- A. General: Clean Project site daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

1. Cutting and Patching: Clean areas and spaces where cutting and patching are performed.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.6 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
- B. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- C. Restore permanent facilities used during construction to their specified condition.
- D. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

END OF SECTION 01700

SECTION 01770 - CLOSEOUT PROCEDURES

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 for contract closeout, including, but not limited to, the following:
 - 1. Inspection procedures.
 - 2. Project Record Documents.
 - 3. Final cleaning.
- B. Related Sections include the following:
 - 1. Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
 - 2. Division 1 Section "Execution Requirements" for progress cleaning of Project site.
 - 3. Division 1 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
 - 4. "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 5. Division 2 Sections for specific closeout and special cleaning requirements for products of those Sections.

1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 5. Prepare and submit Project Record Documents, operation and maintenance manuals, and similar final record information.
 - 6. Submit test records.
 - 7. Terminate and remove temporary facilities from Project site, along with construction tools, and similar elements.
 - 8. Complete final cleaning requirements, including touchup painting.
 - 9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

- B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
 - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 - 2. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
 - 1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
 - 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 - 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 - 4. Instruct Owner's personnel in operation, adjustment, and maintenance of, equipment, and systems.
- B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit **three** copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 - 1. Organize list of areas in sequential order,
 - 2. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect
 - d. Name of Contractor.
 - e. Page number.

1.6 PROJECT RECORD DOCUMENTS

- A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.
- B. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.
 - 1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.
 - 2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
 - 3. Mark important additional information that was either shown schematically or omitted from original Drawings.
 - 4. Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
 - 5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.
- C. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 - 3. Note related Change Orders, Record Drawings and Product Data, where applicable.
- D. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 - 3. Note related Change Orders, Record Drawings, and Record Specifications, where applicable.
- E. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual

performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1.7 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations
- B. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

- d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
- C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 01770

SECTION 024116 – EXISTING LIGHT TOWER DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 16.

1.2 SUMMARY

- A. This section includes requirements for the bidding of and the demolition requirements of the existing light towers.

1.3 DEMOLITION REQUIREMENTS

- A. The contractor shall provide all equipment and machinery as required to successfully and carefully disassemble the existing light towers without causing damage to any adjacent facilities.
- B. All debris, scraps, and remnants created as a result of this demolition shall be removed from the site and disposed of in accordance with all local laws and ordinances.
- C. All steel removed from the light towers shall be recycled.
- D. Existing concrete footings and piers shall be removed and disposed of in accordance with all local laws and ordinances. For the purpose of bidding, the existing east tower footings shall be assumed to consist of an 11'-0" square by 18" thick footing that occurs 4'-6" below grade with a 6'-0" square concrete pier that extends up to finish grade. The west tower footings shall be assumed to consist of a 14'-0" square by 20" thick footing that occurs 6'-6" below grade with a 6'-0" square pier that extends up to finish grade. These footings and piers may differ from the actual condition and it is the responsibility of the contractor to determine, during construction, the actual extent of the foundation system and to remove the entire footing and pier regardless of their actual size.

END OF SECTION 024116

SECTION 055000 - BASIC STRUCTURAL DESIGN CRITERIA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 16.

1.2 SUMMARY

- A. This section includes requirements of the structural design criteria for the pole and its foundation system. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 1:

- Submittals.
 - Drawings and Calculations.
 - Design Criteria.

1.3 SUBMITTALS

- A. Provide at a minimum, five (5) sets of design drawings for the pole structure and the embedment details for review. All submitted design/shop drawings shall be stamped and signed by a licensed professional engineer licensed to practice in the State of Utah.
- B. Provide at a minimum, five (5) sets of structural calculations for the pole structure, elements, and attachments for review. All submitted calculations shall be stamped and signed by a licensed professional engineer licensed to practice in the State of Utah.

1.4 DESIGN CRITERIA

- A. The light support poles, their embedment, and all elements and attachments thereto shall be designed to comply with the requirements of the International Building Code (IBC) 2006 edition, any Utah State Amendments that are applicable, and the approved geotechnical report that has been provided as part of these documents.

END OF SECTION 055000

SECTION 16010 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 16.

1.2 SUMMARY

- A. This section includes general administrative and procedural requirements for electrical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 1:

- Submittals.
- Workmanship.
- Coordination drawings.
- Record documents.
- Drawings and Specifications.
- Maintenance manuals.
- Rough-ins.
- Electrical installations.
- Cutting and patching.

- B. Related Sections: The following sections contain requirements that relate to this section:

- Division 16 Section "BASIC ELECTRICAL MATERIALS AND METHODS," for materials and methods common to the remainder of Division 16, plus general related specifications including:

- 1. Access to electrical installations.

- Division 1 commissioning, coordinate as required.

1.3 SUBSTITUTIONS

- A. The equipment specified carries brand names and catalog numbers and shall be interpreted as establishing a standard of quality. Substitutions will be considered if a duplicate written application (2 copies) is at the office of the engineer as per general conditions of the specifications five working days prior to bid opening. The application shall include the following:
 - 1) A statement declaring the equipment proposed is equal to that specified by having the same physical characteristics and dimensions, meet the drawings layout and structural conditions as well as load requirements;
 - 2) The specified submittal catalog numbers of the equipments under consideration;
 - 3) A pictorial and specification brochure;
 - 4) Sample may be required at engineers discretion;
 - 5) Additional information as may be noted on drawings.

- B. Any conflict arising from the use of substituted equipment shall be the responsibility of the supplier, who shall bear all costs required to make the equipment comply with the intent of the plans and specifications.
- C. At the option of the Prime Engineer, samples may be required for non-standard items before installation during construction.
- D. No materials or apparatus shall be substituted after the bid opening except where the equipment manufacturer has been discontinued or delivery becomes a problem, then written approval of the Prime Engineer is required.

1.4 SUBMITTALS

- A. General: Follow the procedures specified in Division 1 Section "SUBMITTALS."
- B. Increase, by the quantity listed below, the number of electrical related shop drawings, product data, and samples submitted, to allow for required distribution plus two copies of each submittal required, which will be retained by the Electrical Consulting Engineer.
- C. Additional copies may be required by individual sections of these Specifications.

1.5 WORKMANSHIP

- A. All materials and equipment shall be installed in accordance with the recommendations of the manufacturer to conform with the contract documents. The installation shall be accomplished by workmen skilled and licensed by the State of Utah in the type of work involved.
- B. The Electrical Contractor shall have a Utah state licensed Master Electrician assigned to direct the electrical work and to coordinate work with the General Contractor and other trades. Furthermore, a Utah state licensed master electrician shall be assigned to supervise the actual performance of all electrical work under Division 16. All installers must be Utah state licensed electrical journey man.
 - 1. All workmen doing electrical work of any nature must at all times carry their electrician's license with them and show it upon request.
 - 2. The Utah state licensed master journeyman assigned to supervise the performance of Division 16 electrical work, shall be required to be on the job site at all times, while Division 16 work is being performed.
- C. The installation shall conform to the applicable rules of the current (2008) National Electrical Code and current (2008) National Electrical Safety Code except where more stringent requirements are noted in these specifications. Conflicts shall be brought to the attention of the Prime Engineer.
- D. The Contractor and Sub-contractors shall comply with OSHA and EPA Standards while in the performance of this contract.

- E. Installation of communication pathways shall comply with TIA/EIA current standards, conduit sizing specified by Owner. Two (2) 1" EMT shall be minimum size.

1.6 COORDINATION DRAWINGS

- A. Prepare coordination drawings in accordance with Division 1 Section "PROJECT COORDINATION," to a scale of 1/4"=1'-0" or larger; detailing major elements, components, and systems of electrical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
 - 1. Indicate the proposed locations of major raceway systems, equipment, and materials. Include the following:
 - Clearances for servicing equipment, including space for equipment disassembly required for periodic maintenance.
 - Exterior wall and foundation penetrations.
 - Fire-rated wall and floor penetrations.
 - Equipment connections and support details.
 - Sizes and location of required concrete pads and bases.
 - 2. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.

1.7 RECORD DOCUMENTS

- A. Prepare record documents in accordance with the requirements in Division 1 Section "PROJECT CLOSEOUT." In addition to the requirements specified in Division 1, indicate installed conditions for:
 - 1. Major raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.
 - 2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.

1.8 DRAWINGS AND SPECIFICATIONS

- A. Electrical drawings are diagrammatic, but shall be followed as closely as actual construction and work of other contractors will permit. Home runs shall be installed from outlets as shown on drawings **and indicated exact on "as built"**.

- B. The contract drawings indicate the extent and the general location and arrangement of equipment, conduit, and wiring. The Contractor shall study plans and details so that equipment will be properly located and readily accessible. If any conflicts occur necessitating departures from the contract drawings, details of departures and reasons therefore shall be submitted to the Engineer for his prior approval and noted to the WSU Electrical Department.

1.9 MAINTENANCE MANUALS

- A. Prepare maintenance manuals in accordance with Division 1 Section "PROJECT CLOSEOUT." In addition to the requirements specified in Division 1, include the following information for equipment items:
 - B. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
 - C. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
 - D. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.
- B. Refer to equipment specifications in Divisions 2 through 16 for rough-in requirements.

3.2 ELECTRICAL INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:

1. Coordinate electrical systems, equipment, and materials installation with other building components.
2. Verify all dimensions by field measurements.
3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
5. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
7. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Prime Engineer.
8. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
9. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.

3.3 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 1 Section "CUTTING AND PATCHING." In addition to the requirements specified in Division 1, the following requirements apply:
 1. Perform cutting, fitting, and patching of electrical equipment and materials required to:
 2. Uncover Work to provide for installation of ill-timed Work.
 3. Remove and replace defective Work.
 4. Remove and replace Work not conforming to requirements of the Contract Documents.
 5. Remove samples of installed Work as specified for testing.
 6. Install equipment and materials in existing structures.

7. Upon written instructions from the Architect/Prime Engineer, uncover and restore Work to provide for Architect/Prime Engineer observation of concealed Work.
- B. Cut, remove, and legally dispose of selected electrical equipment, components, and materials as indicated, including but not limited to removal of electrical items indicated to be removed and items made obsolete by the new Work.
- C. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
- D. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
- E. Protection of Installed Work: During cutting and patching operations, protect adjacent installations. Cover as necessary.
- F. Patch existing finished surfaces and building components using new materials matching existing materials and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
- G. Refer to Division 1 Section "DEFINITIONS AND STANDARDS" for definition of experienced "Installer."
- H. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
1. Refer to Division 1 Section "DEFINITIONS AND STANDARDS" for definition of experienced "Installer."

END OF SECTION 16010

SECTION 16050 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Requirements specified in Division 16 Section "Basic Electrical Requirements" apply to this Section.

1.2 SUMMARY

- A. This Section includes limited scope general construction materials and methods for application with electrical installations as follows:

Miscellaneous metals for support of electrical materials and equipment.

Joint sealers for sealing around electrical materials and equipment; and for sealing penetrations in fire and smoke barriers, floors, and foundation walls.

1.3 DEFINITIONS

- A. The following definitions apply to excavation operations:
 - 1. Additional Excavation: Where excavation has reached required subgrade elevations, if unsuitable bearing materials are encountered, continue excavation until suitable bearing materials are reached. The Contract Sum may be adjusted by an appropriate Contract Modification.
 - 2. Subbase: as used in this Section refers to the compacted soil layer used in pavement systems between the subgrade and the pavement base course material.
 - 3. Subgrade: as used in this Section refers to the compacted soil immediately below the slab or pavement system.
 - 4. Unauthorized excavation consists of removal of materials beyond indicated subgrade elevations or dimensions without specific direction from the Engineer.
 - 5. Schedules indicating proposed methods and sequence of operations for selective demolition prior to commencement of Work. Include coordination for shut-off of electrical service, and details for dust and noise control. Method of procedure will be required for any work, any power rooms and power outages.

6. Coordinate sequencing with construction phasing and Owner occupancy specified in Division 1 Section "Summary of Work."

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer for the installation and application of joint sealers.
- B. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel."
 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- C. Provide UL Label on each fire-rated access door.
- D. Conditions Affecting Excavations: The following project conditions apply:
 1. Maintain and protect existing building services which transit the area affected by selective demolition.
 2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by excavation operations.
- E. Site Information: Subsurface conditions were investigated during the design of the Project. Reports of these investigations are available for information only; data in the reports are not intended as representations or warranties of accuracy or continuity of conditions. The Owner will not be responsible for interpretations or conclusions drawn from this information, but rather at the contractor's expense.
- F. Existing Utilities: Notify electrical shop for blue staking on WSU property. Existing underground utilities shall be located by the owner. If utilities are indicated to remain, support and protect services during excavation operations. Any damage done to existing utility line during excavation will be contractor's responsibility. Costs of repair will also be the contractor's responsibility.
- G. Use of explosives is not permitted.
- H. Notify the Architect at least 5 days prior to commencing demolition operations.
- I. Perform demolition in phases as indicated.

PART 2 - PRODUCTS

2.1 JOINT SEALERS

- A. General: Joint sealers, joint fillers, and other related materials compatible with each other and with joint substrates under conditions of service and application.
- B. Available Products: subject to compliance with requirements, provide joint sealers of one of the following:

"3M" CP 25WB Caulk

PART 3 - EXECUTION

3.1 PREPARATION FOR JOINT SEALERS

- A. Surface Cleaning for Joint Sealers: Clean surfaces of joints immediately before applying joint sealers to comply with recommendations of joint sealer manufacturer.

3.2 EXCAVATION

- A. Slope sides of excavations to comply with local codes and ordinances. Shore and brace as required for stability of excavation.
- B. Shoring and Bracing: Establish requirements for trench shoring and bracing to comply with local codes and authorities. Maintain shoring and bracing in excavations regardless of time period excavations will be open.
- C. Remove shoring and bracing when no longer required. Where sheeting is allowed to remain, cut top of sheeting at an elevation of 30 inches below finished grade elevation.
- D. Install sediment and erosion control measures in accordance with local codes and ordinances.
- E. Dewatering: Prevent surface water and subsurface or groundwater from flowing into excavations and from flooding project site and surrounding area.
- F. Do not allow water to accumulate in excavations. Remove water to prevent softening of bearing materials. Provide and maintain dewatering system components necessary to convey water away from excavations.
- G. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey surface water to collecting or run-off areas. Do not use trench excavations as temporary drainage ditches.
- H. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape stockpiles for proper drainage.
- I. Locate and retain soil materials away from edge of excavations. Do not store within drip-line of trees indicated to remain.

- J. Remove and legally dispose of excess excavated materials and materials not acceptable for use as backfill or fill.
- K. Trenching: Excavate trenches for electrical installations as follows:
1. Excavate trenches to the uniform width, sufficiently wide to provide ample working room and a minimum of 6 to 9 inches clearance on both sides of raceways and equipment.
 2. Excavate trenches to depth indicated or required.
 3. Limit the length of open trench to that in which installations can be made and the trench backfilled within the same day.
 4. Where rock is encountered, carry excavation below required elevation and backfill with a layer of crushed stone or gravel prior to installation of raceways and equipment. Provide a minimum of 6 inches of stone or gravel cushion between rock bearing surface and electrical installations.
 5. Cold Weather Protection: Protect excavation bottoms against freezing when atmospheric temperature is less than 35 deg F (1 deg 2 C).
 6. Backfilling and Filling: Place soil materials in layers to required subgrade elevations for each area classification listed below, using materials specified in Part 2 of this Section.

Under walks and pavements, use a combination of subbase materials and excavated or borrowed materials.

Under building slabs, use drainage fill materials.

Under piping and equipment, use subbase materials where required over rock bearing surface and for correction of unauthorized excavation.
 7. Backfill excavations as promptly as work permits, but not until completion of the following:

Inspection, testing, approval, and locations of underground utilities have been recorded.

Removal of concrete formwork.

Removal of shoring and bracing, and backfilling of voids.

Removal of trash and debris.
- L. Placement and Compaction: Place backfill and fill materials in layers of not more than 8 inches in loose depth for material compacted by heavy equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- M. Before compaction, moisten or aerate each layer as necessary to provide optimum moisture content. Compact each layer to required percentage of maximum dry density or relative dry density for each area classification specified below. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

- N. Place backfill and fill materials evenly adjacent to structures, piping, and equipment to required elevations. Prevent displacement of raceways and equipment by carrying material uniformly around them to approximately same elevation in each lift.
- O. Compaction: Control soil compaction during construction, providing minimum percentage of density specified for each area classification indicated below.
- P. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture-density relationship (cohesive soils), determined in accordance with ASTM D 1557 and not less than the following percentages of relative density, determined in accordance with ASTM D 2049, for soils which will not exhibit a well-defined moisture-density relationship (cohesionless soils).
- Q. Areas Under Structures, Building Slabs and Steps, Pavements: Compact top 12 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.
- R. Areas Under Walkways: Compact top 6 inches of subgrade and each layer of backfill or fill material to 90 percent maximum density for cohesive material, or 95 percent relative density for cohesionless material.
- S. Other Areas: Compact top 6 inches of subgrade and each layer of backfill or fill material to 85 percent maximum density for cohesive soils, and 90 percent relative density for cohesionless soils.
- T. Moisture Control: Where subgrade or layer of soil material must be moisture conditioned before compaction, uniformly apply water. Apply water in minimum quantity necessary to achieve required moisture content and to prevent water appearing on surface during, or subsequent to, compaction operations.
- U. Subsidence: Where subsidence occurs at electrical installation excavations during the period 12 months after Substantial Completion, remove surface treatment (i.e., pavement, lawn, or other finish), add backfill material, compact to specified conditions, and replace surface treatment. Restore appearance, quality, and condition of surface or finish to match adjacent areas.

3.3 ERECTION OF METAL SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- B. Field Welding: Comply with AWS "Structural Welding Code."

3.4 ERECTION OF WOOD SUPPORTS AND ANCHORAGE

- A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

- B. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members.
- C. Attach to substrates as required to support applied loads.

3.5 APPLICATION OF JOINT SEALERS

- A. General: Comply with joint sealer manufacturers' printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Installation of Fire-Stopping Sealant: Install sealant, including forming, packing, and other accessory materials, to fill openings around electrical services penetrating floors and walls, to provide fire-stops with fire-resistance ratings indicated for floor or wall assembly in which penetration occurs. Comply with installation requirements established by testing and inspecting agency.

3.6 The equipment and systems referenced in this section are to be commissioned per Section 01810 – Commissioning General Requirements and Section 16995 – Commissioning: Mechanical Systems. The contractor, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION 16050

SECTION 16110 - RACEWAYS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Requirements of the following Division 16 Sections apply to this Section:
 - "Basic Electrical Requirements."
 - "Basic Electrical Materials and Methods."

1.2 SUMMARY

- A. This Section includes raceways for electrical wiring. Types of raceways in this section include the following:
 - Electrical metallic tubing (EMT).
 - Underground plastic utilities duct.
 - Rigid metal conduit.
 - Rigid nonmetallic conduit.
 - Surface raceways.
- B. Related Sections: The following Division 16 Sections contain requirements that relate to this Section:
 - "Wires and Cables" for other wiring methods.
 - "Supporting Devices" for raceway supports.
 - "Electrical Boxes and Fittings" for boxes used with conduit and tubing systems.

1.3 QUALITY ASSURANCE

- A. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code" and NFPA 76.
- B. NEMA Compliance: Comply with applicable requirements of NEMA standards pertaining to raceways.
- C. UL Compliance and Labeling: Comply with applicable requirements of UL standards pertaining to electrical raceway systems. Provide raceway products and components listed and labeled by UL, ETL, or CSA.

1.4 SEQUENCING AND SCHEDULING

- A. Coordinate with other Work, including metal and concrete deck installation, as necessary to interface installation of electrical raceways and components with other Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

Conduit Bodies:

Carlson
Crouse-Hinds Division, Cooper Industries, Inc.
Delta Industrial Products
Killark Electric Mfg. Co.
O-Z/Gedney

Surface Metal Raceway:

Allied Tube & Conduit
B-Line Systems, Inc.
Isotrol Systems
Square D Co.
The Wiremold Co.

2.2 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Intermediate Steel Conduit: UL 1242 and NEMA RN 1.
- C. Electrical Metallic Tubing and Fittings: ANSI C80.3.
- D. Flexible Metal Conduit: UL 1, zinc-coated steel.
- E. Liquidtight Flexible Metal Conduit and Fittings: UL 360. Fittings shall be specifically approved for use with this raceway.

2.3 NONMETALLIC CONDUIT AND DUCTS

- A. Rigid Nonmetallic Conduit (RNC): NEMA TC 2 and UL 651, Schedule 40 or 80 PVC.
- B. PVC Conduit and Tubing Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.
- C. Conduit, Tubing, and Duct Accessories: Types, sizes, and materials complying with manufacturer's published product information. Mate and match accessories with raceway.

2.4 CONDUIT BODIES

- A. General: Types, shapes, and sizes as required to suit individual applications and NEC requirements. Provide matching gasketed covers secured with corrosion-resistant screws.
- B. Metallic Conduit and Tubing: Use metallic conduit bodies. Use bodies with threaded hubs for threaded raceways.
- C. Conduit Bodies 1 Inch and Smaller: Use bodies with screw-type EMT connectors.
- D. Nonmetallic Conduit and Tubing: Use nonmetallic conduit bodies conforming to UL 514 B.

2.5 SURFACE RACEWAYS

- A. General: Sizes and channels as indicated. Provide fittings that match and mate with raceway.
- B. Surface Metal Raceway: Construct of galvanized steel with snap-on covers, with 1/8-inch mounting screw knockouts in base approximately 8 inches o.c. Finish with manufacturer's standard prime coating suitable for painting. Provide raceways of types suitable for each application required.
- C. Conduit Sizes: All conduit shall be a minimum of 3/4" unless indicated on the drawings otherwise.
- D. Conduit Sizes for Voice/Data: Two (2) 1" conduits.

PART 3 - EXECUTION

3.1 WIRING METHOD

- A. Outdoors and in the Mechanical Rooms: Use the following wiring methods:

Connection to Vibrating Equipment: Including motor-driven equipment: liquidtight flexible metal conduit.

Buried: PVC schedules 40 conduit. Conduit bends over 22° must be rigid steel.

- B. Indoors: Use the following wiring methods:

Connection to Vibrating Equipment: Including motor-operated equipment: flexible metal conduit.

Exposed: electrical metallic tubing.

Concealed: electrical metallic tubing.

3.2 INSTALLATION

- A. General: Install electrical raceways in accordance with manufacturer's written installation instructions, applicable requirements of NEC, and as follows:

Conceal Conduit and EMT, unless indicated otherwise, within finished walls, ceilings, and floors. Keep raceways at least 12 inches away from parallel runs of flues and steam or hot water pipes. Install raceways level and square and at proper elevations.

- B. Elevation of Raceway: Where possible, install horizontal raceway runs above water and steam piping.

Complete installation of electrical raceways before starting installation of conductors within raceways.

Provide supports for raceways as specified elsewhere in Division 16.

Prevent foreign matter from entering raceways by using temporary closure protection.

Protect stub-ups from damage where conduits rise from floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

Make bends and offsets so the inside diameter is not effectively reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel. For all bends under the ground, use rigid galvanized steel conduit.

Use raceway fittings that are of types compatible with the associated raceway and suitable for the use and location. For electrical metallic tubing (EMT), use rigid steel set screw type fittings (screw must have a full set) except as otherwise indicated. Die-cast fittings shall not be used. Box connectors 1" and larger shall be insulated, throat type or equal type plastic bushing. The use of the indenter-type fittings shall be prohibited. Fittings in the concrete shall be compression type and taped 10/10 mil scotch wrap/dottie wrap or approved for such use.

Run concealed raceways with a minimum of bends in the shortest practical distance considering the type of building construction and obstructions except as otherwise indicated. This does not apply to conduits in crawl spaces.

- C. Raceways embedded in slabs: Install in middle third of the slab thickness where practical and leave at least 1 inch concrete cover. Tie raceways to reinforcing rods or otherwise secure them to prevent sagging or shifting during concrete placement. This must be inspected before the concrete is poured. Space raceways laterally to prevent voids in the concrete. Run conduit larger than 1-inch trade size, parallel with or at right angles to the main reinforcement; where at right angles to the reinforcement, the conduit shall be close to one of the supports of the slab. Where nonmetallic conduit is used, raceways must be converted to rigid steel conduit before rising above floor. No PVC allowed above grade nor penetrating structural elements. Conduits through the floor, concrete and/or earth shall be wrapped with PVC tape (minimum of 10 mil.) And supported to maintain vertical plumb.
- D. Install exposed raceways parallel and perpendicular to nearby surfaces or structural members and follow the surface contours as much as practical.

- E. Run exposed, parallel, or banked raceways together. Make bends in parallel or banked runs from the same center line so that the bends are parallel. Factory long sweep on medium voltage elbows may be used in banked runs only where they can be installed parallel. This requires that there be a change in the plane of the run such as from wall to ceiling and that the raceways be of the same size. In other cases provide field bends for parallel raceways.
- F. Join raceways with fittings designed and approved for the purpose and make joints tight. Where joints cannot be made tight, shall use bonding jumpers to provide electrical continuity of the raceway system. Make raceway terminations tight. Where terminations are subject to vibration, use bonding bushings to assure electrical continuity. Where subject to vibration or dampness, use insulating bushings to protect conductors.

Tighten set screws of threadless fittings with suitable tool (not pliers).

- G. Terminations: Double locknuts and plastic bushing shall be used with all IMC and rigid conduits.
- H. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box, and tighten the chase nipple so no threads are exposed.
- I. Raceway Expansion Fittings, shall be installed on all raceway runs that cross a building expansion joint. The fittings shall be OZ type "AX" or approved equal, sized to raceway. Conduits 1" and larger install OZ type "B" connectors.
- J. Install pull wires in empty raceways. Use monofilament plastic line having not less than 200-lb tensile strength. Leave not less than 12 inches of slack at each end of the pull wire.
- K. Telephone and Signal System Raceways Two (2) each 1-Inch Trade Size: In addition to the above requirements, install raceways 2 each 1-inch trade size in maximum lengths at 100 feet and with a maximum of two, 90-deg bends or equivalent. Install pull or junction boxes where necessary to comply with these requirements. Follow the ANSI/TIA/EIA-569-B standards. Conduits to end within 12' of cable tray with a bend toward IDF room.
- L. Install raceway sealing fittings in accordance with the manufacturer's written instructions. Locate fittings at suitable, approved, accessible locations and fill them with UL- listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere as indicated:

Where conduits pass from warm locations to cold locations, such as the boundaries of refrigerated spaces and air-conditioned spaces.

Where required by the NEC.

- M. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment with an adjustable top or coupling threaded inside for plugs and set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; flexible steel conduit may be used 6 inches above the floor with no more than 36" in length. Where equipment connections are not made under this contract, install screwdriver-operated threaded flush plugs flush with floor.

- N. Flexible Connections: Use short length (maximum of 6 ft.) of flexible steel conduit for recessed and semirecessed lighting fixtures, for equipment subject to vibration, noise transmission, or movement; and for all motors. Install separate ground conductor across flexible connections. Aluminum flexible conduits shall not be used. Use #14 THHN str. Wire with flex whip unit. No MC cable to be used for this purpose.
- O. All Metal Raceways: Install a separate green ground conductor in raceway from the junction box supplying the raceway to receptacle or fixture ground terminals.
- P. Select each surface metal raceway outlet box to which a lighting fixture is attached to be of sufficient diameter to provide a seat for the fixture canopy.
- Q. Install Accessible Junction Boxes: or conduits in conduits runs as required at 100 ft. intervals on long runs. Each junction box shall be supported independent of the conduit. Mark all J-boxes with circuit and panel identification.
- R. Install From Each Recessed Branch Panel, five spare 3/4" conduits (capped) into the ceiling and floor space, when the floor space is not accessible, run six into the ceiling.

3.3 ADJUSTING AND CLEANING

- A. Upon completion of installation of raceways, inspect interiors of raceways; clear all blockages and remove burrs, dirt, and construction debris.

- 3.4 The equipment and systems referenced in this section are to be commissioned per Section 01810 – Commissioning General Requirements and Section 16995 – Commissioning: Mechanical Systems. The contractor, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION 16110

SECTION 16120 - WIRES AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Requirements of the following Division 16 Sections apply to this section:
Basic Electrical Requirements.

1.2 SUMMARY

- A. This Section includes wires, cables, and connectors for power, lighting, control and related systems rated 600 volts and less.
- B. Related Sections: The following Sections contain requirements that relate to this section:
Division 16 Section "Electrical Boxes and Fittings" for connectors for Terminating Cables in boxes and other electrical enclosures.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with provisions of the following code:
NFPA 70 "National Electrical Code."
NFPA 76
- B. Conform to applicable codes and regulations regarding toxicity of combustion products of insulating materials.
- C. UL Compliance: Provide components which are listed and labeled by UL under the following standards.

UL Std. 83	Thermoplastic-Insulated Wires and Cables.
UL Std. 486A	Wire Connectors and Soldering Lugs for Use with Copper Conductors.
UL Std. 854	Service Entrance Cable.
- D. NEMA/ICEA Compliance: Provide components which comply with the following standards:
WC-5 Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

- E. IEEE Compliance: Provide components which comply with the following standard.

Std. 82 Test procedures for Impulse Voltage Tests on Insulated Conductors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Wire and Cable:

American Insulated Wire Corp.
Brintec Corp.
Carol Cable Co. Inc.
Senator Wire and Cable Co.
Southwire Company.

- B. Connectors for Wires and Cable Conductors:

AMP
3M Company
O-Z/Gedney Co.
Square D Company.

2.2 WIRES AND CABLES

- A. General: Provide wire and cable suitable for the temperature, conditions and location where installed.
- B. Conductors: Provide solid conductors for power and lighting circuits no. 10 AWG and smaller. Provide stranded conductors for sizes no. 8 AWG and larger. All control conductors shall be THHN/THWN stranded in raceway. Motor loads shall be standard copper.
- C. Conductor Material: copper for all wires and cables.
- D. Insulation: Provide THHN/THWN insulation for all conductors sizes.
- E. Color Coding for phase identification in accordance with Table 1 in Part 3 below.
- F. Jackets: Factory-applied nylon or PVC external jacketed wires and cables for pulls in raceways over 100-feet in length, for pulls in raceways with more than three equivalent 90 deg. bends, for pulls in conduits underground or under slabs on grade, and where indicated.

2.3 CONNECTORS FOR CONDUCTORS

- A. Provide UL-listed factory-fabricated, solderless metal connectors of sizes, ampacity ratings, materials, types and classes for applications and for services indicated. Use connectors with temperature ratings equal to or greater than those of the wires upon which used.

PART 3 - EXECUTION

3.1 WIRING METHOD

- A. Use the following wiring methods as indicated:

Wire: install all wire in raceway.

3.2 INSTALLATION OF WIRES AND CABLES

- A. General: Install electrical cables, wires, and connectors in compliance with NEC.
- B. Coordinate cable installation with other Work.
- C. Pull conductors simultaneously where more than one is being installed in same raceway. Use UL listed pulling compound or lubricant, where necessary.
- D. Use pulling means including, fish tape, cable, rope, and basket weave wire/cable grips which will not damage cables or raceways. Do not use rope hitches for pulling attachment to wire or cable.
- E. Conceal all cable in finished spaces.
- F. Install exposed cable parallel and perpendicular to surfaces or exposed structural members, and follow surface contours, where possible.
- G. Keep conductor splices to minimum.
- H. Install splice and tap connectors which possess equivalent or better mechanical strength and insulation rating than conductors being spliced.
- I. Use splice and tap connectors which are compatible with conductor material.
- J. Provide adequate length of conductors within electrical enclosures and train the conductors to terminal points with no excess. Bundle multiple conductors, with conductors larger than no 10 AWG cabled in individual circuits. Make terminations so there is no bare conductor at the terminal.
- K. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL 486A and UL 486B.

- L. Mark all the lugs after torquing with a permanent marker or a term color marking tool.
- M. Provide insulated green ground wire in all conduits and sized proper to meet code.

3.3 FIELD QUALITY CONTROL

- A. Prior to energizing, check installed wires and cables with megohm meter to determine insulation resistance levels to assure requirements are fulfilled.
- B. Prior to energizing, test wires and cables for electrical continuity and for short-circuits.
- C. Subsequent to wire and cable hook-ups, energize control circuits and demonstrate proper functioning. Correct malfunctioning units, and retest to demonstrate compliance.
- D. Provide written documents for all Megger testing.

TABLE 1: Color Coding for Phase Identification:

Color code secondary service, feeder, and branch circuit conductors with factory applied color as follows:

<u>208/120 Volts</u>	<u>Phase</u>	<u>480/277 Volts</u>
Black	A	Brown
Red	B	Orange
Blue	C	Yellow
White	Neutral	Gray
Green	Ground	Green
White & Green	Isolated Ground	White & Green

Conductors in sizes #6 and below shall be color coded with the colored insulation. Larger sizes may be identified with colored tape. Colored tape (3" minimum) where used shall be applied at all terminations, junction boxes and pull boxes.

END OF SECTION 16120

SECTION 16135 - ELECTRICAL BOXES AND FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-16 Basic Electrical Materials and Methods section, and is a part of each Division-16 section making reference to electrical wiring boxes and fittings specified herein.

1.2 DESCRIPTION OF WORK:

- A. Extent of electrical box and associated fitting work is indicated by drawings and schedules.
- B. Types of electrical boxes and fittings specified in this section include the following:

- Outlet boxes.
- Junction boxes.
- Pull boxes.
- Floor boxes.
- Bushings.
- Locknuts.
- Knockout closures.

1.3 QUALITY ASSURANCE:

- A. Manufacturers: Firms regularly engaged in manufacture of electrical boxes and fittings, of types, sizes, and capacities required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects utilizing electrical boxes and fittings similar to those required for this project.
- C. NEC Compliance: Comply with NEC as applicable to construction and installation of electrical wiring boxes and fittings.
- D. UL Compliance: Comply with applicable requirements of UL 50, UL 514-Series, and UL 886 pertaining to electrical boxes and fittings. Provide electrical boxes and fittings which are UL-listed and labeled.
- E. NEMA Compliance: Comply with applicable requirements of NEMA Stds/ Pub No.'s OS1, OS2 and Pub 250 pertaining to outlet and device boxes, covers and box supports.

PART 2 - PRODUCTS

2.1 FABRICATED MATERIALS:

- A. Outlet Boxes: Provide galvanized flat rolled sheet-steel type of the class required to satisfy the conditions at each outlet, unless indicated. Construct outlet boxes with mounting holes, and with cable and conduit-size knockout openings in bottom and sides. Provide boxes with threaded screw holes, with corrosion-resistant cover and grounding screws for fastening surface and device type box covers, and for equipment type grounding.
- B. Study the building conditions and materials surrounding each outlet prior to installing such boxes to prevent interference with work of other trades. Switch, telephone and receptacle outlet boxes: Not less than 4"x4" x 2 1/8" with single gang mud ring for adapting tile or plaster covers where necessary to set FLUSH with the finished surfaces. A gang box shall be used where more than one switch or device is located at one point. Sectional boxes are not acceptable. In masonry wall where a tile or plaster ring cannot be used, install a single gang 3 1/2" deep box minimum, unless otherwise noted.
- C. Install boxes with rigid supports using metal bar hangers between studs with screws. Welding boxes directly to metal joist and studs is NOT acceptable. Boxes set opposite in wall shall have at least 10" of conduit between them.
- D. Ceiling fixture outlet boxes shall be 4-inch minimum. Each box shall be supported independently of the conduit to carry 200 lbs. Where three or more raceway entrances are made, use minimum box depth of 2 1/8". Where fixtures are to be installed, provide with standard 3/8" stud.
- E. Outlet Box Accessories: Provide outlet box accessories as required for each installation, including box supports, mounting ears and brackets, wallboard hangers, box extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used to fulfill installation requirements for individual wiring situations. Choice of accessories is Installer's code-compliance option.
- F. Device Boxes: Provide galvanized coated flat rolled sheet-steel non-gangable device boxes, suitable for installation at respective locations. Construct device boxes for flush mounting with mounting holes, and with cable-size knockout openings in bottom and ends, and with threaded screw holes in end plates for fastening devices. Provide cable clamps and corrosion-resistant screws for fastening cable clamps, and for equipment type grounding.
- G. Junction boxes shall be not less than 4 - 0, with plaster ring and flush with finished surface; 4-S or 4-0 boxes shall be used for all devices, single or double gang, with proper plaster ring and covers. Industrial, raised covers shall be used for switch and outlets run on surface. Boxes shall be securely fastened to the surface with approved anchoring means; wooden plugs shall not be allowed. J-boxes with 4 or more conduits shall be minimum size of 4 1 1/16".
- H. Device Box Accessories: Provide device box accessories as required for each installation, including mounting brackets, device box extensions, switch box supports, plaster ears, and plaster board expandable grip fasteners, which are compatible with device boxes being utilized to fulfill installation requirements for individual wiring situations.

- I. Manufacturers: Subject to compliance with requirements, provide interior outlet boxes of one of the following:
- Bowers
 - Appleton Electric; Emerson Electric Co.
 - Midland-Ross Corp.
 - Pass and Seymour, Inc.
 - RACO Div; Harvey Hubbell Inc.
 - Thomas & Betts Co.
- J. Raintight Outlet Boxes: Provide corrosion-resistant cast-metal raintight outlet wiring boxes, of types, shapes and sizes, including depth of boxes, with threaded conduit holes for fastening electrical conduit, cast-metal face plates with spring-hinged watertight caps suitably configured for each application, including face plate gaskets and corrosion-resistant plugs and fasteners.
- K. Manufacturers: Subject to compliance with requirements, provide raintight outlet boxes of one of the following:
- Appleton Electric; Emerson Electric Co.
 - Arrow-Hart Div; Crouse-Hinds Co.
 - Bell Electric; Square D Company.
 - Harvey Hubbell, Inc./RACO
 - OZ/Gedney; General Signal Co.
 - Pass and Seymour, Inc.
- L. Junction and Pull Boxes: Provide galvanized code-gage sheet steel junction and pull boxes, with screw-on covers; of types, shapes and sizes, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.
- M. Manufacturers: Subject to compliance with requirements, provide junction and pull boxes of one of the following:
- Adalet-PLM Div, Scott Fetzer Co.
 - Appleton Electric; Emerson Electric Co.
 - Arrow-Hart Div; Crouse-Hinds Co.
 - Bell Electric; Square D Company.
 - GTE Corporation.
 - Keystone Columbia, Inc,
 - OZ/Gedney Co.; General Signal Co.
 - Spring City Electrical Mfg Co.
- N. Floor Boxes: Provide adjustable floor boxes as indicated on the drawings, with threaded-conduit-entrance ends, and vertical adjusting rings.
- O. Bushings, Knockout Closures and Locknuts: Provide corrosion-resistant box knockout closures, conduit locknuts and malleable iron conduit bushings, offset connectors, of types and sizes, to suit respective installation requirements and applications.
- P. Manufacturers: Subject to compliance with requirements, provide bushings, knockout closures, locknuts and connectors of one of the following:

Adalet-PLM Div; Scott Fetzer Co.
AMP, Inc.
Arrow-Hart Div; Crouse-Hinds Co.
Appleton Electric Co.; Emerson Electric Co.
Bell Electric; Square D Co.
Bowers
Midland-Ross Corp.
Midwest Electric; Cooper Industries Inc.
OZ/Gedney Co.; General Signal Co.
RACO Div; Harvey Hubbell Inc.
Thomas & Betts Co., Inc.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS:

- A. General: Install electrical boxes and fittings as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate installation of electrical boxes and fittings with wire/ cable, wiring devices, and raceway installation work.
- C. Provide weathertight outlets for interior and exterior locations exposed to weather or moisture with proper cover.
- D. Provide knockout closures to cap unused knockout holes where blanks have been removed.
- E. Install electrical boxes in those locations which ensure ready accessibility to enclosed electrical wiring.
- F. Avoid installing boxes back-to-back in walls. Provide not less than 6" (150 mm) separation.
- G. Position recessed outlet boxes accurately to allow for surface finish thickness.
- H. Set floor boxes level and flush with finish flooring material.
- I. Avoid using round boxes where conduit must enter box through side of box, which would result in difficult and insecure connections when fastened with locknut or bushing on rounded surfaces.
- J. Fasten electrical boxes firmly and rigidly to substrates, or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry.
- K. Provide electrical connections for installed boxes.
- L. Subsequent to installation of boxes, protect boxes from construction debris and damage.

3.2 GROUNDING:

- A. Upon completion of installation work, properly ground electrical boxes and demonstrate compliance with 2005 NEC Article 250 requirements with Bonding Pigtail for device boxes.

2005 NEC ART 250

- 3.3 The equipment and systems referenced in this section are to be commissioned per Section 01810 – Commissioning General Requirements and Section 16995 – Commissioning: Mechanical Systems. The contractor, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION 16135

SECTION 16143 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Requirements of the following Division 16 Sections apply to this section:
 - Basic Electrical Requirements.

1.2 SUMMARY

- A. This Section includes the following:
 - Receptacles
 - Ground Fault Circuit Interrupter Receptacles
 - Snap Switches
 - Wall Plates
 - Floor Service Outlets
- B. Related Sections: The following sections contain requirements that relate to this section:
 - Division 16 Section "Circuit and Motor Disconnects" for devices other than snap switches and plug/receptacle sets used as disconnects for motors.

1.3 SUBMITTALS

- A. Product data for each type of product specified.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with provisions of the following codes.
 - NFPA 70 "National Electrical Code".
 - UL and NEMA Compliance: Provide wiring devices which are listed and labeled by UL and comply with applicable UL and NEMA standards.

1.5 SEQUENCING AND SCHEDULING

- A. Schedule installation of finish plates after the surface upon which they are installed has received final finish.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

	<u>Receptacles Cat.#</u>	<u>Switches Cat. #</u>
Hubbell Inc.	2162	2121
Pass and Seymour Inc.	26362	26021
Leviton	16362	5621

2.2 WIRING DEVICES:

- A. General: Provide wiring devices, in types, characteristics, grades, colors, and electrical ratings for applications indicated which are UL listed and which comply with NEMA WD 1 and other applicable UL and NEMA standards. Provide white color devices except as otherwise indicated. Verify color selections with Architect.
- B. Receptacles: All receptacles shall be decorator style specification grade. As scheduled in Table 1 in Part 3 below. Comply with UL 498 and NEMA WD 1.
- C. Receptacles, Industrial Heavy Duty: Receptacles are to have the following features:
- 1) Heavy-duty nylon face to resist cracking and chipping.
 - 2) Heavy-duty wraparound mounting strap locked into body for abuse-resistant installation. Heavy-gauge brass ground contacts riveted to strap with solid brass rivets and pretensioned for reliable, abuse-resistant grounding path.
 - 3) Thick-walled, reinforced thermoplastic polyester heat-resistant base for superior thermal and electrical properties.
 - 4) Automatic self-grounding spring assures ground continuity between mounting strap and metal wall box, as allowed by NEC Article 250-74, Exception 2, for equipment bonding.
- D. Ground-Fault Interrupter (GFI) Receptacles: as indicated in Table 1 in Part 3 below; provide "feed-thru" type ground-fault circuit interrupter, with integral heavy-duty decorator style specification grade receptacles arranged to protect connected downstream receptacles on same circuit and field of view. Provide unit designed for installation in a 2-3/4 inch deep outlet box without adapter, grounding type, Class A, Group 1, per UL Standard 94.3.
- E. Rocker Switches: All rocker switches shall be decorator style, quiet type AC switches as indicated in Table 2 in Part 3 below. Comply with UL 20 and NEMA WD1. Rocker switches are to have the following features:
- 1) Low profile thermoset rocker switch.

- 2) Polycarbonate bezel to ensure proper fit with wall plate and prevent rocker binding.
- 3) Thermoset housing with red base for 20 Amp devices.
- 4) Thermoset housing also includes provision for back and side-wiring and a retaining slot that prevents wire movement or slippage.
- 5) External termination clamp as a visual aid for proper wiring. Over size screw heads with cut slots accept both solid and stranded #12 to #10 AWG wires to aid in the application versatility.
- 6) Provision for two wires per terminal.
- 7) One-piece bridge with integral ground to satisfy all local code requirements.
- 8) For applications requiring 20 Amps, 100% copper contact arm assures low heat rise and 20% more silver in the contacts provides for longer life.
- 9) Switch mechanism with positive action and mechanical break for positive circuit interruption.

F. Color: Color of all devices will be selected by Architect.

2.3 WIRING DEVICE ACCESSORIES

- A. Wall plates: single and combination, of types, sizes, and with ganging and cutouts as indicated. Provide metal screws for securing plates to devices with screw heads colored to match finish of plates.

Material and Finish: brushed stainless steel or color by architect.

PART 3 - EXECUTION

3.1 INSTALLATION OF WIRING DEVICES AND ACCESSORIES:

- A. Install wiring devices and accessories as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and in accordance with recognized industry practices to fulfill project requirements.
- B. Coordinate with other Work, including painting, electrical boxes and wiring installations, as necessary to interface installation of wiring devices with other Work.
- C. Install wiring devices only in electrical boxes which are clean; free from building materials, dirt, and debris.
- D. Install wiring devices after wiring work is completed.

- E. Install wall plates after painting work is completed.
- F. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for wiring devices. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standard 486A. Use properly scaled torque indicating hand tool.

3.2 PROTECTION

- A. Protect installed components from damage. Replace damaged items prior to final acceptance.

3.3 FIELD QUALITY CONTROL

- A. Testing: Prior to energizing circuits, test wiring for electrical continuity, and for short-circuits. Ensure proper polarity of connections is maintained. Subsequent to energizing, test wiring devices and demonstrate compliance with requirements, operating each operable device at least six times.
- B. Test ground fault interrupter operation with both local and remote fault simulations in accordance with manufacturer recommendations.

TABLE 1 (See Evaluations, Ref 3)

RECEPTACLES

DESIG- NATION	CURRENT RATING	VOLTAGE RATING (1) AMPS	SINGLE/ DUPLEX	NEMA	UL CONFIG- URATION	NOTES GRADE
-	20	125	DUPLEX	5-20R	HEAVY DUTY	
WP	20	125	DUPLEX	5-20R	HEAVY DUTY	WEATHERPROOF
WP	20	125	DUPLEX	5-20R	HEAVY DUTY	INTEGRAL GFI (2)

NOTES

- (1) Letter designations are used where symbols alone do not clearly designate on plans locations where specific receptacle types are used.
- (2) Protects downstream receptacles on same circuit and field of view.

DESIG- NATION	TYPICAL APPLICATION	LOAD RATING	VOLTAGE RATING (1)	POLES	UL GRADE (AC)	NOTES
S	CONTROL LIGHTS	20A	120/277	1	HEAVY DUTY	-
S ₃	CONTROL LIGHTS	20A	120/277	3-way	HEAVY DUTY	-
S	DISCONN. MOTOR	1HP	120/277	1	HEAVY DUTY	(2)

NOTES

- (1) For rocker switches, designation is the same as the symbol used on plans for the device. Type of switch is determined from plan context including type of device or circuit being controlled.
 - (2) Overload element in toggle switch.
 - (3) Pilot light "on" when switch is "on".
- 3.4 The equipment and systems referenced in this section are to be commissioned per Section 01810 – Commissioning General Requirements and Section 16995 – Commissioning: Mechanical Systems. The contractor, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION 16143

SECTION 16145 - LIGHTING CONTROL DEVICES

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.

1.2 SUMMARY

- A. This Section includes the following lighting control devices:
 - 1. Lighting contactors.
 - 2. Emergency shunt relays.
- B. Related Sections include the following:
 - 1. Division 16 Section "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Interconnection diagrams showing field-installed wiring.
- B. Field quality-control test reports.
- C. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 LIGHTING CONTACTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Musco.
 2. USL.
 3. Square D; Schneider Electric.
- B. Description: Electrically operated and **mechanically** held, combination type with **fusible switch**, complying with NEMA ICS 2 and UL 508.
1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
 2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
 3. Enclosure: Comply with NEMA 250.
 4. Provide with control and pilot devices, matching the NEMA type specified for the enclosure.
- C. BAS Interface: Provide hardware interface to enable the BAS to monitor and control lighting contactors.
1. Monitoring: On-off status, at operations plant.
 2. Control: On-off operation, at operations plant.

2.2 EMERGENCY SHUNT RELAY

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Bodine.
 2. IOTA.
- B. Description: Normally closed, electrically held relay, arranged for wiring in parallel with **automatic** switching contacts; complying with UL 924.
1. Coil Rating: 120 V.

2.3 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 16 Section "Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. **18** AWG. Comply with requirements in Division 16 Section "Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. **14** AWG. Comply with requirements in Division 16 Section "Conductors and Cables."

PART 3 - EXECUTION

3.1 CONTACTOR INSTALLATION

- A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.2 WIRING INSTALLATION

- A. Wiring Method: Comply with Division 16 Section "Conductors and Cables." Minimum conduit size shall be **3/4 inch**.
- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.3 IDENTIFICATION

- A. Identify components and power and control wiring according to Division 16 Section "Electrical Identification."
 - 1. Identify controlled circuits in lighting contactors.
- B. Label contactors with a unique designation.

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. Operational Test: Verify operation of each lighting control device, and adjust time delays.
- B. Lighting control devices that fail tests and inspections are defective work.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices. Refer to Division 1 Section "Demonstration and Training."

WEBER STATE UNIVERSITY
DEE FOOTBALL STADIUM FIELD LIGHTING UPGRADE

ECE PROJECT #3881
DFCM PROJECT #09061810

END OF SECTION 16145

SECTION 16170 - CIRCUIT DISCONNECTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Requirements of the following Division 16 Sections apply to this section:

Basic Electrical Requirements
Fuses

1.2 SUMMARY

- A. This Section includes circuit and motor disconnects.
- B. Related Sections: The following sections contain requirements that relate to this section:
 - Division 16 Section "Wiring Devices" for snap switches used as motor disconnects.

1.3 SUBMITTALS

- A. Product data for each type of product specified.
- B. Maintenance data for circuit and motor disconnects, for inclusion in Operation and Maintenance Manual specified in Division 1 and Division 16 Section "Basic Electrical Requirements."

1.4 QUALITY ASSURANCE

- A. Electrical Component Standards: Provide components complying with NFPA 70 "National Electrical Code" and which are listed and labeled by UL. Comply with UL Standard 98 and NEMA Standard KS 1.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Square D Company.

General Electric.
Siemens.

2.2 CIRCUIT AND MOTOR DISCONNECT SWITCHES

- A. General: Provide circuit and motor disconnect switches in types, sizes, duties, features ratings, and enclosures as indicated. Provide NEMA 1 enclosure except for outdoor switches, and other indicated locations provide NEMA 3R enclosures with raintight hubs. For motor and motor starter disconnects, provide units with horsepower ratings suitable to the loads.
- B. Fusible Switches: heavy duty switches, with fuses of classes and current ratings indicated. See Section "FUSES" for specifications. Where current limiting fuses are indicated, provide switches with non-interchangeable feature suitable only for current limiting type fuses.
- C. Non-fusible Disconnects: heavy duty switches of classes and current ratings as indicated.

PART 3 - EXECUTION

3.1 INSTALLATION OF CIRCUIT AND MOTOR DISCONNECTS

- A. General: Provide circuit and motor disconnect switches as indicated and where required by the above Code. Comply with switch manufacturers' printed installation instructions.

3.2 FIELD QUALITY CONTROL

- A. Testing: Subsequent to completion of installation of electrical disconnect switches, energize circuits and demonstrate capability and compliance with requirements. Except as otherwise indicated, do not test switches by operating them under load. However, demonstrate switch operation through six opening/closing cycles with circuit unloaded. Open each switch enclosure for inspection of interior, mechanical and electrical connections, fuse installation, and for verification of type and rating of fuses installed. Correct deficiencies then retest to demonstrate compliance. Remove and replace defective units with new units and retest.
- B. Provide engraved nametag for all disconnects.

- 3.3 The equipment and systems referenced in this section are to be commissioned per Section 01810 – Commissioning General Requirements and Section 16995 – Commissioning: Mechanical Systems. The contractor, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION 16170

SECTION 16190 - SUPPORTING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Requirements of the following Division 16 Sections apply to this section:

"Basic Electrical Requirements."
"Basic Electrical Materials and Methods."

1.2 SUMMARY

- A. This Section includes secure support from the building structure for electrical items by means of hangers, supports, anchors, sleeves, inserts, seals, and associated fastenings.
- B. Related Sections: The following Sections contains requirements that relate to this Section:
- C. Division 3 Section "Concrete Accessories" for inserts, anchors, and sleeves to be installed in concrete for use with supporting devices.
- D. Division 5 Section "Metal Fabrications" for requirements for miscellaneous metal items involved in supports and fastenings.
- E. Division 7 Section "Joint Sealers" for requirements for firestopping at sleeves through walls and floors that are fire barriers.
- F. Refer to other Division 16 sections for additional specific support requirements that may be applicable to specific items.

1.3 QUALITY ASSURANCE

- A. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code."
- B. Electrical components shall be listed and labeled by UL, ETL, CSA, or other approved, nationally recognized testing and listing agency that provides third-party certification follow-up services.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:

Slotted Metal Angle and U-Channel Systems:

Allied Tube & Conduit
American Electric
B-Line Systems, Inc.
Cinch Clamp Co., Inc.
GS Metals Corp.
Haydon Corp.
Kin-Line, Inc.
Unistrut Diversified Products

Conduit Sealing Bushings:

Bridgeport Fittings, Inc.
Cooper Industries, Inc.
Elliott Electric Mfg. Corp.
GS Metals Corp.
Killark Electric Mfg. Co.
Madison Equipment Co.
L.E. Mason Co.
O-Z/Gedney
Product Electric Corp.
Raco, Inc.
Red Seal Electric Corp.
Spring City Electrical Mfg. Co.
Thomas & Betts Corp.

2.2 COATINGS

- A. Coating: Supports, support hardware, and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic. Products for use outdoors shall be hot-dip galvanized.

2.3 MANUFACTURED SUPPORTING DEVICES

- A. Raceway Supports: Clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps.
- B. Fasteners: Types, materials, and construction features as follows:

No pin driven anchors are acceptable – all must be removable. If necessary threaded screw anchors accepted.
- C. Expansion Anchors: Carbon steel wedge or sleeve type.

- D. Toggle Bolts: All steel springhead type.
- E. Powder-Driven Threaded Studs: Heat-treated steel, designed specifically for the intended service.
- F. Conduit Sealing Bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit, or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.
- G. U-Channel Systems: 16-gage steel channels, with 9/16-inch-diameter holes, at a minimum of 8 inches on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of the same manufacture. No wire type conduit straps shall be used.

2.4 FABRICATED SUPPORTING DEVICES

- A. General: Shop- or field-fabricated supports or manufactured supports assembled from U-channel components.
- B. Steel Brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.
- B. Coordinate with the building structural system and with other electrical installation.
- C. Raceway Supports: Comply with the NEC, according to seismic zone 3 and the following requirements:
- D. Conform to manufacturer's recommendations for selection and installation of supports.
- E. Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 lbs, provide additional strength until there is a minimum of 200 lbs safety allowance in the strength of each support.
- F. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
- G. Support parallel runs of horizontal raceways together on trapeze-type hangers. Minimum 3/8" thread rods.

- H. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 3/4-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 3/8-inch-diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing according to seismic zone 3.
- I. Space supports for raceways in accordance with Table I of this section. Space supports for raceway types not covered by the above in accordance with NEC.
- J. Support raceways to the structure at intervals not to exceed eighth foot centers and within twelve inches of each junction outlet, device box, fittings or 90° elbows, minimum of two straps per ten foot run.
- K. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.
- L. Miscellaneous Supports: Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports and according to seismic zone 3. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, switchgears, generators, 2" conduit runs and larger, and other devices.
- M. In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support; support sheet metal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved type of fastener not more than 24 inches from the box.
- N. Sleeves: Install in concrete slabs and walls and all other fire-rated floors and walls for raceways and cable installations. For sleeves through fire rated-wall or floor construction, apply UL- listed firestopping sealant in gaps between sleeves and enclosed conduits and cables in accordance with "Fire Resistant Joint Sealers" requirement of Division 7 Section "Joint Sealers."
- O. Conduit Seals: Install seals for conduit penetrations of slabs on grade and exterior walls below grade and where indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.
- P. Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, panelboards, boxes, disconnect switches, and control components in accordance with the following:
- Q. Fasten by means of wood screws, toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry, and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws in steel beams only, not concrete. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheet metal screws.

- R. Holes cut to depth of more than 1-1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete shall not cut the main reinforcing bars. Fill holes that are not used.
- S. Ensure that the load applied to any fastener does not exceed 25 percent of the proof test load. Use vibration- and shock- resistant fasteners for attachments to concrete slabs.

TABLE I: SPACING FOR RACEWAY SUPPORTS

Raceway Size (Inches)	No. of Conductors in Run	Maximum Spacing of Supports (Feet) Location	RMC&IMC*	EMT	RNC
HORIZONTAL RUNS					
3/4	1 or 2	Flat ceiling or wall.	5	5	3
3/4	1 or 2	Where it is difficult to provide supports except at intervals fixed by the building construction.	7	7	...
3/4	3 or more	Any location.	7	7	...
1	3 or more	Any location.	6	6	...
1 & larger	1 or 2	Flat ceiling or wall.	6	6	...
1 & larger	1 or 2	Where it is difficult to provide supports except at intervals fixed by the building construction.	8	8	...
1 & larger	3 or more	Any location.	8	8	...
Any	....	Concealed.	8	8	...
VERTICAL RUNS					
3/4	....	Exposed.	7	7	...
1, 1-1/4	....	Exposed.	8	8	...
1-1/2 and larger	....	Exposed.	8	8	...
Up to 2	....	Shaftway.	8	8	...
2-1/2	....	Shaftway.	8	8	...
3 & larger	....	Shaftway.	8	8	...
Any	....	Concealed.	8	8	...

* Maximum spacings for IMC above apply to straight runs only. Otherwise the maximums for EMT apply.

Abbreviations: EMT Electrical metallic tubing.
 IMC Intermediate metallic conduit.
 RMC Rigid metallic conduit.
 RNC Rigid nonmetallic conduit.

- 3.2 The equipment and systems referenced in this section are to be commissioned per Section 01810 – Commissioning General Requirements and Section 16995 – Commissioning: Mechanical Systems. The contractor, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION 16190

SECTION 16195 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Requirements of the following Division 16 Sections apply to this section:
 - "Basic Electrical Requirements."
 - "Basic Electrical Materials and Methods."

1.2 SUMMARY

- A. This Section includes identification of electrical materials, equipment, and installations. It includes requirements for electrical identification components including but not limited to the following:
 - Buried electrical line warnings.
 - Identification labeling for raceways, cables, and conductors.
 - Operational instruction signs.
 - Warning and caution signs.
 - Equipment labels and signs.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - Division 9 Section "Painting" for related identification requirements.
 - Division 16 Section "Wires and Cables" for requirements for color coding of conductors for phase identification.
 - Refer to other Division 16 sections for additional specific electrical identification associated with specific items.

1.3 QUALITY ASSURANCE

- A. Electrical Component Standard: Components and installation shall comply with NFPA 70 "National Electrical Code."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:

American Labelmark Co.
Calpico, Inc.
Cole-Flex Corp.
Emed Co., Inc.
George-Ingraham Corp.
Ideal Industries, Inc.
Kraftbilt
LEM Products, Inc.
Markal Corp.
National Band and Tag Co.
Panduit Corp.
Radar Engineers Div., EPIC Corp.
Seton Name Plate Co.
Standard Signs, Inc.
W.H.Brady, Co.

2.2 ELECTRICAL IDENTIFICATION PRODUCTS

- A. Underground Line Marking Tape: Permanent, bright-colored, continuous-printed, magnetic tracking colored PVC type for direct-burial service not less than 6 inches wide by 4 mils thick. Printed legend indicative of general type of underground line below.
- B. Wire/Cable designation Tape Markers: Vinyl or vinyl-cloth, self- adhesive, wraparound, cable/conductor markers with preprinted numbers and letter.
- C. Aluminum, Wraparound, Cable Marker Bands: Bands cut from 0.014- inch thick, aluminum sheet, fitted with slots or ears for securing permanently around wire or cable jacket or around groups of conductors. Provide for legend application with stamped letters or numbers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install identification devices in accordance with manufacturer's written instructions and requirements of NEC.
- B. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.
- C. Conduit Identification:
1. Underground Electrical Line Identification: During trench backfilling, for exterior underground power and signal lines, install continuous underground plastic line marker,

located directly above line at 6 to 8 inches below finished grade. Where multiple lines installed in a common trench or concrete envelope, do not exceed an overall width of 16 inches; install a single line marker.

2. Install line marker for underground wiring, both direct-buried and in raceway.

D. Conductor Color Coding: Provide color coding for secondary service, feeder, and branch circuit conductors throughout the project secondary electrical system as follows:

<u>208/120 Volts</u>	<u>Phase</u>	<u>480/277 Volts</u>
Black	A	Brown
Red	B	Purple
Blue	C	Yellow
White	Neutral	White
Green	Ground	Green
Green & White Control	Isolated Ground Violet	Green & White

2. Apply the following colors to the systems listed below:

- a. Telecommunications System: Blue.
- b. Emergency power system: Yellow.
- c. 277/480 Volts System: Brown.
- d. 120/208 Volts System: Black.

E. Use conductors with color factory-applied the entire length of the conductors except as follows:

1. The following field-applied color-coding methods may be used in lieu of factory-coded wire for sizes larger than No. 6 AWG.

F. Apply colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last two laps of tape with no tension to prevent possible unwinding. Use 1-inch-wide tape in colors as specified. Do not obliterate cable identification markings by taping. Tape locations may be adjusted slightly to prevent such obliteration.

G. In lieu of pressure-sensitive tape, colored cable ties may be used for color identification. Apply three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten for snug fit, and cut off excess length.

H. Tag or label conductors as follows:

1. Future Connections: Conductors indicated to be for future connection or connection under another contract with identification indicating source and circuit numbers.

I. Apply warning, caution, and instruction signs and stencils as follows:

Install warning, caution, or instruction signs where required by NEC, where indicated, or where reasonably required to assure safe operation and maintenance of electrical systems and of the items to which they connect. Install engraved plastic-laminated instruction signs with approved

legend where instructions or explanations are needed for system or equipment operation. Install butyrate signs with metal backing for outdoor items.

J. Install equipment/system circuit/device identification as follows:

Apply equipment identification labels of engraved plastic- laminate on each major unit of electrical equipment in building, including central or master unit of each electrical system. This includes communication/signal/alarm systems, unless unit is specified with its own self-explanatory identification. Except as otherwise indicated, provide single line of text, with 1/2-inch-high lettering on 1-1/2-inch-high label (2-inch-high where two lines are required), white lettering in black field. Text shall match terminology and numbering of the Contract Documents and shop drawings. Apply labels for each unit of the following categories of electrical equipment.

Panelboards.
Electrical switchboards.
Motor starters.

All sub-panelboards are to be labeled to identify the main from which their power is obtained as well as the location of the main panel, using Weber State University room number.

K. Apply circuit/control/item designation labels of engraved plastic laminate for disconnect switches, breakers, pushbuttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panelboards and alarm/signal components, where labeling is specified elsewhere. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.

L. Install labels at locations indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.

3.2 The equipment and systems referenced in this section are to be commissioned per Section 01810 – Commissioning General Requirements and Section 16995 – Commissioning: Mechanical Systems. The contractor, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION 16195

SECTION 16452 - GROUNDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-16 Basic Materials and Methods sections apply to work of this section.
- C. Requirements of this section apply to electrical grounding and bonding work specified elsewhere in these specifications.

1.2 SUMMARY:

- A. Extent of electrical grounding and bonding work is indicated by drawings and schedules and as specified herein. Grounding and bonding work is defined to encompass systems, circuits, and equipment.
- B. Type of electrical grounding and bonding work specified in this section includes the following:
 - Solidly grounded.
- C. Applications of electrical grounding and bonding work in this section includes the following:
 - Electrical power systems.
 - Raceways.
 - Service equipment.
 - Enclosures.
 - Equipment.
 - Lighting standards.
 - Sports Lighting Poles.
- D. Refer to other Division-16 sections for wires/cables, electrical raceways, boxes and fittings, and wiring devices which are required in conjunction with electrical grounding and bonding work; not work of this section.

1.3 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of grounding and bonding products, of types, and ratings required, and ancillary grounding materials, including stranded cable, grounding electrodes and plate electrodes, and bonding jumpers whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with electrical grounding work similar to that required for project.

C. Codes and Standards:

1. Electrical Code Compliance: Comply with applicable local electrical code requirements of the authority having jurisdiction, and 2005 NEC as applicable to electrical grounding and bonding, pertaining to systems, circuits and equipment.
2. UL Compliance: Comply with applicable requirements of UL Standards No.'s 467, "Electrical Grounding and Bonding Equipment", and 869 "Electrical Service Equipment", pertaining to grounding and bonding of systems, circuits and equipment. In addition, comply with UL Std 486A, "Wire Connectors and soldering Lugs for Use with Copper Conductors." Provide grounding and bonding products which are UL-listed and labeled for their intended usage.
3. IEEE Compliance: Comply with applicable requirements and recommended installation practices of IEEE Standards 80, 81, 141 and 142 pertaining to grounding and bonding of systems, circuits and equipment. NFPA 780, ANSI J-STD-607-A.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Manufacturers: Subject to compliance with requirements, provide grounding and bonding products of one of the following (for each type of product):

Burndy Corporation.
Cadweld Div; Erico Products Inc.
Joslyn Corporation.
Okonite Company.
OZ Gedney Div; General Signal Corp.
Thomas and Betts Corp.

2.2 GROUNDING AND BONDING:

- A. Materials and Components:

1. General: Except as otherwise indicated, provide electrical grounding and bonding systems indicated; with assembly of materials, including, but not limited to, cables/wires, connectors, solderless lug terminals, grounding electrodes and plate electrodes, bonding jumper braid, surge arresters, and additional accessories needed for a complete installation. Where more than one type component product meets indicated requirements, selection is Installer's option. Where materials or components are not indicated, provide products which comply with NEC, UL, and IEEE requirements and with established industry standards for those applications indicated.
- B. Conductors: Unless otherwise indicated, provide electrical grounding conductors for grounding system connections that match power supply wiring materials and are sized according to NEC.

- C. Provide stainless steel ground rods. Cadweld connections.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine areas and conditions under which electrical grounding and bonding connections are to be made and notify Contractor in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF ELECTRICAL GROUNDING AND BONDING SYSTEMS:

- A. General: Install electrical grounding and bonding systems as indicated, in accordance with manufacturer's instructions and applicable portions of NEC, NECA's "Standard of Installation", and in accordance with recognized industry practices to ensure that products comply with requirements.
- B. Coordinate with other electrical work as necessary to interface installation of electrical grounding and bonding system work with other work.
- C. Ground electrical service system neutral at service entrance equipment to existing grounding electrodes.
- D. Ground each separately-derived system neutral to:
 - 1. Effectively grounded metallic water pipe.
 - 2. Separate grounding electrode.
- E. Connect together system neutral, service equipment enclosures, exposed noncurrent carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing systems.
- F. Terminate feeder and branch circuit insulated equipment grounding conductors with grounding lug, bus, or bushing.
- G. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torquing requirements are not indicated, tighten connections to comply with tightening torque values specified in UL 486A to assure permanent and effective grounding.
- H. Install braided type bonding jumpers with code-sized ground clamps on water meter piping to electrically bypass water meters.
- I. Route grounding connections and conductors to ground and protective devices in shortest and straightest paths as possible to minimize transient voltage rises.

- J. Apply corrosion-resistant finish to field-connections, buried metallic grounding and bonding products, and places where factory applied protective coatings have been destroyed, which are subjected to corrosive action.
- K. Install clamp-on connectors on clean metal contact surfaces, to ensure electrical conductivity and circuit integrity.

3.3 FIELD QUALITY CONTROL:

- A. Upon completion of installation of electrical grounding and bonding systems, test ground resistance with ground resistance tester. Where tests show resistance-to-ground is over 10 ohms, take appropriate action to reduce resistance to 10 ohms, or less, by driving additional ground rods; then retest to demonstrate compliance. Provide written report for ground testing.

Owner will test the grounding resistance independently.

- 3.4 The equipment and systems referenced in this section are to be commissioned per Section 01810 – Commissioning General Requirements and Section 16995 – Commissioning: Mechanical Systems. The contractor, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION 16452

SECTION 16470 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-16 Basic Electrical Materials and Methods sections apply to work specified in this section.

1.2 SUMMARY:

- A. Extent of panelboard, load-center and enclosure work, including cabinets and cutout boxes, is indicated by drawings and schedules, and as specified herein.
- B. Types of panelboards and enclosures required for the project include the following:
 - Power-distribution panelboards.
 - Lighting and appliance panelboards.
- C. Fuses required in connection with installation of panelboards and enclosures are specified in another Division-16 section.
- D. Refer to other Division-16 sections for wires/cables, electrical boxes and fittings, and raceway work required in conjunction with installation of panelboards and enclosures.
- E. Wires/cables, electrical boxes and fittings, and raceways required in conjunction with the installation of panelboards and enclosures are specified in other Division-16 sections.

1.3 SUBMITTALS:

- A. Product Data: Submit manufacturer's data on panelboards and enclosures.
- B. Wiring Diagrams: Submit wiring diagrams for panelboards showing connections to electrical power feeders and distribution branches.

1.4 QUALITY ASSURANCE:

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of panelboards and enclosures, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: A firm with at least 3 years of successful installation experience on projects utilizing panelboards similar to those required for this project.

C. Codes and Standards:

1. Electrical Code Compliance: Comply with applicable local code requirements of the authority having jurisdiction and NEC Article 384 as applicable to installation, and construction of electrical panelboards and enclosures.
2. UL Compliance: Comply with applicable requirements of UL 67, "Electric Panelboards," and UL's 50, 869, 486A, 486B, and 1053 pertaining to panelboards, accessories and enclosures. Provide panelboard units which are UL-listed and labeled.
3. NEMA Compliance: Comply with NEMA Stds Pub/No. 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)," Pub/No. PB 1, "Panelboards," and Pub/No. PB 1.1, "Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less."

1.5 SEQUENCING AND SCHEDULING:

- A. Coordinate installation of panelboards and enclosures with installation of wires/cables, electrical boxes and fittings, and raceway work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Manufacturers: Subject to compliance with requirements, provide panelboard products of one of the following (for each type and rating of panelboard and enclosure):

Square D Company.
General Electric.
Siemens.

2.2 PANELBOARDS:

- A. General: Except as otherwise indicated, provide panelboards, enclosures and ancillary components, of types, sizes, and ratings indicated, which comply with manufacturer's standard materials; with the design and construction in accordance with published product information; equip with proper number of unit panelboard devices as required for complete installation. Where types, sizes, or ratings are not indicated, comply with NEC, UL and established industry standards for those applications indicated.
- B. Power Distribution Panelboards: Provide dead-front safety type power distribution panelboards as indicated, with panelboard switching and protective devices in quantities, ratings, types, and with arrangement shown; with anti-turn solderless pressure type main lug connectors approved for use with copper conductors. Select unit with feeders connecting at top of panel. Equip with copper bus bars with not less than 98-percent conductivity, and with full-sized neutral bus; provide suitable lugs on neutral bus for outgoing feeders requiring neutral connections. Provide molded-case main and branch circuit-breaker types for each circuit, with toggle handles that

indicate when tripped. Where multiple-pole breakers are indicated, provide with common trip so overload on one pole will trip all poles simultaneously. Provide panelboards with bare uninsulated grounding bars suitable for bolting to enclosures. Select enclosures fabricated by same manufacturer as panelboards, which mate and match properly with panelboards.

- C. Lighting and Appliance Panelboards: Provide dead-front safety type lighting and appliance panelboards as indicated, with switching and protective devices in quantities, ratings, types and arrangements shown; with anti-burn solderless pressure type lug connectors approved for use with copper conductors; construct unit for connecting feeders at top of panel; equip with copper bus bars, full-sized neutral bar, with bolt-in type heavy-duty, quick-make, quick-break, single-pole circuit-breakers, with toggle handles that indicate when tripped. Provide suitable lugs on neutral bus for each outgoing feeder required; and provide bare uninsulated grounding bars suitable for bolting to enclosures. Select enclosures fabricated by same manufacturer as panelboards, which mate and match properly with panelboards.
- D. Panelboard Enclosures: Provide galvanized sheet steel cabinet type enclosures, in sizes and NEMA types as indicated, code-gage, minimum 16-gage thickness. Construct with multiple knockouts and wiring gutters. Provide fronts with adjustable trim clamps, and doors with flush locks and keys, all panelboard enclosures keyed alike, with concealed piano door hinges and door swings as indicated. Equip with interior circuit-directory frame, and card with clear plastic covering. Provide baked gray enamel finish over a rust inhibitor coating. Design enclosures for recessed mounting. Provide enclosures which are fabricated by same manufacturer as panelboards, which mate and match properly with panelboards to be enclosed.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine areas and conditions under which panelboards and enclosures are to be installed, and notify Contractor in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF PANELBOARDS:

- A. Install panelboards and enclosures as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC standards and NECA's "Standards of Installation," and in compliance with recognized industry practices to ensure that products fulfill requirements.
- B. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A and B.
- C. Fasten enclosures firmly to walls and structural surfaces, ensuring that they are permanently and mechanically anchored.
- D. Provide properly wired electrical connections for panelboards within enclosures.

- E. Fill out panelboard's circuit directory card upon completion of installation work.
- F. Provide engraved name tags for all panelboards to indicate the names, the voltage and where they are tied to. Color of name tags for emergency panelboards to be red.

3.3 GROUNDING:

- A. Provide equipment grounding connections for panelboard enclosures as indicated. Tighten connections to comply with tightening torques specified in UL 486A to assure permanent and effective grounds.

3.4 FIELD QUALITY CONTROL:

- A. Prior to energization of electrical circuitry, check all accessible connections to manufacturer's tightening torque specifications.
- B. Prior to energization of panelboards, check with ground resistance tester phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled. Provide written report for insulation resistance testing.
- C. Prior to energization, check panelboards for electrical continuity of circuits, and for short-circuits.

3.5 ADJUSTING AND CLEANING:

- A. Adjust operating mechanisms for free mechanical movement.
- B. Touch-up scratched or marred surfaces to match original finishes.

3.6 DEMONSTRATION:

- A. Subsequent to wire and cable hook-ups, energize panelboards and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units, and then retest to demonstrate compliance.
- B. Refer to specification section 17000 for project commissioning requirements.

- 3.7 The equipment and systems referenced in this section are to be commissioned per Section 01810 – Commissioning General Requirements and Section 16995 – Commissioning: Mechanical Systems. The contractor, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION 16470

SECTION 16477 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions apply to the work of this section.
- B. Division-16 Basic Electrical Materials and Methods sections apply to work of this section.

1.2 SUMMARY:

- A. Extent of fuse work required by this section is indicated by drawings, and by requirements of this section.
- B. Refer to other Division-16 sections for the following items; not work of this section.
 - 1. Motor disconnects.

1.3 SYSTEM DESCRIPTION:

- A. Types of fuses specified in this section include the following:
 - 1. Class RKI time-delay.

1.4 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical product data on fuses, including specifications, electrical characteristics, installation instructions, furnished specialties and accessories. In addition, include voltages and current ratings, interrupting ratings, current limitation ratings, time-current trip characteristic curves, and mounting requirements.
- B. Codes and Standards:
 - 1. UL Compliance and Labeling: Comply with applicable provisions of UL 198D, "High-Interrupting-Capacity Class K Fuses". Provide overcurrent protective devices which are UL-listed and labeled.
 - 2. NEC Compliance: Comply with NEC as applicable to construction and installation of fusible devices.
 - 3. ANSI Compliance: Comply with applicable requirements of ANSI C97.1 "Low-Voltage Cartridge Fuses 600 Volts or Less".

1.5 MAINTENANCE:

- A. Extra Materials:
 - 1. Maintenance Stock, Fuses: For types and ratings required, furnish additional fuses, amounting to one unit for every 5 installed units, but not less than one set of 3 of each amperage size.
- B. Provide NEMA 1 fuse box by electrical room for spare fuses. Label the box. Minimum size: 12"x12"x6". Located by fence-in control box.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Manufacturers: Subject to compliance with requirements, provide fuses of one of the following:
 - Bussmann Div; Cooper Industries.
 - Shawmut Div; Gould Inc.
 - Little Fuse.

2.2 FUSES:

- A. General: Except as otherwise indicated, provide fuses of types, sizes, ratings, and average time-current and peak let-through current characteristics indicated, which comply with manufacturer's standard design, materials, and constructed in accordance with published product information, and with industry standards and configurations.
- B. Class RK1 Time-Delay Fuses: Provide UL Class RK1 time-delay fuses rated 600-volts, 60 Hz, 400 amperes, with 200,000 RMS symmetrical interrupting current rating for protecting motors and circuit- breakers.

PART 3 - EXECUTION

3.1 INSTALLATION OF FUSES:

- A. Install fuses as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC, and NEMA standards for installation of fuses.
- B. Coordinate with other work, including electrical wiring, as necessary, to interface installation of fuses with other work.
- C. Install fuses in fused switches, if any.

3.2 FIELD QUALITY CONTROL:

- A. Prior to energization of fusible devices, test devices for continuity of circuitry and for short-circuits. Replace malfunctioning units with new units, and then demonstrate compliance with requirements.

- 3.3 The equipment and systems referenced in this section are to be commissioned per Section 01810 – Commissioning General Requirements and Section 16995 – Commissioning: Mechanical Systems. The contractor, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION 16477

SECTION 16526 – SPORTS FIELD LIGHTING

PART 1 – GENERAL

1.1 SUMMARY

- A. Work covered by this section of the specifications shall conform to the contract documents, engineering plans as well as state and local codes.
- B. The purpose of these specifications is to define the performance and design standards for Weber State University located in Ogden, Utah. The manufacturer / contractor shall supply lighting equipment to meet or exceed the standards set forth by the criteria set forth in these specifications.
- C. The sports lighting will be for the following fields:
 - 1. Football Field
 - 2. Track and Field Area
 - 3. Home Bleacher Area
 - 4. Visitor Bleacher Area
- D. The primary goals of this sports lighting project are:
 - 1. Life Cycle Cost: In order to reduce the operating budget, the preferred lighting system shall be energy efficient and cost effective to operate. All maintenance costs shall be eliminated, and the field(s) should be proactively monitored to detect fixture outages over a 25 year life cycle. To allow for optimized use of labor resources and avoid unneeded operation of the facility, customer requires a remote on/off control system for the lighting system.
 - 2. Guaranteed Light Levels: Selection of appropriate light levels impact the safety of the players and the enjoyment of spectators. Therefore the lighting system shall be designed such that the light levels are guaranteed for a period of 25 years. Lamps shall be replaced at any time the lighting levels are reduced by 5%.
 - 3. Environmental Light Control: Manufacture to design and build system to meet dark sky compliances.

1.2 LIGHTING PERFORMANCE

- A. Performance Requirements: Playing surfaces shall be lit to an average constant light level and uniformity as specified in the chart below and drawings. Light levels shall be held constant for 25 years. Lighting calculations shall be developed and field measurements taken on the grid spacing with the minimum number of grid points specified below. Measured average illumination level shall be +/- 10% of predicted mean in accordance with IESNA RP-6-01, and measured at the first 100 hours of operation.

Area of Lighting	Average Constant Light Levels	Maximum to Minimum Uniformity Ratio	Grid Points	Grid Spacing
Football Field	80 foot-candles	1.5:1.0	72	30' x 30'
Track and Field Area	29 foot-candles	2.0:1.0	80	20' x 20'
Home Bleacher Area	1 foot-candle	4.0:1.0	396	10' x 10'
Visitor Bleacher Area	1 foot-candle	4.0:1.0	396	10' x 10'

- B. Mounting Heights: To ensure proper aiming angles for reduced glare and to provide better playability, the pole mounting heights from the playing field surface shall be 130'. Refer to the soils report for exact grading information.

1.3 LIFE CYCLE COSTS

- A. Energy Consumption: The average kWh consumption for the field lighting system shall be 162.7 or less for the football field, 31.3 or less for the track and field area, 12.0 or less for the home bleacher area, and 12.0 or less for the visitor bleacher area.
- B. Complete Lamp Replacement: Manufacturer shall include all group lamp replacements required to provide 25 years of operation based upon 100 usage hours per year.
- C. Preventative and Spot Maintenance: Manufacturer shall provide all preventative and spot maintenance, including parts and labor for 25 years from the date of equipment shipment. Individual lamp outages shall be repaired when the usage of any field is materially impacted.
- D. Remote Monitoring System: System shall monitor lighting performance and notify manufacturer if individual luminaire outage is detected so that appropriate maintenance can be scheduled. The manufacturer shall notify the owner of outages within 24 hours, or the next business day. The controller shall determine switch position (Manual or Auto) and contactor status (open or closed).
- E. Remote Lighting Control System: System shall allow owner and users with a security code to schedule on/off system operation via a web site, phone, fax or email up to ten years in advance. Manufacturer shall provide and maintain a two-way TCP/IP communication link. Trained staff shall be available 24/7 to provide scheduling support and assist with reporting needs.

The owner may assign various security levels to schedulers by function and/or fields. This function must be flexible to allow a range of privileges such as full scheduling capabilities for all fields, to only having permission to execute "early off" commands by phone.

Controller shall accept and store 7-day schedules, be protected against memory loss during power outages, and shall reboot once power is regained and execute any commands that would have occurred during outage.

System shall be compatible and provide an interface with the lamps wide Johnson Controls System.

- F. Management Tools: Manufacturer shall provide a web-based database of actual field usage and provide reports by facility and user group.
- G. Communication Costs: Manufacturer shall include communication costs for operating the controls and monitoring system for a period of 25 years.
- H. 25-Year Life Cycle Cost: Manufacturer shall submit 25-year life cycle cost calculations as follows. Equipment price and total life cycle cost shall be entered separately on bid form.

a.	Luminaire energy consumption # luminaires x kW demand per luminaire x \$.02 kWh rate x 100 annual usage hours x 25 years		
b.	Cost for spot relamping and maintenance over 25 years Assume 7.5 repairs at \$500 each if not included with the bid	+	
c.	Cost to relamp all luminaires during 25 years 100 annual usage hours x 25 years / lamp replacement hours x \$125 lamp & labor x # fixtures if not included with the bid	+	

d.	Extra energy used without base bid automated control system \$ Energy consumption in item a. x 25% if control system not included with the bid	+	
	TOTAL 25-Year Life Cycle Operating Cost	=	

1.4 WARRANTY AND GUARANTEE

- A. 25-Year Warranty: Each manufacturer shall supply a signed warranty covering the entire system for 25 years. Warranty shall guarantee light levels; lamp replacements; system energy consumption; monitoring, maintenance and control services, spill light control, and structural integrity. Manufacturer shall maintain specifically-funded financial reserves to assure fulfillment of the warranty for the full term. Warranty may exclude fuses, storm damage, vandalism, abuse and unauthorized repairs or alterations.

1.5 DELIVERY TIMING

- A. Equipment On-Site: The equipment must be on-site 4 to 6 weeks from receipt of approved submittals and receipt of complete order information.

1.6 PRE-BID SUBMITTAL REQUIREMENTS

- A. Approved Product: Musco’s Light-Structure Green™ System and United Sports Lighting are the approved products. All substitutions must provide a complete submittal package for approval as outlined in Submittal Information at the end of this section at least 10 days prior to bid. Special manufacturing to meet the standards of this specification may be required. An addendum will be issued prior to bid listing any other approved lighting manufacturers and designs.
- B. Design Approval: The owner / engineer will review pre-bid shop drawings from the manufacturers to ensure compliance to the specification. If the design meets the design requirements of the specifications, a letter will be issued to the manufacturer indicating approval for the specific design submitted.

1.7 ALTERNATE SYSTEM REQUIREMENTS

- A. Compliance to Specifications: Acceptance of a bid alternate does not negate the contractor and lighting manufacturer’s responsibility to comply fully with the requirements of these specifications. Any exceptions to the specifications must be clearly stated in the prior approval submittal documents.
- B. Light Level Requirements: Manufacturer shall provide computer models guaranteeing light levels on the field over 25 years. If a constant light level cannot be provided, a maximum Recoverable Light Loss Factor of 0.70 shall be applied to the initial light level design to achieve the following Initial and target/maintained light levels. For alternate systems, scans for both initial and maintained light levels shall be submitted.

Area of Lighting	Average Initial Light Levels	Average Target/Maintained Light Levels	Max. to Min. Uniformity Ratio	Grid Points	Grid Spacing
Football Field	114.3 footcandles	80 footcandles	1.5:1.0	72	30' x 30'
Track and Field Area	41.4 footcandles	29 footcandles	2.0:1.0	80	20' x 20'
Home Bleacher Area	1.4 footcandles	1 footcandles	4.0:1.0	396	10' x 10'
Visitor Bleacher Area	1.4 footcandles	1 footcandles	4.0:1.0	396	10' x 10'

- C. Revised Electrical Distribution: Manufacturer shall provide revised electrical distribution plans to include changes to service entrance, panel, and wire sizing.

PART 2 – PRODUCT

2.1 LIGHTING SYSTEM CONSTRUCTION

- A. System Description: Lighting system shall consist of the following:
1. Galvanized steel poles and crossarm assembly
 2. Pre-stressed concrete base embedded in concrete backfill allowed to cure for 12-24 hours before pole stress is applied. Alternate may be an anchor bolt foundation designed such that the steel pole and any exposed steel portion of the foundation is located a minimum of 18 inches above final grade. The concrete for anchor bolt foundations shall be allowed to cure for a minimum of 28 days before the pole stress is applied.
 3. All luminaires shall be constructed with a die-cast aluminum housing or external hail shroud to protect the luminaire reflector system.
 4. Manufacturer will remote all ballasts and supporting electrical equipment in aluminum enclosures mounted approximately 8' above grade. The enclosures shall include ballast, capacitor and fusing for each luminaire. Safety disconnect per circuit for each pole structure will be located in the enclosure.
 5. Wire harness complete with an abrasion protection sleeve, strain relief and plug-in connections for fast, trouble-free installation.
 6. Controls and Monitoring Cabinet to provide on-off control and monitoring of the lighting system, constructed of NEMA Type 4 aluminum. Communication method shall be provided by manufacturer. Cabinet shall be wireless, labeled to match field diagrams and electrical design. Manual Off-On-Auto selector switches shall be provided.
- B. Manufacturing Requirements: All components shall be designed and manufactured as a system. All luminaires, wire harnesses, ballast and other enclosures shall be factory assembled, aimed, wired and tested.
- C. Durability: All exposed components shall be constructed of corrosion resistant material and/or coated to help prevent corrosion. All exposed steel shall be hot dip galvanized per ASTM A123. All exposed hardware and fasteners shall be stainless steel of at least 18-8 grade, passivated and polymer coated to prevent possible galvanic corrosion to adjoining metals. All exposed aluminum shall be powder coated with high performance polyester. All exterior reflective inserts shall be anodized, coated with a clear, high gloss, durable fluorocarbon, and protected from direct environmental exposure to prevent reflective degradation or corrosion. All wiring shall be enclosed within the crossarms, pole, or electrical components enclosure.

- D. Lightning Protection: All structures shall be equipped with lightning protection meeting NFPA 780 standards. Contractor shall supply and install a ground rod of not less than 5/8" in diameter and 8' in length, with a minimum of 10' embedment. Ground rod should be connected to the structure by a copper main down conductor with a minimum size of #2 for poles with less than 75' mounting height and 2/0 for poles with more than 75' mounting height.
- E. Safety: All system components shall be UL Listed for the appropriate application.
- F. Electric Power Requirements for the Sports Lighting Equipment:
 - 1. Electric power: 120/240 Volt, 1 Phase
 - 2. Maximum total voltage drop: Voltage drop to the disconnect switch located on the poles shall not exceed three (3) percent of the rated voltage.

2.2 STRUCTURAL PARAMETERS

- A. Support Structure Wind Load Strength: Poles and other support structures, brackets, arms, bases, anchorages and foundations shall be determined based on the 2006 edition of the IBC Building Code, wind speed of 100 MPH, exposure category exposure C. and a 1.3 gust factor. Luminaire, visor, and crossarm shall withstand 150 mph winds and maintain luminaire aiming alignment. Foundation design will be based on IBC 2006.
- B. Structural Design: The stress analysis and safety factor of the poles shall conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals.
- C. Soil Conditions: The design criteria for these specifications are based on soil design parameters as outlined in the geotechnical report.

It shall be the contractor's responsibility to notify the owner if soil conditions exist other than those on which the foundation design is based, or if the soil cannot be readily excavated. Contractor may issue a change order request / estimate for the owner's approval / payment for additional costs associated with:

- a) Providing engineered foundation embedment design by a registered engineer in the State of Utah.
 - b) Additional materials required to achieve alternate foundation.
 - c) Excavation and removal of materials other than normal soils, such as rock, caliche, etc.
- D. Foundation Drawings: Project specific foundation drawings stamped by a registered engineer in the state where the project is located are required. The foundation drawings must list the moment, shear (horizontal) force, and axial (vertical) force at ground level for each pole.

PART 3 – EXECUTION

3.1 FIELD QUALITY CONTROL

- A. Illumination Measurements: Upon substantial completion of the project and in the presence of the Contractor, Project Engineer, Owner's Representative, and Manufacturer's Representative, illumination measurements shall be taken and verified. The illumination measurements shall be conducted in accordance with IESNA RP-6-01, Appendix B.

- B. Correcting Non-Conformance: If, in the opinion of the Owner or his appointed Representative, the actual performance levels including footcandles, uniformity ratios, and maximum kilowatt consumptions are not in conformance with the requirements of the performance specifications and submitted information, the Manufacturer or Contractor shall be liable to any or all of the following:
1. Manufacturer or Contractor shall at his expense provide and install any necessary additional fixtures to meet the minimum lighting standards. The Manufacturer or Contractor shall also either replace the existing poles to meet the new wind load (EPA) requirements or verify by certification by a licensed structural engineer that the existing poles will withstand the additional wind load.
 2. Manufacturer or Contractor shall minimize the Owner's additional long term fixture maintenance and energy consumption costs created by the additional fixtures by reimbursing the Owner the amount of \$1,000.00 (one thousand dollars) for each additional fixture required.
 3. Manufacturer or Contractor shall remove the entire unacceptable lighting system and install a new lighting system to meet the specifications.

SUBMITTAL INFORMATION

Design Submittal Data Checklist and Certification

All items listed below are mandatory, shall comply with the specification and be submitted according to pre-bid submittal requirements

Included	Tab	Item	Description
	A	Letter/ Checklist	Listing of all information being submitted must be included on the table of contents. List the name of the manufacturer's local representative and his/her phone number. Signed submittal checklist to be included.
	B	On Field Lighting Design	Lighting design drawing(s) showing: a. Field Name, date, file number, prepared by, and other pertinent data b. Outline of field(s) being lighted, as well as pole locations referenced to the center of the field (x & y). Illuminance levels at grid spacing specified c. Pole height, number of fixtures per pole, as well as luminaire information including wattage, lumens and optics d. Height of meter above field surface e. Summary table showing the number and spacing of grid points; average, minimum and maximum illuminance levels in foot candles (fc); uniformity including maximum to minimum ratio, coefficient of variance and uniformity gradient; number of luminaries, total kilowatts, average tilt factor; light loss factor. f. Alternate manufacturers shall provide both initial and maintained light scans using a maximum 0.70 Light Loss Factor to calculate maintained values.
	C	Photometric Report	Provide photometric report for a typical luminaire used showing candela tabulations as defined by IESNA Publication LM-35-02. Photometric data shall be certified by laboratory with current National Voluntary Laboratory Accreditation Program or an independent testing facility with over 5 years experience.
	D	Life Cycle Cost calculation	Document life cycle cost calculations as defined in the specification. Identify energy costs for operating the luminaires, maintenance cost for the system including spot lamp replacement, and group relamping costs. All costs should be based on 25 Years.
	E	Luminaire Aiming Summary	Document showing each luminaire's aiming angle and the poles on which the luminaries are mounted. Each aiming point shall identify the type of luminaire.
	F	Structural Calculations	Pole structural calculations and foundation design showing foundation shape, depth backfill requirements, rebar and anchor bolts (if required). Pole base reaction forces shall be shown on the foundation drawing along with soil bearing pressures. Design must be stamped by a structural engineer in the state of Utah.
	G	Control and Monitoring	Manufacturer shall provide written definition and schematics for automated control system to include monitoring. They will also provide examples of system reporting and access for numbers for personal contact to operate the system.
	H	Electrical distribution plans	If bidding an alternate system, manufacturer must include a revised electrical distribution plan including changes to service entrance, panels and wire sizing, signed by a licensed Electrical Engineer in the state of Utah.
	I	Performance Guarantee	Provide performance guarantee including a written commitment to undertake all corrections required to meet the performance requirements noted in these specifications at no expense to the owner. Light levels must be guaranteed per specification for 25 years.
	J	Warranty	Provide written warranty information including all terms and conditions.
	K	Project References	Manufacturer to provide a list of project references of similar products completed within the past three years.
	L	Product Information	Complete set of product brochures for all components, including a complete parts list and UL Listings.
	M	Non-Compliance	Manufacturer shall list all items that do not comply with the specifications.
	N	Compliance	Manufacturer shall sign off that all requirements of the specifications have been met at that the manufacturer will be responsible for any future costs incurred to bring their equipment into compliance for all items not meeting specifications and not listed in item N – Non-Compliance

Manufacturer: _____

Signature: _____

Contact Name: _____

Date: ____/____/____

SECTION 16660 - SEISMIC BRACING

PART 1 - GENERAL

1.1 GENERAL CONDITIONS

- A. The General Conditions, Supplementary General Conditions Alternates and Addenda, Applicable Drawings and the Technical Specifications shall apply to all work under this division.

1.2 SCOPE OF WORK

- A. The materials covered by these specifications consists of furnishing all labor, material and equipment necessary to complete the seismic bracing for all work provided under Division 16000.
- B. The work shall include all electrical isolated and non-isolated equipment, fixtures, raceways, panelboards, engine generator, etc.

1.3 CODES - REGULATIONS

- A. In the installation of this work, comply in every way with the requirements of the laws, ordinances and rules of the system design and installation shall be based on seismic zone III of the Uniform Building code, 1985 edition and other standards listed below.
- B. Reference Standards

Uniform Building Code 1985 edition
NFPA bulletin 90A, current edition
UL Standard 181
Tri-services manual, fagel etal 1973
- C. If a conflict occurs between these rules and this specification, the rules are to govern. Accept this condition upon submitting bid, and no extra charge will be allowed after the contract is awarded. This shall not be construed as relieving the contractor from complying with any requirements on the plans or specifications which may be in excess of requirements of the hereinbefore mentioned rules and not contrary to same. Contractor shall bear all costs arising from the installation of any materials or equipment which is in conflict with the above mentioned codes or ordinances.
- D. Obtain approvals, inspections, etc., required by code. All fees shall be included in the contract price. The contractor shall furnish a certificate of approval to the Owners Representative from the inspection authority at completion of the work.

1.4 MATERIALS AND WORKMANSHIP

- A. All materials and equipment furnished and installed shall be first quality, new and meet the standards of NEMA, IPCEA, LS, UL, NFPA, UBC, UOSH, NEC, and shall bear their label wherever standards have been established and label service is available. Where materials and equipment are specified by manufacturer's name, the type and quality required is thereby denoted. The Owners Representative shall be afforded every facility, deemed necessary to inspect and examine the materials and apparatus being installed to provide their quality, skill and competency of workmanship.
- B. Workmanship shall be the best quality of its kind for the respective industries, trades, crafts and practices and shall be acceptable in every respect to the Owner's Representative. Nothing contained herein shall relieve the contractor from making good and perfect work in all details of construction.
- C. The contractor shall work in harmony with the Owner's Representative and with other contractors, companies or individuals working in connection with this project. Imperfections or errors by other contractors shall not relieve responsibility of this contractor. Store materials orderly and clean up without interference with other trades.

1.5 QUALITY ASSURANCE

- A. The contractor shall be held responsible for purchasing and installing vibrator isolators, flexible connections, rigid steel frames, concrete inertia bases, anchors, inserts, hangers, and attachments, seismic bracing and snubbers as required for seismic control and prevention of the transmission of vibration for both isolated and non-isolated systems.
- B. Manufacturers and suppliers approved for use by the contractors Mason Industries, Inc., Korfund, and Amber/Booth Company.
- C. The approved manufacturer or supplier shall be totally responsible for the fabrication and operation of the seismic bracing components specified herein for al isolated equipment, non-isolated equipment, fixtures, raceways, etc.

1.6 GUARANTEE

- A. The entire electrical system installed under this contract shall be left in proper working order and be in compliance with the drawings, specifications and/or authorized changes to the satisfaction of the Owner's Representative. Without additional charge, replace any work or materials which develop defects, except from ordinary wear, within one year from the date of substantial completion.

PART 2 - PRODUCTS

2.1 RACEWAYS, PANELBOARDS, LIGHTING FIXTURES, ETC.

- A. All equipment shall be installed according to 1982 Uniform Building Code Sec. 2312 (g): Cp Factor Table 23j, I Factor Table 23K. I Factor Table 23K. In addition the vertical forces, restraint requirements shall be computed as .5g the value of the lateral forces.

- B. All raceway shall be protected against seismic disturbances except as noted below:

All electrical conduit less than 2" inside diameter.

PART 3 - EXECUTION

3.1 SEISMIC REQUIREMENTS

- A. All electrical work shall be braced or supported to withstand seismic disturbances and remain operational. Furnish all labor, materials and equipment to provide protection against seismic disturbances and remain in place.
- 3.2 The equipment and systems referenced in this section are to be commissioned per Section 01810 – Commissioning General Requirements and Section 16995 – Commissioning: Mechanical Systems. The contractor, coordination, startup, test development, testing and documentation. Coordinate all commissioning activities with the Commissioning Authority.

END OF SECTION 16660