BID FOR

TMWRF MCC 6 REPLACEMENT

BID # 17/18-010

PWP # WA-2018-016

BIDS DUE NOT LATER THAN: 1:45 PM ON NOVEMBER 8, 2017

PUBLIC BID OPENING: 2:00 PM ON NOVEMBER 8, 2017

[NOTE: TIME BIDS ARE DUE IS DIFFERENT FROM BID OPENING TIME]

431 PRATER WAY
P.O. BOX 857
SPARKS, NV 89432-0857

Company Name: _____

CITY OF SPARKS
NOTICE TO BIDDERS
TMWRF MCC 6 REPLACEMENT
BID #17/18-010 / PWP #WA-2018-016

NOTICE IS HEREBY GIVEN that the City of Sparks, Nevada, will receive written sealed bids only, for the project listed above. Said bids must be in the hands of the Contracts and Risk Manager at 431 Prater Way, Sparks, Nevada, NO LATER THAN **1:45 PM ON NOVEMBER 8, 2017.** Bids postmarked prior to, but not received until after this deadline will not be accepted. Vendor bid response submittals may not be sent to the City of Sparks via the Internet/e-mail and will not be entertained for award by the City of Sparks. The right is reserved to reject any Bid/Proposal or to accept the Bid/Proposal which is deemed by the City of Sparks to be in the best interest of the City of Sparks. The City of Sparks reserves the right to waive any irregularities and/or informalities in the bid process.

All Bids are to be marked clearly on the outside. Bids will be opened and publicly read at **2:00 PM ON NOVEMBER 8, 2017**, at Sparks City Hall, 431 Prater Way Sparks, NV 89431.

PROJECT DESCRIPTION: Demolition and replacement of the existing "MCC 6" motor control center for the Truckee Meadows Water Reclamation Facility (TMWRF).

PRE-BID MEETING: A **MANDATORY** pre-bid meeting will be held at the project site Training Room (8500 Cleanwater Way), at 10:00AM on October 24, 2017. Contractors wishing to submit bids on this project must attend the pre-bid meeting to be considered in evaluation.

BONDING/LICENSING: A Bid Bond in the amount of 5% of bid amount is required. This bid bond will function as a penalty in the event the successful bidder fails to enter into a written contract with the City in accordance with the bid documents. Additionally, the City will be entitled to actual damages, if any. Prospective bidders will be required to have a current Contractor's License under the Nevada State Law for the type of work specified herein.

The work to be performed under this Contract shall be commenced by the successful Bidder after all executed Contract documents have been submitted, and after being notified to proceed by the City of Sparks.

Bid documents and specifications may be obtained from the City of Sparks website. Please visit http://www.cityofsparks.us/bids to obtain complete bid documents. There is no cost to use the system or obtain plans, but registration at the site is required. It is the responsibility of all potential bidders/responders to monitor the Purchasing Division's website for any changing information prior to submitting their bid/proposal. The City of Sparks will not be responsible for the timeliness or completeness of information provided by any 3rd party bid listing or re-selling service. For further information, contact the Purchasing Division at dmarran@cityofsparks.us or at (775) 353-2273. The individual responsible for coordinating this bid is: Dan Marran, CPPO, C.P.M. – Contracts and Risk Manager

Reno Gazette Journal Legal Notices Section
Publish Date: October 18, 2017
Proof of publication required

Bidder's Checklist

Bidders are instructed to complete and return the following forms in order for their bids to be complete. Failure to return the following items may result in your bid being declared "non-responsive."

1. _____ Bid Item Schedule
2. _____ Bidder Information Sheets
3. _____ Subcontractor Information Form (5% list due with bid submittal)
4. _____ Acknowledgement and Execution Form
5. _____ Certification Regarding Debarment
6. _____ "Certificate of Eligibility" (Local Preference) - If Contractor wishes to potentially apply their preference.
7. _____ Bid Bond
8. _____ Signed Bid Addenda (if applicable)

CITY OF SPARKS
BID ITEM SCHEDULE

BID TITLE: **TMWRF MCC 6 REPLACEMENT**

BID #17/18-010 / PWP# WA-2018-016

PRICES must be valid for 90 calendar days after the bid opening.

COMPLETION of this project is expected **PURSUANT TO CONTRACT DOCUMENTS**.

BIDDER acknowledges receipt of _____ Addenda.

_____ _____
Bidder Name (signature)

Item No.	Quantity	Unit	Description	Unit Price	Total Price
1	1	LS	Mobilization	/LS	$
2	1	LS	Demolition of Existing MCC 6/ECP-5	/LS	$
3	1	LS	Procure Two VFDs	/LS	$
4	1	LS	Procure Active Harmonic Filter	/LS	$
5	1	LS	Procure New MCC 6/Install New MCC 6 & Controls	/LS	$
6	1	LS	Force Account	$62,500.00 / LS	**$62,500.00**

Grand Total **$** **(written total bid price)**	$

Bidder Information

COMPANY INFORMATION:

Company Name:
Contact Name:
Address:
City:
State / Zip Code:
Telephone Number including area code:
Fax Number including area code:
E-mail:

COMPANY BACKGROUND

1) Has your company ever failed to complete any contracts awarded to it? No___ Yes___ (If yes, please provide details.)

2) Has your company filed any arbitration request or law suits on contracts awarded within the last five years? No___ Yes___ (If yes, please provide details.)

3) Does your company now have any legal suits or arbitration claims pending or outstanding against it or any officers relating to the performance of a public contract? No___ Yes___ (If yes, please provide details.)

4) Does your company now employ any officers or principals who were with another firm when that company failed to complete a contract within the last five years? No___ Yes___ (If yes, please provide details.)

5) Has your company had a contract partially or completely terminated for default (cause) within the past five years? No___ Yes___ (If yes, please provide details.

6) Has your company been found non-responsible on a government bid within the last five years? No___ Yes___ (If yes, please provide details.)

Bidder Information

CONTRACTOR LICENSE INFORMATION:

Nevada State Contractor's License Number (If Applicable):
License Classification(s):
Limitation(s) of License:
Date Issued:
Date of Expiration:
Name of Licensee:
City, State, Zip Code of Licensee:
Telephone Number of Licensee:

BUSINESS LICENSING INFORMATION All vendors doing business within the City of Sparks are required to obtain and maintain a current business license from the City of Sparks prior to commencement of work (Sparks Municipal Code Section 5.08.020A). Vendor(s) awarded a contract resulting from this bid shall be required to obtain a current business license if they do not already hold one.

City of Sparks Business License Number:
Date Issued:
Date of Expiration:
Name of Licensee:
City, State, Zip Code of Licensee:
Telephone Number of Licensee:
Taxpayer Identification Number:

Bidder Information

DISCLOSURE OF PRINCIPALS:

a) **Individual and/or Partnership:**

Owner 1) Name:
Address:
City, State, Zip Code:
Telephone Number:
Owner 2) Name:
Address:
City, State, Zip Code:
Telephone Number:
Other 1) Title:
Name
Other 2) Title:
Name:

b) **Corporation:**

State in which Company is Incorporated:
Date Incorporated:
Name of Corporation:
Address
City, State, Zip Code:
Telephone Number:
President's Name:
Vice-President's Name:
Other 1) Name:
Title:

SUBCONTRACTOR DETAIL
SUBCONTRACTORS EXCEEDING FIVE PERCENT OF BID AMOUNT

INSTRUCTIONS: Per NRS 338.141, Bidder submits the following names of First-Tier Subcontractors who will provide to Bidder labor or a portion of the Work or improvements for which Subcontractor will be paid an amount exceeding five percent (5%) of the Bid Price. The Bidder shall list the name of a Subcontractor for each portion of the Work, the value of which exceeds five percent (5%) of the Bid Price. **If Bidder will perform more than 5% of the Work, BIDDER SHALL ALSO LIST HIS NAME and description of the work that the prime contractor will perform in the space provided below.**

Name of Subcontractor	Address	
Phone	Nevada Contractor License #	Limit of License
Description of Work:		
Name of Subcontractor	Address	
Phone	Nevada Contractor License #	Limit of License
Description of Work:		
Name of Subcontractor	Address	
Phone	Nevada Contractor License #	Limit of License
Description of Work:		
Name of Subcontractor	Address	
Phone	Nevada Contractor License #	Limit of License
Description of Work:		
Name of Subcontractor	Address	
Phone	Nevada Contractor License #	Limit of License
Description of Work:		
Name of Subcontractor	Address	
Phone	Nevada Contractor License #	Limit of License
Description of Work:		

Bidder Name: ___________________________ **Authorized Signature: _________________________**

SUBCONTRACTOR DETAIL
SUBCONTRACTORS EXCEEDING ONE PERCENT OF BID AMOUNT OR $50,000

INSTRUCTIONS: In compliance with NRS 338.141, Bidder submits the following names of First-Tier Subcontractors who will provide to Bidder labor or a portion of the Work or improvements for which Subcontractor will be paid an amount exceeding one percent (1%) of the Bid or $50,000, whichever is greater. The Bidder shall list the name of a Subcontractor for each portion of any of the Work the value of which exceeds one percent (1%) of the Bid Price.

Since all Subcontractors listed on the Bidder's 5% Subcontractor Information Form are over 1% of the Bid amount, those Subcontractors shall automatically be deemed incorporated into this 1% Subcontractor Information form and need not be re-listed below.

Information provided must be submitted within two (2) hours after the completion of the opening of the bids (Per NRS 338.141). Bidder shall enter "**NONE**" under "**Name of Subcontractor**" if not utilizing subcontractors exceeding this amount. This form must be complete in all respects. If, additional space is needed, attach a separate page. The bidder may elect to submit this information with the bid proposal and, in that case, the bidder will be considered as having submitted this information within the above two hours.

Name of Subcontractor	Address	
Phone	Nevada Contractor License #	Limit of License
Description of Work:		
Name of Subcontractor	Address	
Phone	Nevada Contractor License #	Limit of License
Description of Work:		
Name of Subcontractor	Address	
Phone	Nevada Contractor License #	Limit of License
Description of Work:		
Name of Subcontractor	Address	
Phone	Nevada Contractor License #	Limit of License
Description of Work:		

Bidder Name: _____ Authorized Signature: _____

CITY OF SPARKS ACKNOWLEDGMENT AND EXECUTION:

STATE OF _____)
) SS
County of _____)

_____ (Name of Principal) being first duly sworn, deposes and says: That he/she is the Bidder, or authorized agent of the Bidder for whom the aforesaid described work is to be performed by; that he/she has read the Plans, Specifications, and related documents including but not limited to, any addenda issued and understands the terms, conditions, and requirements thereof; that if his/her bid is accepted that he/she agrees to furnish and deliver all materials except those specified to be furnished by the City of Sparks (Owner) and to do and perform all work for the **TMWRF MCC 6 REPLACEMENT,** Bid # **17/18-010,** together with incidental items necessary to complete the work to be constructed and/or services to be provided in accordance with the Specifications, Plans, and Contract Documents annexed hereto.

TO THE CONTRACTS AND RISK MANAGER OF THE CITY OF SPARKS:
The undersigned, as Bidder, declares that the only persons or parties interested in this proposal, as principals, are those named herein, the Bidder is fully informed respecting the preparation and contents of the attached Bid and of all pertinent circumstances respecting such Bid: that this proposal is made without collusion with any other person, firm or corporation; that he/she has carefully examined the location of the proposed work; the proposed form of Contract, the Contract Provisions, Plans, Specifications and Contract Documents incorporated therein referred to and made part thereof; that he/she proposes and agrees if this proposal is accepted, that he/she will contract with the City of Sparks in the form of the Contract prescribed, to provide all necessary machinery, tools, apparatus and other means of construction, and to do all the work and furnish all the materials specified in the Contract and annexed Contract Provisions, Plans and Specifications, in the manner and time prescribed and according to the requirements of the Project Representative as therein set forth, it being understood and agreed that the quantities shown herein are approximate only and are subject to increase or decrease, and that he/she will accept, in full, payment therefore the indicated prices.

Contractor/Bidder:

(Printed Name of Contractor/Bidder) BY:

Firm:

Address:

City:

State / Zip Code:

Telephone Number:

Fax Number:

E-mail Address:

(Signature of Principal) Signature:

DATED this day of , 2017.

State of Nevada)

) SS.

County of _____)

On this day of , in the year 2017, before me,

/Notary Public, personally appeared Personally known to me (or proved

to me on the basis of satisfactory evidence) to be the person whose name is subscribed to this instrument, and acknowledged that he (she) executed it. WITNESS my hand and official seal.

Notary's Signature: My commission Expires:

CERTIFICATION REGARDING DEBARMENT, SUSPENSION, AND OTHER RESPONSIBIILTY MATTERS
(This form to be signed and returned at the time of bid)

The prospective bidder, _____ certifies to the best of its knowledge and belief that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State, or local) with commission of any of the offenses enumerated in paragraph (b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.

I understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award. Any exceptions provided will not necessarily result in denial of award, but will be considered in determining bidder responsibility and whether or not the City will enter into contract with the party. For any exception noted, indicate on an attached sheet to whom it applies, initiating agency, and dates of action. Providing false information may result in criminal prosecution or administrative sanctions.

_____

Typed Name & Title of Authorized Representative

_____

Signature of Authorized Representative Date

I am unable to certify to the above statement. My explanation is attached.

Signature_____Date_____

Local Preference Affidavit

***NEW Instructions*:** This form is required to receive a preference in bidding on projects exceeding $250,000. This form must be submitted no later than two (2) hours following the opening of bids, only if the bidder wishes for their preferential status(established by their current Certificate of Eligibility) to be considered in the evaluation of bids. A copy of the bidder's Certificate of Eligibility must be submitted at the time the contractor submits their bid.

I, _____, on behalf of the Contractor, _____, swear and affirm that in order to be in compliance with NRS 338.0117 and be eligible to receive a preference in bidding **TMWRF MCC 6 REPLACEMENT** (**Bid #17/18-010**) certify that the following requirement will be adhered to, documented and attained on completion of the contract. Upon submission of this affidavit on behalf of _____, I recognize and accept that failure to comply with any requirements is a material breach of the contract and entitles the City to damages. In addition, the Contractor may lose their preference designation and/or lose their ability to bid on public works for a period of time, pursuant to NRS 338:

1. The Contractor shall ensure at least 50 percent of workers employed on the public work possess a Nevada driver's license or identification card;

2. The Contractor shall ensure all vehicles used primarily for the public work will be registered and (where applicable) partially apportioned to Nevada;

3. The Contractor shall ensure payroll records related to this project are maintained and available within the State of Nevada.

These requirements are not applicable to Contractors who do not use the "Bidder's Preference" eligibility certificate in their bid or do not receive an advantage in ranking of bids due to their preference status.

By:_____ Title:_____

Signature:_____ Date:_____

Signed and sworn to (or affirmed) before me on this _____ day of _____, 20_____, by_____ (name of person making statement).

State of _____)
)ss.
County of _____)

_____ STAMP AND SEAL
Notary Signature

CITY OF SPARKS, NEVADA – 5% Bid Bond

KNOW ALL MEN BY THESE PRESENTS: That we the undersigned _____, as "Principal," and _____, as "Surety," are hereby held and firmly bound unto the City of Sparks, Nevada, as "Obligee," in the penal sum of _____dollars ($_____) for the payment of which, well and truly to be made, the Principal and Surety bind themselves, their heirs, executors, and administrators, successors and assigns, jointly and severally, by this instrument. The condition of the obligation of this bid bond is as follows:

WHEREAS, NRS 332.105 authorizes local governments to require bid bonds to insure execution and proper performance of the Contract and the Bonding Company has an "A" or better rating with Moody's or A.M. Best and T-Listed with the U.S. Treasury Department;

AND, WHEREAS, the Principal has submitted a bid for Bid # **17/18-010**, PWP # **WA-2018-016**, for the **TMWRF MCC 6 REPLACEMENT**.

NOW, THEREFORE,

(a) If said Bid shall be rejected; or

(b) If said Bid shall be accepted and the Principal shall execute and deliver the contract in the bid documents ("Contract") to Obligee in accordance with the terms of the bid documents, and give such bond or bonds as may be specified in the bid or contract documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or

(c) If the Principal shall pay to the Obligee the full amount of the bid bond as a penalty irrespective of the Obligee's actual damages in the event of the failure of the Principal to enter into such Contract and give such bond or bonds,

then, this obligation shall be null and void. Otherwise it shall remain in full force and effect, it being expressly understood and agreed that the liability of the Surety (but not of the Principal) for any and all claims hereunder shall, in no event, exceed the penal amount of the obligation as herein stated.

The Surety, for the consideration for which this bond was executed, hereby stipulates and agrees that the obligations of said Surety and its bond shall be in no way impaired or affected by any extension of the time within which the Obligee may accept such bid, and hereby waives notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and the Surety has caused their seal to be hereto affixed and these present to be signed by their proper officers.

Signed, Sealed and dated: _____

_____
Principal
By: _____

_____
Surety
By: _____

GENERAL CONDITIONS

GENERAL CONDITIONS

Please Read Carefully
These Provisions Are a Part of Your Bid and any Contract Awarded

Scope of Bid/Proposal: Bids/Proposals are hereby requested for **TMWRF MCC 6 REPLACEMENT**, as per specifications herein.

The bidder agrees that:

A. Bidder has carefully examined the specifications, and all provisions relating to the item(s) to be furnished or the work to be done; understands the meaning, intent, and requirements; and

B. Bidder will enter into a written contract and furnish the item(s) or complete the work in the time specified, and in strict conformity with the City of Sparks specifications for the prices quoted.

Note: Bidder is defined as any individual, partnership, or corporation submitting a bid, proposal, or quotation in response to a request for bid (RFB), request for proposal (RFP), request for information (RFI) or request for quotation (RFQ). A bidder may also be referred to as a bidder, contractor, supplier or vendor.

The use of the title "Bidder:, "Vendor", "Contractor" or "Consultant" within this solicitation document and any resulting contract shall be deemed interchangeable and shall refer to the person or entity with whom the City of Sparks is soliciting and/or contracting for the service or product referenced within the bid document.

1. Prices:

All prices and notations must be in ink or typewritten. Mistakes may be crossed out and corrections typed or written with ink adjacent to the error. Bids shall indicate the unit price extended to indicate the total price for each item bid. Any difference between the unit price correctly extended and the total price shown for all items bid shall be resolved in favor of the unit prices. Bidders are encouraged to review all prices prior to bid submittal, as withdrawal or correction may not be permitted after the bid has been opened.

2. Firm Prices:

Prices on bid shall be firm prices not subject to escalation unless otherwise provided for in the specifications. In the event the specifications provide for escalation, the maximum limit shall be shown, or the bid shall not be considered. In the event of a decline in market price below a price bid, the City of Sparks shall receive the benefit of such decline.

3. Items Offered:

If the item offered by the bidder has a trade name, brand and/or catalog number, such shall be stated in the bid. If the bidder proposes to furnish an item of a manufacturer or vendor other than that mentioned on the face hereof, bidder must specify maker, brand, quality, catalog number, or other trade designation. Unless such is noted on the bid form, it will be deemed that the item offered is that designated even though the bid may state "or equal".

4. Brand Names:

Whenever reference to a specific brand name is made by the City, it is intended to describe a component that has been determined to best meet operational, performance, or reliability standards of the City, thereby incorporating these standards by reference within the specifications. These specifications are not meant to limit the vendor; they are guidelines to minimum qualifications. The bidder shall indicate their compliance or non-compliance for each line of the specification. Any deviations from the specifications or where submitted literature does not fully support the meaning of the specifications must be clearly cited in writing by the bidder.

An equivalent ("or equal") may be offered by the bidder, subject to evaluation and acceptance by the City. It is the bidder's responsibility to provide, at bidder's expense, samples, test data, or other documentation the City may require to fully evaluate and determine acceptability of an offered substitute. The City reserves the sole right to reject a substituted component that will not meet or exceed City standards.

5. Samples:
Samples may be required for bid evaluation and testing purposes. Bidders shall agree to provide samples upon request and at no additional cost to the City.

6. Withdrawal of Bids:
Bids may be withdrawn by written or facsimile notice received prior to the exact hour and date specified for receipt of bid. A bid may also be withdrawn in person by a bidder, or bidder's authorized representative, prior to the exact hour and date set for receipt of bids. Telephone withdrawals are not permitted.

7. Late Bids, Modifications, or Withdrawals:
Bids, modifications of bids, or bid withdrawals received after the exact time and date specified for receipt will not be considered.

8. Mistake in Bid:
(a) If the bidder discovers a mistake in bid prior to the hour and date specified for receipt of bid, bidder may correct the mistake by withdrawing the bid in accordance with Item 7 above and resubmit prior to the stated bid deadline.

(b) If within seventy-two hours of the bid closing and prior to the issuance of a purchase order or a contract, the apparent low bidder discovers a mistake in bid of a serious and significant nature, bidder may request consideration be given to withdrawing the bid. The mistake must be evident and provable. The right is reserved by the City to reject any and all requests for withdrawal of bids. The decision of the Purchasing Manager is final as regards acceptance or rejection of requests for withdrawal after closing of bids.

(c) A mistake in bid cannot be considered once a purchase order or contract is issued.

9. Signature:
All bids shall be signed and the title and firm name indicated. A bid by a corporation shall be signed by an authorized officer, employee or agent with his or her title.

10. Exceptions:
A bidder deviating from specifications must specify any and all deviation(s). Failure to note said exceptions shall be interpreted to convey that the bidder shall propose to perform in the manner described and/or specified in this bid solicitation. If exception(s) are taken or alternatives offered, complete descriptions must be shown separately.

11. Confidential Information:
Any information deemed confidential or proprietary should be clearly identified by the bidder as such. It may then be protected and treated with confidentiality only to the extent permitted by state law. Otherwise the information shall be considered a public record. Information or data submitted with a bid will not be returned.

12. Quality:
Unless otherwise required in the specifications, all goods furnished shall be new and unused.

13. Litigation Warranty:

The bidder, by bidding, warrants that bidder is not currently involved in litigation or arbitration concerning the materials or bidder's performance concerning the same or similar material or service to be supplied pursuant to this contract of specification, and that no judgments or awards have been made against bidder on the basis of bidder's performance in supplying or installing the same or similar material or service, unless such fact is disclosed to the City in the bid. Disclosure may not disqualify the bidder. The City reserves the right to evaluate bids on the basis of the facts surrounding such litigation or arbitration and to require bidder to furnish the City with a surety bond executed by a surety company authorized to do business in the State of Nevada and approved by The City of Sparks in a sum equal to one hundred percent (100%) of the contract price conditional on the faithful performance by bidder of the contract in the event the bid is awarded to bidder, notwithstanding the litigation or arbitration.

14. Royalties, Licenses and Patents:

Unless otherwise specified, the bidder shall pay all royalties, license and patent fees. The bidder warrants that the materials to be supplied do not infringe any patent, trademark or copyright and further agrees to defend any and all suits, actions and claims for infringement that are brought against the City, and to defend, indemnify and hold harmless the City from all loss or damages, whether general, exemplary or punitive, as a result of any actual or claimed infringement asserted against the City, the bidder or those furnishing material to bidder pursuant to this contract.

15. Performance Standards:

Performance of work and acceptability of equipment or materials supplied pursuant to any contract or award shall be to the satisfaction and full discretion of the City.

16. Americans with Disabilities Act (ADA) Standards:

Bidders shall be required to comply with current ADA Standards in preparing their bids and executing work required under any contract resulting from this bid. Completed work must comply with current ADA Standards.

17. Warranties:

(a) Unless otherwise specified, all workmanship, material, labor or equipment provided under the contract shall be warranted by bidder and/or manufacturer for a minimum of twelve (12) months after acceptance by City. Greater warranty protection will be accepted. Lesser warranty protection must be indicated by bidder on the bid proposal as an exception.

(b) Bidder shall be considered primarily responsible to the City for all warranty service, parts and labor applicable to the goods or equipment provided by bidder under this bid or award, irrespective of whether bidder is an agent, broker, fabricator or manufacturer's dealer. Bidder shall be responsible for ensuring that warranty work is performed at a local agency or facility convenient to City and that services, parts and labor are available and provided to meet City's schedules and deadlines. If required and defined within the Scope of Work, the Bidder will post a performance bond after contract award to guarantee performance of these obligations. Bidder may establish a service contract with a local agency satisfactory to City to meet this obligation if bidder does not ordinarily provide warranty service.

18. Addenda:

The effect of all addenda to the bid documents shall be considered in the bid, and said addenda shall be made part of the bid documents and shall be returned with them. Before submitting a bid, each bidder shall ascertain

whether or not any addenda have been issued, and failure to acknowledge any such addenda may render the bid invalid and result in its rejection.

All potential bidders are responsible for monitoring the City website regarding the availability of new bid documents or addenda (where applicable). The City of Sparks will not be responsible for the results of any potential failures in automatic notification systems to potential bidders or plan holders with respect to these documents and will not adjust bid schedules or requirements due to any potential failures of those systems. It is the responsibility of all potential bidders/responders to monitor the Purchasing Division's website for any changing information prior to submitting their bid/proposal. The City of Sparks will not be responsible for the timeliness or completeness of information provided by any 3rd party bid listing or re-selling service.

19. Specifications to Prevail:

The detailed requirements of the Specifications, Scope of Work or Special Conditions shall supersede any conflicting reference in these General Conditions or the stated language on the City of Sparks Standard Purchase Order that are in conflict therewith.

20. Taxes:

The City is exempt from State, City and County Sales Taxes per NRS 372.325. The City will furnish Exemption Certificates for Federal Excise Tax when applicable. The successful bidder shall pay all taxes, levies, duties and assessments of every nature, which may be applicable to any work or materials under this Contract. The Contract Sum and any agreed variations thereof shall include all taxes imposed by law. The successful bidder shall make any and all payroll deductions required by law. The successful bidder herein indemnifies and holds the City harmless from any liability on account of any and all such taxes, levies, duties, assessments and deductions.

21. Prevailing Wages:

Bidder is responsible for complying with all applicable local, State and Federal wage laws, whether or not specifically cited in this bid document.

Per NRS Sections 338.020 through 338.090, certain projects defined as "public works" require the payment of the prevailing wage as determined by the Labor Commissioner. Generally speaking, projects/contracts for construction of a public work valued at less than $250,000 are exempt from the prevailing wage requirement (NRS 338.080). Bidder shall be fully aware of the prevailing wage requirements of the State of Nevada as detailed in NRS Chapter 338 and price their bid response accordingly. Further information concerning Prevailing Wage rates can be found at:
http://labor.nv.gov/PrevailingWage/Public_Works/Prevailing_Wages/

Federal "Davis Bacon" wages may be applicable if the funding for the project includes Federal funds. These requirements are detailed in the "Special Conditions – Federal Requirements" section that will be included in this bid document when such conditions apply.

22. Conflict of Interest:

No City employee or elected or appointed member of City government, or member of the employee's immediate family, may participate directly or indirectly in the procurement process pertaining to this bid if they:

(a) Have a financial interest or other personal interest that is incompatible with the proper discharge of their official duties in the public interest or would tend to impair their independence, judgment or action in the performance of their official duties.

(b) Are negotiating for or have an arrangement concerning prospective employment with bidder. The bidder warrants to the best of his knowledge that the submission of the bid will not create such conflict of interest. In the event such a conflict occurs, the bidder is to report it immediately to the Purchasing Manager. For breach or violation of this warranty, the City shall have the right to annul this contract without liability at its discretion, and bidder may be subject to damages and/or debarment or suspension.

23. Disqualification of Bidder:

Any one or more of the following may be considered as sufficient for the disqualification of a prospective Bidder and the rejection of the Bid:

(a) The Bidder is not responsive or responsible.
(b) The quality of services, materials, equipment or labor offered does not conform to the approved plans and specifications.
(c) There is evidence of collusion among prospective Bidders (Participants in such collusion will receive no recognition as Bidders).
(d) The Bidder lacks the correct contractor's license classification required for the defined scope of work.
(e) Lack of competency, understanding of the scope of work, adequate machinery, plant and/or equipment as revealed in routine due diligence associated with bid evaluation.
(f) Unsatisfactory performance record as shown by past work for the City of Sparks, judged from the standpoint of workmanship, progress, and quality of services/goods provided.
(g) Uncompleted work which, in the judgment of the City of Sparks, might hinder or prevent the prompt completion of additional work, if awarded.
(h) Failure to pay or satisfactorily settle all bills due for labor and/or material on any contract(s).
(i) Failure to comply with any requirements of the City of Sparks.
(j) Failure to list, as required, all subcontractors who will be employed by the Bidder.
(k) Any other reason determined, in good faith, to be in the best interest of the City of Sparks.

24. Gratuities:

The City may rescind the right of the bidder to proceed under this agreement if it is found that gratuities in the form of entertainment, gifts, cash or otherwise are offered or given by the bidder, or any agent or representative of the bidder, to any officer or employee of the City with the intent of influencing award of this agreement or securing favorable treatment with respect to performance of this agreement.

25. Bidder's Security (This Section ☒ IS ☐ IS NOT Applicable to this bid):

A bid deposit in an amount equal to at least 5% of the bid may be required as a bid security by the City. The bid security may only be in cash, a cashier's or certified check made payable to the City of Sparks, or a bid bond. If the bid security is a bond, it shall be executed by a surety insurer authorized to issue surety bonds in the State of Nevada. All Bonding Companies must have an "A" rating or better with Moody's or A.M. Best Company, and be included on the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bond and as Acceptable Reinsuring Companies" as published in circular 570 (as amended) by the audit staff, Bureau of Accounts, U.S. Treasury Department. (In other words, the company is T-listed.) The bid security must be executed by the bidder and enclosed with the bid proposal in the sealed bid envelope.

26. Performance and Payment Bonds:

Per NRS 339.025, before any contract, except one subject to the provisions of chapter 408 of NRS, exceeding $100,000 for any project for the new construction, repair or reconstruction of any public building or other public work or public improvement of any contracting body is awarded to any contractor, he shall furnish to the contracting body the following bonds which become binding upon the award of the contract to the contractor

(All Bonding Companies must have an "A" rating or better with Moody's or A.M. Best Company, and be included on the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bond and as Acceptable Reinsuring Companies" as published in circular 570 (as amended) by the audit staff, Bureau of Accounts, U.S. Treasury Department. (In other words, the company is T-listed.)):

Performance Bond (This Section ☒ IS ☐ IS NOT Applicable to this bid):
The Contractor awarded this bid will be required to furnish the City with a surety bond conditioned upon the faithful performance of the contract. This may take the form of a bond executed by a surety company authorized to do business in the State of Nevada and approved by the City of Sparks. The bond shall be in a sum equal to one hundred percent (100%) of the amount of the contract price. Such bond shall be forfeited to the City in the event that bidder receiving the contract shall fail or refuse to fulfill the requirements and all terms and conditions of the contract.

Payment Bond (This Section ☒ IS ☐ IS NOT Applicable to this bid):
The Contractor awarded this bid will be required to furnish the City with a payment bond**.** This may take the form of a bond executed by a surety company authorized to do business in the State of Nevada and approved by the City of Sparks. The bond shall be in a sum equal to one hundred percent (100%) of the amount of the contract price The bond must be solely for the protection of claimants supplying labor or materials to the contractor to whom the contract was awarded, or to any of his subcontractors, in the prosecution of the work provided for in such contract.

27. Indemnification:
To the fullest extent permitted by law, upon award, Contractor shall hold harmless, indemnify, defend and protect City, its affiliates, officers, agents, employees, volunteers, successors and assigns ("Indemnified Parties"), and each of them from and against any and all claims, demands, causes of action, damages, costs, expenses, actual attorney's fees, losses or liabilities, in law or in equity, of every kind and nature whatsoever ("Claims") arising out of or related to any act or omission of Contractor, its employees, agents, representatives, or Subcontractors in any way related to the performance of work under this Agreement by Contractor, or to work performed by others under the direction or supervision of Contractor, including but not limited to:

1. Personal injury, including but not limited to bodily injury, emotional injury, sickness or disease, or death to persons;
2. Damage to property of anyone, including loss of use thereof;
3. Penalties from violation of any law or regulation caused by Contractor's action or inaction;
4. Failure of Contractor to comply with the Insurance requirements established under this Agreement;
5. Any violation by Contractor of any law or regulation in any way related to the occupational safety and health of employees.

In determining the nature of the claim against City, the incident underlying the claim shall determine the nature of the claim, notwithstanding the form of the allegations against City.

If City's personnel are involved in defending such actions, Contractor shall reimburse City for the time and costs spent by such personnel at the rate charged City for such services by private professionals.

In cases of professional service agreements, requiring professional liability coverage:

If the insurer by which a Consultant is insured against professional liability does not so defend the City and applicable agents and/or staff, and the Consultant is adjudicated to be liable by a trier of fact, the City shall be entitled to reasonable attorney's fees and costs to be paid to the City by the Consultant in an amount which is proportionate to the liability of the of the Consultant.

Nothing in this contract shall be interpreted to waive nor does the City, by entering into this contract, waive any of the provisions found in Chapter 41 of the Nevada Revised Statutes.

28. Insurance:

BIDDERS' ATTENTION IS DIRECTED TO THE INSURANCE REQUIREMENTS BELOW. IT IS HIGHLY RECOMMENDED THAT BIDDERS CONFER WITH THEIR RESPECTIVE INSURANCE CARRIERS OR BROKERS TO DETERMINE IN ADVANCE OF BID SUBMISSION THE AVAILABILITY OF INSURANCE CERTIFICATES AND ENDORSEMENTS AS PRESCRIBED AND PROVIDED HEREIN. IF THE APPARENT LOW BIDDER FAILS TO COMPLY STRICTLY WITH THE INSURANCE REQUIREMENTS, THAT BIDDER MAY BE DISQUALIFIED FROM AWARD OF THE CONTRACT.

Should work be required on City premises or within the public right-of-way, upon award of the contract, the bidder shall provide proof of insurance for the types of coverage, limits of insurance and other terms specified herein, prior to initiation of any services under City, Bid, Proposal or Contract. Coverage shall be from a company authorized to transact business in the State of Nevada and the City of Sparks and shall meet the following minimum specifications:

Contractor shall at its own expense carry and maintain at all times the following insurance coverage and limits of insurance no less than the following or the amount customarily carried by Contractor or any of its subcontractors, whichever is greater. Contractor shall also cause each subcontractor employed by Contractor to purchase and maintain insurance of the type specified herein. All insurers must have AM Best rating not less than A-VII, and be acceptable to the City. Contractor shall furnish copies of certificates of insurance evidencing coverage for itself and for each subcontractor. Failure to maintain the required insurance may result in termination of this contract at City's option. If Contractor fails to maintain the insurance as set forth herein, City shall have the right, but not the obligation, to purchase said insurance at Contractor's expense.

Contractor shall provide proof of insurance for the lines of coverage, limits of insurance and other terms specified below prior to initiation of any services. Coverage shall be from a company authorized to transact business in the State of Nevada and the City of Sparks. Contractor and any of its subcontractors shall carry and maintain coverage and limits no less than the following or the amount customarily carried by Contractor or any of its subcontractors, whichever is greater.

Applicable to this Contract	Insurance Type	Minimum Limit	Insurance Certificate	Additional Insured	Waiver of Subrogation
Yes	General Liability/Umbrella (Excess) Liability	$2,000,000	✔	✔	✔
Yes	Automobile Liability	$1,000,000	✔	✔	
Yes	Workers' Compensation	Statutory	✔	N/A	✔
Yes	Employer's Liability	$1,000,000	✔	N/A	

Applicable to this Contract	Insurance Type	Minimum Limit	Insurance Certificate	Additional Insured	Waiver of Subrogation
No	Professional Liability	$1,000,000	✔	N/A	N/A
No	Pollution Legal Liability	$1,000,000	✔	N/A	N/A

Commercial General Liability

Contractor shall carry and maintain Commercial General Liability (CGL) and, if necessary to meet required limits of insurance, commercial umbrella/excess liability insurance with a total limit of not less than the limits specified herein.

For contracts that are for the construction or improvement of public facilities, the Contractor shall obtain and maintain products and completed operations liability coverage through the statute of repose after completion of the project.

There shall be no endorsement or modification of the CGL limiting the scope of coverage for liability arising from pollution, explosion, collapse, underground property damage, employment-related practices, or damage to the named insured's work unless Subcontractor carries and maintains separate policies providing such coverage and provides Contractor evidence of insurance confirming the coverage.

Minimum Limits of Insurance

$2,000,000 Each Occurrence Limit for bodily injury and property damage
$2,000,000 General Aggregate Limit
$2,000,000 Products and Completed Operations Aggregate Limit
$10,000 Medical Expense Limit

If Commercial General Liability Insurance or other form with a general aggregate limit is used, it shall be revised to apply separately to this PROJECT or LOCATION.

Coverage Form

Coverage shall be at least as broad as the unmodified Insurance Services Office (ISO) Commercial General Liability (CGL) "Occurrence" form CG 00 01 04/13 or substitute form providing equivalent coverage and shall cover liability arising from premises, operations, independent contractors, products-completed operations, personal and advertising injury, and liability assumed under an insured contract (including the tort liability of another assumed in a business contract).

Additional Insured

City, its officers, agents, employees, and volunteers are to be included as insureds using the applicable ISO additional insured endorsement(s) or substitute forms providing equivalent coverage, in respects to damages and defense arising from: activities performed by or on behalf of Contractor, including the insured's general supervision of Contractor; products and completed operations of Contractor; premises owned, occupied, or used by Contractor. The coverage shall contain no special limitations on the scope of protection afforded to City, its officers, employees, or volunteers. Additional insured status for City shall apply until the expiration of time within which a claimant can bring suit per applicable state law.

Any failure by the Contractor to comply with reporting provisions of the policies shall not affect its obligations to the additional insureds.

Primary and Non-Contributory

Contractor's insurance coverage shall apply as primary insurance with respect to any other insurance or self-insurance programs afforded to City, its officers, agents, employees, and volunteers. There shall be no endorsement or modification of the CGL to make it excess over other available insurance; alternatively, if the CGL states that it is excess or pro rata, the policy shall be endorsed to be primary with respect to the additional insured. Any insurance or self-insurance maintained by City, its officers, employees, or volunteers shall be excess of Contractor's insurance and shall not contribute with it in any way.

Separation of Insureds

Contractor's insurance shall apply separately to each insured against whom a claim is made or suit is brought, except with respect to the limits of the insurer's liability.

Waiver of Subrogation

Contractor waives all rights against City and its agents, officers, directors and employees for recovery of damages to the extent these damages are covered by the commercial general liability or commercial umbrella liability insurance maintained pursuant to this agreement. Insurer shall endorse CGL policy as required to waive subrogation against the City with respect to any loss paid under the policy.

Endorsements

A policy form or endorsement is required confirming coverage for all required additional insureds. The endorsement for CGL shall be at least as broad as the unmodified ISO additional insured endorsement CG 20 10 11/85 or substitute forms providing additional insured coverage for products and completed operations.

A waiver of subrogation in favor of City shall be endorsed to the policy using an unmodified Waiver of Transfer of Rights of Recovery of Others to Us ISO CG 24 04 05 09, or a substitute form providing equivalent coverage.

If any underground work will be performed, Contractor shall maintain electronic data liability insurance applicable to the Project and insuring against liability arising out of the loss of, loss of use of, damage to, corruption of, inability to access, or inability to manipulate electronic data. This coverage shall be maintained with a limit of liability of not less than $1,000,000 and provide coverage at least as broad as electronic data liability coverage form CG 04 37 (or substitute form providing equivalent coverage.

Business Automobile Liability

Minimum Limits of Insurance

$1,000,000 Combined Single Limit per accident for bodily injury and property damage or the limit customarily carried by Contractor, whichever is greater. No aggregate limit may apply. Coverage may be combined with Excess/Umbrella Liability coverage to meet the required limit.

Coverage Form
Coverage shall be at least as broad as the unmodified Insurance Services Office (ISO) Business Automobile Coverage form CA 00 01 10/13, CA 00 25 10/13, CA 00 20 10/13 or substitute form providing equivalent coverage. Such insurance shall cover liability arising out of any auto (including owned, hired, and non-owned autos).

Pollution liability coverage at least as broad as that provided under the ISO pollution liability—broadened coverage for covered autos endorsement (CA 99 48) shall be provided, and the Motor Carrier Act endorsement (MCS 90) shall be attached for all contracts involving transportation of "hazardous material" as this term is defined by applicable law, including, but not limited to, waste, asbestos, fungi, bacteria and mold.

Additional Insured
City, its officers, agents, employees, and volunteers are to be included as insureds with respect to damages and defense arising from the ownership, maintenance or use of automobiles owned, leased, hired, or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to City, its officers, employees, or volunteers. Additional insured status for City shall apply until the expiration of time within which a claimant can bring suit per applicable state law.

Endorsements
A policy endorsement is required listing all required additional insureds. The endorsement for Business Automobile Liability shall be at least as broad as the unmodified ISO CA 20 48 10/13 or a substitute form confirming City's insured status for Liability Coverage under the Who Is An Insured Provision contained in Section II of the coverage form ISO CA 00 01 10/13.

Workers' Compensation and Employer's Liability
Contractor shall carry and maintain workers' compensation and employer's liability insurance as required by NRS 616B.627 or provide proof that compliance with the provisions of Nevada Revised Statutes Chapters 616A-D and all other related chapters is not required. It is understood and agreed that there shall be no coverage provided for Contractor or any Subcontractor of the Contractor by the City. Contractor agrees, as a precondition to the performance of any work under this Agreement and as a precondition to any obligation of the City to make any payment under this Agreement to provide City with a certificate issued by an insurer in accordance with NRS 616B.627 and with a certificate of an insurer showing coverage pursuant to NRS 617.210.

It is further understood and agreed by and between City and Contractor that Contractor shall procure, pay for and maintain the above mentioned coverage at Contractor's sole cost and expense.

Should Contractor be self-funded for workers' compensation and employer's liability insurance, Contractor shall so notify City in writing prior to the signing of this Contract. City reserves the right to approve said retentions, and may request additional documentation, financial or otherwise, for review prior to the signing of this Contract.

Nevada law allows the following to reject workers' compensation coverage if they do not use employees or subcontractors in the performance of work under the contract:

- Sole proprietors (NRS 616B.627 and NRS 617.210)
- Unpaid officers of quasi-public, private or nonprofit corporations (NRS 616B.624 and NRS 617.207)

- Unpaid managers of limited liability companies (NRS 616B.624 and NRS 617.207)
- An officer or manager of a corporation or limited liability company who owns the corporation or company (NRS 616B.624 and NRS617.207)

If a contractor has rejected workers' compensation coverage under applicable Nevada law, the contractor must indicate the basis for the rejection of coverage and complete, sign and have notarized an Affidavit of Rejection of Coverage. The Affidavit must be completed, signed and notarized prior to performance of any work.

Minimum Limits of Insurance

Workers' Compensation:	Statutory Limits
Employer's Liability:	**$1,000,000** Bodily Injury by Accident – Each Accident
	$1,000,000 Bodily Injury by Disease – Each Employee
	$1,000,000 Bodily Injury by Disease – Policy Limit

Coverage Form

Coverage shall be at least as broad as the unmodified National Council on Compensation Insurance (NCCI) Workers Compensation and Employer's Liability coverage form WC 00 00 07/11 or substitute form providing equivalent coverage.

OTHER INSURANCE COVERAGES (IF APPLICABLE)

Professional Liability Insurance (if Applicable) $1,000,000 per occurrence limits of liability or whatever limit is customarily carried by the Contractor, whichever is greater, for design, design-build or any type of professional services with a minimum of three (3) years reporting of claims following completion of the project.

Contractors Pollution Liability Insurance (If Applicable)- $1,000,000 per occurrence and $2,000,000 aggregate or whatever amount is acceptable to the City for any exposure to "hazardous materials" as this term is defined in applicable law, including but not limited to waste, asbestos, fungi, bacterial or mold.

Lower tier sub-subcontractors, Truckers, Suppliers: Evidence confirming lower tier subcontractors, truckers and suppliers are maintaining valid insurance prior to beginning work on the project to meet the requirements set forth herein on Subcontractor, including but not limited to all additional insured requirements of Subcontractor.

ALL COVERAGES

Coverage shall not be suspended, voided, canceled, or non-renewed by either CONTRACTOR or by the insurer, reduced in coverage or in limits except after thirty (30) days' prior written notice has been given to CITY except for ten (10) days' notice for nonpayment of premium.

OTHER INSURANCE PROVISIONS

Should City and Contractor agree that higher coverage limits are needed warranting a project policy, project coverage shall be purchased and the premium for limits exceeding the above amount may be borne by City. City retains the option to purchase project insurance through Contractor's insurer or its own source.

Any failure to comply with reporting provisions of the policies shall not affect coverage provided to City, its officers, agents, employees, or volunteers.

ACCEPTABILITY OF INSURERS

Insurance is to be placed with insurers with a Best's rating of no less than A-VII and acceptable to the City.. City, with the approval of the Risk Manager, may accept coverage with carriers having lower Best's ratings upon review of financial information concerning Contractor and insurance carrier. City reserves the right to require that Contractor's insurer be a licensed and admitted insurer in the State of Nevada, or on the Insurance Commissioner's approved but not admitted list.

VERIFICATION OF COVERAGE

Contractor shall furnish City with certificates of insurance and with original endorsements affecting coverage required by this contract. The certificates and endorsements for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf.

Prior to the start of any Work, Contractor must provide the following documents to City of Sparks, Attention: Purchasing Division, P.O. Box 857, Sparks, NV 89432-0857:

A. Certificate of Insurance. Contractor must provide a Certificate of Insurance form to the City of Sparks to evidence the insurance policies and coverage required of Contractor.

B. Additional Insured Endorsements. An original Additional Insured Endorsement, signed by an authorized insurance company representative, must be submitted to the City of Sparks, by attachment to the Certificate of Insurance, to evidence the endorsement of the City of Sparks as additional insured.

C. Policy Cancellation Endorsement. Except for ten (10) days' notice for non-payment of premium, each insurance policy shall be endorsed to specify that without thirty (30) days prior written notice to the City of Sparks, the policy shall not be suspended, voided, cancelled or non-renewed, and shall provide that notices required by this paragraph shall be sent by certified mailed to the address specified above. A copy of this signed endorsement must be attached to the Certificate of Insurance.

D. Bonds (as Applicable). Bonds as required and/or defined in the original bid documents.

All certificates and endorsements are to be addressed to the City of Sparks, Purchasing Division and be received and approved by City before work commences. The City reserves the right to require complete certified copies of all required insurance policies at any time.

SUBCONTRACTORS

Contractor shall include all Subcontractors as insureds under its policies or shall furnish separate certificates and endorsements for each Subcontractor. All coverages for Subcontractors shall be subject to all of the requirements stated herein.

MISCELLANEOUS CONDITIONS

1. Contractor shall be responsible for and remedy all damage or loss to any property, including property of City, caused in whole or in part by Contractor, any Subcontractor, or anyone employed, directed, or supervised by Contractor.
2. Nothing herein contained shall be construed as limiting in any way the extent to which Contractor may be held responsible for payment of damages to persons or property resulting from its operations or the operations of any Subcontractors under it.

3. In addition to any other remedies City may have if Contractor fails to provide or maintain any insurance policies or policy endorsements to the extent and within the time herein required, City may, at its sole option:
    a. Purchase such insurance to cover any risk for which City may be liable through the operations of Contractor under this Agreement and deduct or retain the amount of the premiums for such insurance from any sums due under the Agreement;
    b. Order Contractor to stop work under this Agreement and/or withhold any payments which become due Contractor here under until Contractor demonstrates compliance with the requirements hereof; or,
    c. Terminate the Agreement.

29. Safety Program:

Upon award, the Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the work. The Contractor shall take all necessary precautions for the safety of, and shall provide all necessary protection to prevent damage, injury, or loss to:

1. All employees on the work site and all other persons who may be affected thereby.
2. All the work, materials, and equipment to be incorporated therein, whether in storage on or off the site.
3. Other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

Contractor shall comply with all applicable laws, ordinances, rules, regulations, and others of any public authority having jurisdiction for the safety of persons or property or to protect them from damage, injury, or loss. He shall erect and maintain, as required by existing conditions and progress on the work, all necessary safeguards for safety and protection, including posting danger signs, other warnings against hazards, promulgating safety regulations, and notifying owners and users of adjacent utilities. Contractor shall comply with OSHA'S Hazard Communication Standards.

Contractor shall designate a responsible member of its organization at the site whose duty shall be the prevention of accidents. This person shall be Contractor's superintendent unless otherwise designated in writing by Contractor to the Owner and the Engineer.

30. Award of Contract:

(a) Bids/Proposals will be analyzed and award will be made to the lowest, responsive and responsible bidder whose bid conforms to the solicitation and whose bid is considered to be most advantageous to the City, price and other factors considered. Factors to be considered may include, but are not limited to: bidder's past performance, total unit cost, economic cost analysis, life cycle costs, warranty and quality, maintenance cost, durability, the operational requirements of the City and any other factors which will result in the optimum economic benefit to the City.

(b) The City reserves the right to reject any item or items, to waive informalities, technical defects and minor irregularities in bids/proposals received; and to select the bid(s) or proposal(s) deemed most advantageous to the City. Should the City elect to waive a right it will not constitute an automatic waiver of that right in the future nor will it impact any other right or remedy. The City may consider bids/proposals submitted on an "all or nothing" basis if the bid/proposal is clearly designated as such.

(c) The City reserves the right to award one or more contracts on the bids/proposals submitted, either by award of all items to one bidder or by award of separate items or groups of items to various bidders as the interests of the City may require, unless the bidder clearly specifies otherwise in his bid.

(d) Upon acceptance by the City of Sparks, the solicitation, bid, proposal, or price quotation and issuance of a purchase order issued to the successful bidder shall be deemed to result in a binding contract incorporating those terms and these General Conditions without further action required by either party. Items are to be furnished as described in the bid and in strict conformity with all instructions, conditions, specifications, and provisions in the complete contract, as defined by this clause or any related integrated agreement.

31. Request for Proposal (RFP) Submittals:

In the case of Request for Proposals (RFP's), it should be noted that the documents submitted by prospective bidders are competitive sealed proposals and not competitive sealed bids. When proposals are opened, prices and other information will not be made public until the proposal is awarded. There shall be no disclosure of any bidder's information to competing bidders prior to the award of the proposal.

By their nature, proposals will include a number of variables that will vary based on the complexity of the product or service addressed within the proposal. Therefore, the evaluation of RFP's and the recommendation for award will not be based on price alone. Selection criteria will be better defined for each scope of work in the Special Conditions section of this bid.

Upon award of the contract, the executed contract and proposals will become public information. Accordingly, each proposal should be submitted on the vendor's most favorable terms from a price and technical standpoint.

32. Bidder Preference Law (This Section ☒ IS ☐ IS NOT Applicable to this bid):

This project will be bid and awarded under the Provisions(s) of NRS 338.147, which restricts preference given to certain contractors on Public Works Projects. The NRS cited in this section is meant to be a reference only. Each bidder shall acquaint himself with the latest provisions of NRS 338.147.

If the Contract for any Public Works Construction Project is expected to cost $250,000 or more, then all Contractors wishing to receive benefit of their preference status in the evaluation of bids must submit a copy of their Certificate of Bidder Preference issued by the State Contractor's Board. (Call 775-688-1141 or 775-486-1100 to obtain certification information from the State Contractors Board). Contractors who do not submit a preference certificate at the time of their bid are presumed to have wished not to exercise the benefit of their preference, or do not possess the certificate of eligibility.

To the extent Contractor has sought, qualified and receives a bidding preference on this project, pursuant to Nevada Revised Statutes Chapter 338, Contractor acknowledges and agrees that the following requirements will be adhered to, documented and attained for the duration of the Project:

1. At least 50 percent of the workers employed on the Project (including subcontractors) hold a valid driver's license or identification card issued by the Nevada Department of Motor Vehicles;

2. All vehicles used primarily for the public work will be (a) registered and (where applicable) partially apportioned to Nevada; or (b) registered in Nevada; and

3. The Contractor shall maintain and make available for inspection within Nevada all payroll records

related to the Project.

Contractor recognizes and accepts that failure to comply with any requirements herein shall be a material breach of the contract and entitle the City of Sparks to liquidated damages in the amount set by statute. In addition, the Contractor recognizes and accepts that failure to comply with any requirements herein may lose its certification for a preference in bidding and/or its ability to bid on any contracts for public works pursuant to NRS Chapter 338.

To the extent Contractor has sought, qualified and receives a bidding preference, and this project has a value of over $250,000 pursuant to Nevada Revised Statutes Chapter 338, each contract between the contractor, applicant or design-build team and a subcontractor must provide for the apportionment of liquidated damages assessed pursuant to this section if a person other than the Contractor was responsible for the breach of a contract for a public work caused by a failure to comply with a requirement of Items 1-3 within this section. The apportionment of liquidated damages must be in proportion to the responsibility of each party for the breach.

This section shall not be applicable for projects in which some or all of the funding comes from Federal sources.

33. Tie Bids:

Should identical low, responsive and responsible bids be received from two bidders, the City of Sparks Purchasing Manager shall notify all parties involved in the tie and may at his option utilize a coin-flip to determine the low bidder who shall be recommended for award. Or;

Should there be three or more low, responsive and responsible tie bids the Purchasing Manager shall exercise the following tie breaking method, unless another alternative is apparent and prudent: The City of Sparks Purchasing Manager shall set a mutually agreed upon time where, in his office, he shall shuffle a new deck of playing cards and have each bidder's representative cut the cards. The tie bidder who cuts the highest card (with Ace high) shall be recommended for bid award.

34. Appeals/Protests – Bids Only (Not Applicable to Request for Proposals):

A person who submits a bid on a contract may, after the bids are opened and within 5 business days after the date the "Recommendation to Award" is issued by the City, unless otherwise stated in the Special Conditions, file a notice of protest regarding the awarding of the contract. The City's "Recommendation to Award" will be dated and posted on the City's public website within the area where bid notices and bid re-caps are posted (Currently: http://www.cityofsparks.us/departments/financial-services/purchasing/bids-rfps).

(a) A notice of protest must include a written statement setting forth with specificity the reasons the person filing the notice believes the applicable provisions of law were violated.

(b) A person filing a notice of protest may be required by the governing body or its authorized representative, at the time the notice of protest is filed, to post a bond with a good and solvent surety authorized to do business in this State or submit other security, in a form approved by the governing body or its authorized representative, to the governing body or its authorized representative who shall hold the bond or other security until a determination is made on the protest. A bond posted or other security submitted with a notice of protest must be in an amount equal to the lesser of:

(1) Twenty-five percent of the total value of the bid submitted by the person filing the notice of protest; or

(2) Two hundred fifty thousand dollars ($250,000).

(c) A notice of protest filed in accordance with the provisions of this section operates as a stay of action in relation to the awarding of any contract until a determination is made by the governing body or its authorized representative on the protest.

(d) A person who submits an unsuccessful bid may not seek any type of judicial intervention until the governing body or its authorized representative has made a determination on the protest and awarded the contract.

(e) A governing body or its authorized representative is not liable for any costs, expenses, attorney's fees, loss of income or other damages sustained by a person who submits a bid, whether or not the person files a notice of protest pursuant to this section.

(f) If the protest is upheld, the bond posted or other security submitted with the notice of protest must be returned to the person who posted the bond or submitted the security. If the protest is rejected, a claim may be made against the bond or other security by the governing body or its authorized representative in an amount equal to the expenses incurred by the governing body or its authorized representative because of the unsuccessful protest. Any money remaining after the claim has been satisfied must be returned to the person who posted the bond or submitted the security.

35. Documentation:

Due to the time constraints that affect contract performance, all required documents, certificates of insurance and bonds shall be provided to the City within ten (10) calendar days following award or date of request by City, whichever is later. Any failure to comply may result in bid being declared non-responsive and rejected, and at City's option, the bid bond may be attached for damages suffered.

36. Discounts:

(a) Prompt payment discounts will not be considered in evaluating bids for award. However, offered discounts will be taken if payment is made within the discount period, even though not considered in the evaluation of bids.

(b) In connection with any discount offered, time will be computed from date of delivery and acceptance, or invoice receipt, whichever is later. Payment is deemed to be made for the purpose of earning the discount on the date of mailing of the City check.

(c) Any discount offered other than for prompt payment should be included in the net price quoted and not included in separate terms. In the event this is not done, the City reserves the right to accept the discount offered and adjust prices accordingly on the Purchase Order.

37. Seller's Invoice:

Invoices shall be prepared and submitted in duplicate to the address shown on the Purchase Order. Separate invoices are required for each Purchase Order. Invoices shall contain the following information: Purchase Order number, item number, description of supplies or services, sizes, unit of measure, quantity, unit price and extended totals.

38. Inspection and Acceptance:

Inspection and acceptance will be at destination unless specified otherwise, and will be made by the City department shown in the shipping address or other duly authorized representative of the City. Until delivery and acceptance, and after any rejection, risk of loss will be on the bidder unless loss results from negligence of the City.

39. **Lost and Damaged Shipments:**
Risk of loss or damage to items prior to the time of their receipt and acceptance by the City is upon the bidder. The City has no obligation to accept damaged shipments and reserves the right to return at the bidder's expense damaged merchandise even though the damage was not apparent or discovered until after receipt of the items.

40. **Late Shipments:**
Bidder is responsible to notify the City department receiving the items and the Purchasing Manager of any late or delayed shipments. The City reserves the right to cancel all or any part of an order if the shipment is not made as promised.

41. **Document Ownership:**
All technical documents and records originated or prepared pursuant to this contract, including papers, reports, charts, and computer programs, shall be delivered to and become the exclusive property of the City and may be copyrighted by the City. Bidder assigns all copyrights to City by undertaking this agreement.

42. **Advertisements, Product Endorsements:**
City employees and agencies or organizations funded by the City of Sparks are prohibited from making endorsements, either implied or direct, of commercial products or services without written approval of the City Manager. No bidder may represent that the City of Sparks has endorsed their product or service without prior written approval.

43. **Optional Cooperative Purchase Agreement**
It is intended that any other public agency (i.e., city, county, district, public agency, municipality or state agency) shall have the option to participate (A.K.A. "join" or "piggyback") in any award made as a result of this solicitation. The City of Sparks shall incur no financial responsibility in connection with purchase orders or contracts made by the bidder with another public agency resulting from this solicitation. The public agency utilizing the original contract shall accept sole responsibility for placing orders and making applicable payments to the vendor. Should the Bidder not wish for a contract resulting from this bid to be used by other public agencies, they have the option to decline that option at the time of request.

44. **Vendor Workplace Policies**
No Vendor providing a service, program or activity to the public on behalf of the City shall discriminate against any person because of sex, race, color, creed, national origin or disability. Vendor, if providing a service, program or activity to the public on behalf of the City, shall comply with the Americans with Disability Act and City's policies pursuant thereto when providing said service, program or activity.

    The City of Sparks is an Affirmative Action/Equal Opportunity Employer. Bidders shall be cognizant of the requirements for compliance with Executive Order 11246, entitled "Equal Employment Opportunity" as amended by Executive Order 11375 and as supplemented in regulations of the U.S. Department of Labor (41 CFR part 60).

45. **Business License Requirement:**
All companies doing business with, or within, the City of Sparks are required to obtain and maintain a current business license from the City of Sparks prior to the commencement of work per Sparks Municipal Code Section 5.08.020A. Bidder(s) awarded a contract resulting from this bid shall be required to obtain a current business license if they do not already possess one.

46. City Provisions to Prevail:

Except as indicated in the specifications, the City's standard General Conditions shall govern any contract award. Any standard terms and conditions of bidder submitted by bidder shall not be acceptable to City unless expressly agreed to by the City. The City reserves the right to reject bidder's bid as non-responsive, to consider the bid without bidder's standard terms and conditions, or to require bidder to delete reference to such, as a condition of evaluation or award of the bid. If, after award of contract, bidder (contract vendor) provides materials or services accompanied by new or additional standard terms or conditions, they too shall be considered void and City may require deletion as a further condition of performance by vendor.

47. Invalid Provisions:

In the event that any one or more of the provisions of this agreement shall be found to be invalid, illegal or unenforceable, the remaining provisions shall remain in effect and be enforceable.

48. Amendments and Modifications:

The Purchasing Manager may at any time, by written order, and without notice to the sureties, make a modification to the contract or an amendment to the Purchase Order, within the general scope of this contract, in (1) quantity of materials or service, whether more or less; (2) drawings, designs, or specifications, where the supplies to be furnished are to be specially manufactured for the City; (3) method of shipment or packing; and (4) place of delivery. If any such change causes an increase or decrease in the cost or the time required for the performance of this contract, an equitable adjustment shall be made by written modification of the contract or amendment to the Purchase Order. Any claim by the bidder for adjustment under this clause must be asserted within 30 calendar days from the notification date.

49. Assignment:

Vendor shall not assign or delegate duties or responsibilities under this agreement, in whole or in part, without prior written approval of the City.

50. Disputes After Award:

Except as otherwise provided in these provisions, any dispute concerning a question of fact arising under this contract which is not disposed of by agreement shall be decided by the Purchasing Manager, who shall reduce this decision to writing and mail a copy to the bidder. The decision of the Purchasing Manager shall be final and conclusive, unless bidder requests arbitration within ten (10) calendar days. Pending final decision of a dispute, the bidder shall proceed diligently with the performance of the contract and in accordance with the Purchasing Manager's decision.

51. Arbitration after Award:

Any and all disputes, controversies or claims arising under or in connection with the contract resulting from this bid, including without limitation, fraud in the inducement of this Contract, or the general validity or enforceability of this Contract, shall be governed by the laws of the State of Nevada without giving effect to conflicts of law principles, may be submitted to binding arbitration before one arbitrator, and shall be conducted in accordance with the Commercial Arbitration Rules of the American Arbitration Association in a private manner in Washoe County, Nevada. This award shall be final and judgment may be entered upon it in any court having jurisdiction thereof. In reaching this final award, the arbitrator shall have no authority to change or modify any provision of this Contract. All other expenses of arbitration shall be borne equally by the parties. All fees, including legal fees, shall be borne by the party who incurred them. All costs of enforcement shall be borne by the losing party. Each party shall have the right to discovery in accordance with the Nevada Rules of Civil Procedure.

52. Lawful Performance:
Vendor shall abide by all Federal, State and Local Laws, Ordinances, Regulations, and Statutes as may be related to the performance of duties under this agreement. In addition, all applicable permits and licenses required shall be obtained by the vendor, at vendor's sole expense.

53. Annual Appropriation of Funds:
Multi-year term supply and service contracts and leases are subject to annual appropriation of funds by the City Council. The City plans and makes appropriations to the City Budget with respect to a fiscal year that starts July 1st and ends June 30th of each year. Payments made under term contracts and leases are considered items of current expense. Purchase Orders are funded when issued; therefore, they are current expense items and are not subject to any subsequent appropriation of funds.

Continuance of a multi-year contract beyond the limits of funds available shall be contingent upon appropriation of the requisite funds in the ensuing fiscal year and the termination of this contract due to lack of appropriation shall be without penalty.

54. Extension:
When in the City's best interest, this agreement may be extended on a daily, month-to-month, or annual basis by mutual agreement of both parties. Services and/or materials received under an extension shall be in accordance with pricing, terms, and conditions, as described herein.

55. Termination:
The City may terminate this agreement and be relieved of any consideration to the vendor should vendor fail to perform in the manner required. Furthermore, the City may terminate this agreement for any reason without penalty upon giving thirty (30) days written notice to the vendor. In the event of termination, the full extent of City liability shall be limited to an equitable adjustment and payment for materials and/or services authorized by and received to the satisfaction of the City prior to termination.

56. Venue:
This agreement shall be governed by and interpreted according to the laws of the State of Nevada, and venue for any proceeding shall be in Washoe County.

Special Conditions and Specifications
(Specific to Project)

In instances where the Special Conditions conflict with the General Conditions, the Special Conditions will prevail with respect to that instance or item(s).

SPECIAL PROVISIONS
TMWRF MCC6 REPLACEMENT PROJECT
BID #17/18-010 / PWP #WA-2018-016

These Special Provisions supplement and modify the "Standard Specifications for Public Works Construction" Latest Edition, and adopted by the City of Sparks, Nevada. All of the requirements and provisions of said Standard Specifications shall apply except where modified by the plans and these Special Provisions.

SECTION 1: SCOPE OF WORK

This project includes replacement of the existing "MCC6" motor control center for the Truckee Meadows Water Reclamation Facility (TMWRF). The scope shall also include the following:

1. The Demolition Work includes, but is not necessarily limited to, the following:

    a. Disconnect and remove 480-V, 3-Phase, 3-Wire, 600A, NEMA 1, Motor Control Center (MCC) #06.

    b. Disconnect and remove existing capacitors located above the existing MCC.

    c. Disconnect and remove Local Control Panels as shown on the Contract Drawings. This will include the corroded mounting panels and conduit.

    d. Disconnect and remove the components on the top portion of the back panel of ECP-5. Refer to the Contract Drawings for more detail.

2. The New Work includes, but is not necessarily limited to, the following:

    a. Contractor to provide a 480-V, 3-Phase, 3-Wire, 600A, NEMA 1 Motor Control Center in accordance with Section 16480, Motor Control Center (MCC) Specification and as shown on the Contract Drawings.

    b. Contractor to provide new local control panels to replace the existing local control panels at the clarifier equipment as shown on the Contract Drawings and specified herein.

    c. Contractor to provide a 480-240/120V transformer, with a 240/120V, 3-W, 30-circuit panel board in the MCC as shown on the Contract Drawings.

    d. New Foxboro DCS I/O Cards and back panel were installed and temporarily wired inside existing Electrical Control Panel No. 5 (ECP-5) for a previous project. The Contractor shall mount and wire these components in their permanent locations and ensure the installation is up to standards. Modifications include network system additions and miscellaneous equipment to interface the new MCC power metering equipment to the existing plant Distributed Control System (DCS) network. When the project is complete, ECP-5 will become part of PC006. Contractor to coordinate all work with the Owner's IT Department Representative.

    e. An Arc Flash Study will be performed by others and is not a part of this project. Any placement of labels and revision in breaker settings due to the study will also be done by

others. The equipment supplier shall provide the dimensional data required for the arc flash study.

The work of this Contract is located at the Truckee Meadows Water Reclamation Facility, 8500 Clean Water Way, Reno, Nevada 89502.

SECTION 2: SPECIAL PROVISIONS

The requirements set forth in these "Special Provisions" shall be used in addition to those set forth in "Standard Specifications for Public Works Construction".

SECTION 3: STANDARD SPECIFICATIONS

All materials furnished and work performed shall be done in accordance with the most current edition of the "Standard Specifications for Public Works Construction" (Orange Book) and any revisions thereto if not covered or amended by the Special Provisions. The "Standard Specifications for Public Works Construction" are herein referred to as "Standard Specifications".

SECTION 4: STANDARD DETAILS

All materials furnished and work performed shall be done in accordance with the most current edition of the "Standard Details for Public Works Construction" (Orange Book) and any revisions thereto if not covered or amended by the Special Provisions. The "Standard Details for Public Works Construction" are herein referred to as "Standard Details".

SECTION 5: NOTICE TO PROCEED AND TIME SCHEDULE

An official "Notice to Proceed" specifying the date by which construction operations shall be started will be issued in writing and delivered to the CONTRACTOR by the City at the Pre-construction Meeting. Contract time will begin on the date specified in the "Notice to Proceed", unless operations begin at an earlier date, in which case the date that such operations begin will apply. The CONTRACTOR shall immediately begin and diligently prosecute the work to completion. The CONTRACTOR shall obligate himself to complete the work within the stated time limits. All work described in this document shall be completed within One Hundred Twenty (100) working days from the time of issuance of the Notice to Proceed. The Notice to Proceed date will be discussed and determined at the Pre-construction meeting.

A Gantt style Project Schedule shall be developed by the Contractor and submitted to the Engineer for review and approval. The Project Schedule shall be submitted a minimum of one (1) week prior to the Pre-construction Meeting. Project Schedules shall be edited and provided to Engineer following any large modifications to the Project timeframe.

Two-week look ahead schedules shall be updated and provided by Contractor at all Construction Progress Meetings.

SECTION 6: LIQUIDATED DAMAGES

In case all work called for under the contract is not completed before or upon the expiration of the time limits set forth above, it is agreed by the parties to the contract that damage will be sustained by the City and that it will be impracticable to determine accurately the actual damage the City will sustain in the event of any such delay. Therefore, the CONTRACTOR shall pay to the City, FIVE HUNDRED DOLLARS ($500.00) for each and every working day of delay in finishing the work in excess of the number of working

days prescribed and the City shall further have the right to charge to the CONTRACTOR, his heirs, assigns or sureties and to deduct from the final payment for the work, all or any part as it may deem proper of the actual cost of which are directly chargeable to the contract and which accrue during the period of such extensions, except that the cost of the final surveys and preparation of final estimate shall not be included in such charges. The City may deduct this amount from any money due or that may become due the CONTRACTOR under the contract. This payment shall not be considered as a penalty, but as liquidated damages suffered by the City on account of the failure of the CONTRACTOR to complete the work within the time limit of the contract.

SECTION 7: EXCUSABLE DELAYS

The CONTRACTOR shall not be assessed with liquidated damage nor the cost of Project Coordinating inspection during any delay in the completion of the work caused by acts of God, the public enemy, fire, floods, epidemics, quarantine restrictions, strikes, freight embargoes, unusually severe weather, or due to such causes, provided that the CONTRACTOR shall within ten (10) days from the beginning of such delay notify the Project Coordinator in writing of the causes of delay. The Project Coordinator's findings of the facts thereon shall be final and conclusive.

SECTION 8: INTENT OF THE SPECIFICATIONS

The intent of the plans and specifications is to prescribe a complete outline of work, which the CONTRACTOR undertakes to do in full compliance with the contract.

The CONTRACTOR shall furnish all required materials, equipment, tools, labor and incidentals, unless otherwise provided in the contract and shall include the cost of these items in the contract unit prices for the several units of work. All items of work called for on the plans or in the specifications and not included as a separate item in the proposal shall be considered as incidental to the other items listed in the proposal and the payment for such incidental items shall be considered as included in the contract unit prices bid.

SECTION 9: AUTHORITY OF THE PROJECT COORDINATOR AND INSPECTOR

All work shall be done under the supervision of the Project Coordinator acting on behalf of the City. The Project Coordinator shall decide all questions that arise as to the quality and acceptability of materials furnished, work performed, manner of performance, rates of progress, interpretation of the plans and specifications, acceptable fulfillment of the contract and compensation under the specifications. He shall determine the amount of work performed and materials furnished and his decision and estimate shall be final. The Project Coordinators estimate shall be "condition precedent" to the right of the CONTRACTOR to receive money due him under the contract. The Project Coordinator does not have authority to authorize changes in plans and specifications without prior written approval of the Engineer.

The CONTRACTOR is responsible to provide, coordinate and schedule all inspections. Inspections related to satisfaction of the City of Sparks Building Permit shall be performed by the City. The Owner will provide Construction Observation and Management.

SECTION 10: CHANGE ORDERS

The City of Sparks reserves the right to make alterations or supplements to the Contract. Change Order Forms are required for all changes in decreases and/or increases of quantities and/or dollar amount changes in accordance with the Standard Specifications and required by the City of Sparks.

SECTION 11: COOPERATION WITH OTHER CONTRACTORS

The CONTRACTOR shall cooperate with other CONTRACTOR's who may be employed by the City on construction of other work adjacent to or in the proximity of the location of the project.

SECTION 12: DISPOSAL OF EXCESS AND WASTE MATERIALS

Trash, construction debris, cleared vegetation, excavated material unsuitable to be incorporated in the construction shall become the property of the CONTRACTOR and shall be removed by the CONTRACTOR and shall be legally disposed of offsite in accordance with all federal, state and local regulations.

SECTION 13: LIMITS OF CONTRACTOR'S OPERATIONS

If the CONTRACTOR's operations result in damage to any publicly or privately-owned facilities outside the limitations of the construction easement, the CONTRACTOR shall, at his expense, repair such damage or indemnify the owner of the damaged property.

If the CONTRACTOR negotiates with property owners for the use of land for construction operations outside the limits of the construction easements, he shall do so at his own risk and the City will assume no liability for such use of private property. All agreements between the CONTRACTOR and private property owners shall be in writing and the City will be furnished copies of such agreements.

At no time will the CONTRACTOR be allowed to store debris or materials on the street overnight. All asphalt, concrete, soil and aggregate base will be hauled off at the conclusion of each working day. Materials for installation of Drop Inlets (Pipe, boxes frame and cover) will be allowed to be stored onsite with the approval of the Project Coordinator or inspector.

SECTION 14: PROTECTION OF EXISTING UTILITIES

Utility locations are provided for reference in determining the required scope of the work. The location and completeness of existing utilities shown on the plans are not guaranteed, but indicates generally their location according to the best knowledge of the Project Coordinator. Existing utilities are not always shown on design drawings for clarity in areas where existing utilities are congested. The CONTRACTOR shall make all investigations as necessary to satisfy himself as to the field conditions prior to bidding and construction.

The CONTRACTOR shall notify Underground Services Alert (USA Dig) at 1-800-227-2600, and NV Energy, Truckee Meadows Water Reclamation Facility (TMWRF), The City of Sparks, Truckee Meadows Water Authority (TMWA), SBC, Charter Communications and other cable companies not less than five (5) working days prior to the start of construction to verify the location and depths of utilities.

The CONTRACTOR shall inform himself of the exact location of all vaults, boxes, conduits, ducts, cables, pipe systems, etc. and shall protect said utilities. Any damage caused by operation of the CONTRACTOR shall be repaired by the CONTRACTOR at his own expense. It shall be the CONTRACTOR's responsibility to contact the impacted utility for any replacement hardware.

SECTION 15: CONTRACT AMOUNT

The total amount payable under this contract shall be determined by the sum of the amounts earned and the various quantities of repairs actually made and determined from unit prices as furnished by the CONTRACTOR in the schedule of prices contained in his proposal. The various quantities of repairs in

the bid proposal are estimates and the City of Sparks reserves the right to vary quantities as may be necessary.

SECTION 16: PRECONSTRUCTION CONFERENCE

After the execution of the contract, but prior to the commencement of any work, a preconstruction conference between the CONTRACTOR, TMWRF, and the Engineer will be held at a mutually acceptable time and place.

SECTION 17: MEASUREMENT AND APPLICATION FOR PAYMENT

Whenever possible, the actual quantities installed or work performed on any project shall be measured on the site of the work by a crew composed of both the CONTRACTOR and the Project Coordinator. This combined crew shall record all measured quantities in field notebooks, in legible and understandable entries. The CONTRACTOR and the Project Coordinator shall each have a set of field notes which are to be in agreement on all quantities and items measured and shall include all work accomplished on the project under contract. Each set of field measurements shall be initialed and dated by responsible representatives of the CONTRACTOR and the Project Coordinator participating on the combined crew. In the event that it is not possible to form a combined crew for the measurements, the area repaired shall be measured by the Project Coordinator.

Lump Sum items will not be paid until they are finally complete unless a schedule of values is provided for sub components that can be verified by the owner; then the value of the complete components will be paid minus retention.

Application for payment shall be in satisfactory spreadsheet type form and submitted to Engineer for review and approval. EJCDC Application for Payment Form (C-620) or approved alternate shall be used. Engineer will provide form C-620 in excel format to Contractor upon request Retainage will be held and released per NRS requirements.

Submitted application for payment form shall be signed, correct, include application number and date, and include appropriate substantiating data to support amounts included in application for payment. Lump sum items shall be prorated as realistically as possible to reflect the work completed for those items.

SECTION 18: SURFACE MOUNTED UTILITY ADJUSTMENT

It shall be the CONTRACTOR‘s responsibility to adjust all surface mounted utility appurtenances, such as manholes, survey monument covers and valve boxes to grade consistent with the grade of the restored street surface.

SECTION 19: PRE/POST-CONSTRUCTION WALK-THRU

The CONTRACTOR, Inspector, and/or Project Coordinator shall conduct a pre and post construction walk-thru. This shall be accomplished to determine limits of construction and existing conditions at each site and the surrounding area. The CONTRACTOR should walk the site and note all existing conditions. Concrete pavers, mow strips, fencing, edging, sprinklers block and brick walls, etc. are within this area. Any damage and finish back to these landscapes will be included within the scope of work and no additional pay item will be allowed for this work.

The CONTRACTOR will be required to video tape the entire project prior to any construction including all effected properties and staging locations. This video media will be in a DVD format and a copy of the

tape will be provided to the City. Areas near the property lines, back of sidewalk and driveways, landscaping, mow strips, fences and edging should be filmed in great detail to avoid any damage or disputes with property owners. The CONTRACTOR will be required to replace and or repair all areas that damaged by construction activities. Areas that are in question or concern should be noted on the video and the CONTRACTOR should notify the project coordinator or inspector.

SECTION 20: WORKING DAY, WORK HOURS, SATURDAY, SUNDAY, HOLIDAY AND OVERTIME WORK

The CONTRACTOR shall not perform any contract work on Sunday, legal Holidays and outside of the twelve (12) hours available during a regular working day except as directed and/or approved by the City Project Coordinator and as specified herein. The CONTRACTOR shall not commence Construction operations before seven o'clock (7:00 A.M. Pacific Time) each working day except as directed by the City Project Coordinator and as specified herein.

If the CONTRACTOR plans to perform work outside of the twelve (12) hours available during a regular working day, the CONTRACTOR shall first obtain approval from the City Project Coordinator at least twenty-four (24) hours prior to commencing such overtime work. If the CONTRACTOR plans to perform work on Sunday, he/she shall obtain approval by the Thursday prior to work on the Sunday for which work is planned. If the CONTRACTOR plans to perform work on a legal Holiday, he/she shall first obtain approval from the City Project Coordinator at least 48 hours in advance.

The CONTRACTOR shall be charged for all of City of Sparks' employee(s) time spent for overtime, Saturday, Sunday or Holiday work, based on the employee's hourly rate, plus benefits. The CONTRACTOR will be notified of the costs incurred and if the payment is not made, such costs will be deducted from any payment due to the CONTRACTOR.

The CONTRACTOR's normal working hours shall be from 7:00 A.M. until 7:00 P.M., Monday through Friday unless otherwise required by these specifications or approved in writing by the City Project Coordinator when requested in writing by the CONTRACTOR, excluding but not limited to, the following legal Holidays, recognized by the City of Sparks:

January 1	New Year's Day
3rd Monday in January	Martin Luther King, Jr. Birthday
3rd Monday in February	President's Day
Last Monday in May	Memorial Day
July 4	Independence Day
1st Monday in September	Labor Day
Last Friday in October	Nevada Day
November 11	Veteran's Day
4th Thursday in November	Thanksgiving Day
4th Friday in November	Family Day (day after Thanksgiving)

December 25 Christmas Day

SECTION 21: SUBMITTALS

Submittals for the following items shall be provided and shall have been compiled within the previous 12 months. One (1) electronic copy of each item should be submitted unless otherwise noted.

- Worker Certifications (if necessary)
- Bonds and Insurance
- Project Schedule and Three-Week Outlook Schedules. Project schedule shall be submitted a minimum of one (1) week prior to Pre-construction Meeting.
- Letter from Contractor to identify Contractor 24-hour emergency contact person and Contractor's authorized representative
- Outage Plans
- Electrical Gear submittal with shop drawings
- Information needed for Arc Flash by others
- Concrete Patch Mix Design
- Asset Attribute List
- Controls Equipment
- Conductors
- Raceway's and Boxes
- Grounding and bonding
- Disconnects
- Low voltage Transformers
- Data and Fiber cabling
- Data Cabinet
- Manufacturer's certification
- Start Up report
- User Manuals/Operations and Maintenance Manuals
- Test Results and Reports

- Record Drawings

Submittals for the items listed above shall be submitted to the Engineer and approved for use prior to implementation into the Project. Engineer shall have fourteen (14) days to review and comment on information submitted. Submittal transmittal will be provided by the Engineer in electronic format for Contractor use.

SECTION 22: FORCE ACCOUNT

THIS ITEM SHALL BE IDENTIFIED AS A CONTINGENT ITEM. The use of this contingent item will be as directed by the Project Coordinator. The quantity of the above contingent item of work, as set forth on the bid schedule represent no actual estimate, is nominal only and may be greatly increased or decreased or reduced to zero. The increase or reduction of this quantity as compared with that set forth on the bid schedule shall not constitute a basis for claim by the CONTRACTOR for extra payment or damages.

Force Account items as defined by the City of Sparks will be additions to the contract arising within the course and scope of the contract for incidental costs due to unforeseen circumstances. Unforeseen circumstances include but are not limited to the following:

Emergency repairs, complications arising with interfacing new improvements to existing improvements, emergency pumping, emergency light/power plants, premium time or overtime to accelerate portions of work, unexpected utility modifications or conflicts, correcting existing substandard work, requested traffic control measures or signage, over-excavation of unsuitable materials, unknown field conditions, underground storage tanks, asbestos encountered, or any other miscellaneous or incidental items related to unforeseen circumstances.

Any force account items shall be adjusted daily upon report sheets, furnished to the Project Coordinator by the CONTRACTOR and signed by both parties. These daily reports shall thereafter be considered the true record of force account items for unforeseen circumstances. No additional incidental work shall be performed or made except upon a written order from the Project Coordinator.

SECTION 23: INSURANCE AND INDEMNIFICATION

The CONTRACTOR shall not commence any work nor permit a Subcontractor to commence work on this project until satisfactory proof has been presented to the City of Sparks Purchasing Division that all insurance requirements as outlined by the City have been met.

The CONTRACTOR shall provide and maintain, during the effective life of the awarded contract, Comprehensive General Liability Insurance covering the CONTRACTOR and the City of Sparks.

SECTION 24: SEQUENCE OF CONSTRUCTION

The design should be constructed in a manner to minimize the effects to the plant operations and minimize service outage. Outages shall be brief and only as approved by the owner. Temporary power and control outages can last a maximum of four (4) hours but outages for some specific equipment may have shorter allowable timeframes. Not all work days or work shifts may be suitable for power and control shutdowns.

Contractor to develop a power and control Shutdown Schedule and submit schedule to the Engineer for review and approval. Contractor to consider plant operations during specific days and shifts when developing a Shutdown Schedule. Close coordination with Owner will be required during development of a Shutdown Schedule and during implementation of shutdowns to avoid delays during work.

Temporary service for each piece of equipment shall be provided. The Contractor shall submit a detailed outage plan and time schedule for approval by plant operations before removing any equipment, conduits, circuits or structures from service.

SECTION 25: MEETINGS

Contractor is required to attend the following anticipated meetings:

- Pre-bid Meeting
- Pre-Construction Meeting
- Construction Progress Meetings
- Substantial completion walkthrough
- Final completion walkthrough

Meetings will typically be held at the TMWRF Training Facility. Walkthroughs will occur at the Project site unless determined otherwise. The list of meetings above is not necessarily all inclusive. Other meetings may be necessary as determined by Owner or warranted by the work.

SECTION 26: TESTING, TRAINING, START UP, DEMONSTRATION, COMMISSIONING

Testing will be detailed in the electrical specifications and drawings and will be performed by a certified third party approved by the OWNER and paid for by the CONTRACTOR. Twenty-four (24) hour notice must be given by the CONTRACTOR to the Project Coordinator or Inspector prior to any testing so that all testing work will be done in the presence of the OWNER or OWNER'S Representative. See individual Technical Specification Division 16 for additional requirements.

SECTION 27: CLOSEOUT PROCEDURES

Contractor shall complete all the work within the time designated in the Agreement unless modified by Change Order or the Certificate of Substantial Completion. Contractor shall complete Work and send subsequent written notice(s) to Owner and Engineer certifying that Work or designated portion of the Work is Substantially Complete. Contractor shall submit all warranty certificates at the time of application for Substantial Completion. The guarantee and warranty periods begin with the date of Final Acceptance. However, in connection with any specific equipment certified by the Owner as completed and its use or operation thereof for its intended purpose is assumed by the Owner, the warranty period for such equipment shall begin with the beginning date of such use or operation.

In preparation for Substantial Completion or occupancy, Contractor to conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from sight-exposed interior and exterior finished surfaces; polish surfaces so designated to shine finish. Repair, patch, and touch up marred surfaces to specified finish, to match adjacent surfaces. Broom clean paved surfaces; rake clean other surfaces of grounds.

Contractor to compile Operations and Maintenance manual for the Project. See requirements in individual Technical Specifications sections.

The Contractor shall maintain and provide Record Drawings prior to Project closeout. Record Drawings shall be full size drawings which capture and notate all differences between the work constructed and the design shown in the Drawings. Notes and sketches shall be complete, legible, precise, correct, and detailed.

The Contractor, prior to requesting final payment, shall complete, obtain, and submit the following items to the Engineer, as applicable:

- Substantial Completion Walkthrough
- Final Completion Walkthrough
- Written guarantees, where required.
- O&M Manual, Technical Manuals and instructions.
- Maintenance stock items; spare parts; special tools.
- Completed and approved record documents.
- Certificates of inspection and certificates of acceptance by local governing agencies.
- Releases from all parties who are entitled to claims against the subject project, property, or improvement pursuant to the provisions of law.
- Release form from all property owners for which the Contractor has made agreements.
- Submit final pay request to Owner in accordance with the Contract.

SECTION 28: PERMITS

The Contractor shall apply for and obtain a City of Sparks Building Permit for the work utilizing the project drawings. The permit fee shall be based on the contractor's bid amount and shall be included in the Mobilization bid item. The Contractor shall comply with all permit requirements including but not limited to coordinating inspections from the building department and filing completion paperwork.

The contractor shall be responsible for and compliant with all other applicable Federal, State, and local standards.

BID ITEM CLARIFICATIONS
TMWRF MCC 6 REPLACEMENT
BID # 17/18-010 /PWP# WA-2018-016

BID ITEM 1 ~ MOBILIZATION (LUMP SUM)

A. No specific unit of measurement shall apply to the lump sum item "Mobilization".

B. The bid price for "Mobilization" shall constitute full payment for "Mobilization", complete as specified. The bid price shall constitute full pay for all labor, materials, tools, equipment and incidentals necessary to comply with these Specifications including, but not limited to, coordinating, obtaining and maintaining all bonds, permits, and licenses; moving equipment and materials onto and off the site; furnishing and erecting construction trailers, temporary utilities, and other construction facilities; and all preparatory work as required for the proper performance and completion of the project (including work items not identified in a separate bid item), all in accordance with the Contract Documents. This item also includes de-mobilization.

BID ITEM 2 ~ DEMOLITION OF EXISTING MCC 6/ECP-5 (LUMP SUM)

A. No specific unit of measurement shall apply to the lump sum item "Demolition of Existing MCC 6".

B. The bid price for "Demolition of Existing MCC 6" shall constitute full payment for "Demolition of Existing MCC 6", complete as specified. The bid price shall constitute full pay for all labor, materials, tools, equipment and incidentals necessary to comply with these Specifications including, but not limited to, the removal of the existing MCC 6 and appurtenant conduits, controls, and equipment in total as may be required by Project permits, all in accordance with the Contract Documents.

BID ITEM 3 ~ PROCURE TWO (2) VFDS (LUMP SUM)

A. The specific unit of "each" (EA) shall apply to the lump sum item "Procure Two (2) VFDs".

B. The bid price for "Procure Two (2) VFDs" shall constitute full payment for "Procure Two (2) VFDs", complete as specified. The bid price shall constitute full pay for all materials, tools, equipment and incidentals necessary to comply with these Specifications including, but not limited to, the purchase and receiving of this equipment, all in accordance with the Contract Documents. This item includes startup and testing services.

BID ITEM 4 ~ PROCURE ACTIVE HARMONIC FILTER (LUMP SUM)

A. The specific unit of "each" (EA) shall apply to the lump sum item "Procure Active Harmonic Filter".

B. The bid price for "Procure Active Harmonic Filter" shall constitute full payment for "Procure Active Harmonic Filter", complete as specified. The bid price shall constitute full pay for all materials, tools, equipment and incidentals necessary to comply with these Specifications including, but not limited to, the purchase and receiving of this equipment, all in accordance with the Contract Documents. This item includes startup and testing services.

BID ITEM 5 ~ PROCURE NEW MCC 6 / INSTALL NEW MCC6 & CONTROLS (LUMP SUM)

A. The specific unit of “each” (EA) shall apply to the lump sum item “Procure and Install New MCC 6”.

B. The bid price for “Procure and Install New MCC 6” shall constitute full payment for “Procure and Install New MCC 6” complete as specified. The bid price shall constitute full pay for all labor, materials, tools, equipment and incidentals necessary to comply with these Specifications including, but not limited to, procuring the new MCC, receiving and assembling it, preparing the site, ensuring the integrity and dimensional requirements of the concrete housekeeping pad, power, and control connections for electrical and control equipment; and site cleanup; all in accordance with the Contract Documents. This item also includes temporary service to equipment powered by the existing MCC 6, startup and testing services.

BID ITEM 6 ~FORCE ACCOUNT (LUMP SUM)

A. No specific unit of measurement shall apply to the lump sum item “Force Account”.

B. A force account has been established for this project and shall be included in each bid. The Force Account will be utilized only for extra work not included in the contract documents which is authorized by the Engineer after the bid opening under the direction of the Owner. This item is a contingent item which means this item may be increased by the Owner or reduced to zero without modification to other bid items and without compensatory compensation to the Contractor.

City of Sparks, Nevada

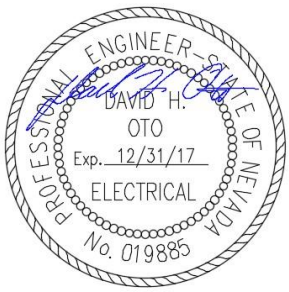
TMWRF MCC 6 Replacement Project

TECHNICAL SPECIFICATIONS

Project Bid No. 17/18-010

PWP No. WA-2018-016

OCTOBER 2017



Signed: 10/12/2017

TECHNICAL SPECIFICATIONS

TMWRF MCC6 REPLACEMENT

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SECTION 01672

ASSET IDENTIFICATION AND LABELING

PART 1 – GENERAL

1.01 SUMMARY

A. Extent of asset identification, labeling, and tagging work is indicated by project drawings.

B. Work described in this Section includes furnishing all labor, materials, equipment, tools and incidentals required for identification of materials, assets, and installations. All equipment shall be installed, adjusted, tested and placed in operation in accordance with these Specifications, the manufacturer's recommendations, and as shown on the Drawings.

1.02 QUALITY ASSURANCE

A. Manufacturers: Firms shall have sufficient experience in the manufacture of asset identification products of types required, for quality and successful manufacture of asset identification products for this Project.

1.03 SUBMITTALS

A. Submittals shall be submitted to the Engineer for review and acceptance prior to construction in accordance with Special Provisions Section 21- Submittals.

B. Asset Attribute List and List of Proposed Electrical and Control Nameplate descriptions.

C. Product Data: Submit manufacturer's data on asset identification materials and products.

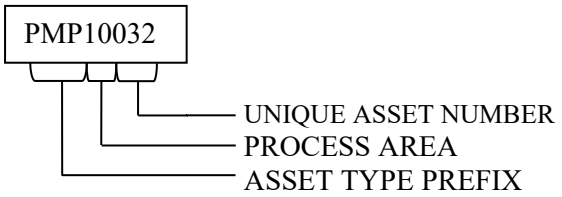
D. Samples: Submit samples of each color, lettering style and other graphic representation required for each identification material or system.

1.04 ASSET NAMING CONVENTION AND ATTRIBUTE LIST

A. Asset identification numbers appearing on asset tags and labels or in O&M manuals shall conform to the TMWRF asset naming convention as shown in the Project Drawings.

1. Asset identification tag numbers shall be a three-digit letter prefix followed by a five-digit number with no spaces. The three-digit letter prefix denotes the asset type. The first two digits in the five-digit tag number denote the process area where the asset is located. The following three digits form a unique number for the asset within the process area.

2. An example of acceptable tag format is shown below. A bubble format is also acceptable and shown below.



Asset ID
Bubble format

3. At the completion of the construction phase of the project, a completed Asset Attribute List shall be submitted by the Contractor. The Asset Attribute List shall include an entry for each asset identified within the Project construction documents.

    a. Contractor to obtain approved Asset Attribute List template in excel format from TMWRF. It is important that the format of the spreadsheet remain preserved and capable of direct upload to the Facility asset management database.

1.05 ASSET FIELD TAG AND NAMEPLATE REQUIREMENTS

A. Contractor to furnish and install Asset ID tags conforming to the requirements of this section for each asset, electrical component, control device, or indicating device identified in the contract documents.

B. Coordinate information to be displayed on field tags with TMWRF prior to purchase of tags.

C. At a minimum, an asset field tag shall include the Asset ID. Other information including lettering and wording as coordinated with OWNER, recommended by manufacturer, or as required for proper identification and operation/maintenance of instruments and equipment may be included on field tags.

D. Each device nameplate shall include up to three lines with the first line containing the device tag number as shown on the drawings, the second line containing a functional description (e.g., Recirculation Pump No. 1), and the third line containing a functional control description (e.g., Start) if applicable. If a tag or nameplate references another asset, the Asset ID for the referenced asset shall be included in the description denoted in parentheses.

E. Install asset tags at locations indicated or at a location for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not or cannot penetrate substrate.

F. Asset tags shall be either engraved plastic laminate signs or round brass tags.

PART 2 – PRODUCTS

2.01 ENGRAVED PLASTIC LAMINATE SIGNS

A. Provide engraving stock melamine plastic laminate lamicoid-type engraved nameplates, complying with FS L P 387, in sizes and thickness indicated, engraved with engraver's standard letter styles of sizes and wording indicated, black face and white core plies (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.

B. Except as otherwise indicated, provide single line of text, 1/2-inch high lettering on 1-1/2-inch high sign (2-inches high where 2 lines are required), white lettering in black field. Provide text matching terminology and numbering of the Contract documents and Shop Drawings as coordinated with TMWRF. Edges of the nameplates shall be beveled and smooth. Nameplates with chipped or rough edges will not be acceptable.

C. Thickness: 1/8-inch except as otherwise indicated.

D. Fasteners: Self-tapping screws of brass, cadmium-plated steel, or stainless steel, except contact type permanent adhesive where screws cannot or should not penetrate substrate. Stainless steel bands shall be used to attach tags to equipment if no place for proper attachment is feasible (e.g. valves).

E. Adhesive: Nameplates shall be bonded using an epoxy or similar permanent waterproof adhesive. 3M VHB two-sided foam adhesive tape is an acceptable alternative to epoxy adhesive.

2.02 ROUND BRASS SUSPENDED TAGS

A. Round brass tags shall be minimum 19-gauge brass, 1-1/2" diameter, and include a 3/16" diameter top hole for fastener.

B. Lettering shall be stamped, minimum 1/4" in height, and black in color.

C. Tags shall accurately display the Asset ID in the format described in the TMWRF Design Guideline Manual and as coordinated with TMWRF.

D. Fastener cable shall be stainless steel braided cable.

2.03 LETTERING, GRAPHICS, AND PAINTING

A. Coordinate names, abbreviations, and other designations used in asset identification work with corresponding designations shown, specified, or scheduled.

B. Provide numbers, lettering, and wording as indicated or, if not otherwise indicated as recommended by manufacturer or as required for proper identification and operation/maintenance of instruments and equipment.

C. Contractor shall color code pipes according to the designated use of each pipe done in accordance with the TMWRF Piping Color Scheme. Contractor to obtain TMWRF Piping Color Scheme from Engineer or TMWRF.

1. Select paint system applicable for surface material and location (exterior or interior).

2. Labeling of each pipe shall be done using color coded self-adhesive vinyl tape not less than 3-mil thick by 1-1/2-inches wide. Minimum sizes for lettering and numbering shall comply with ANSI A13.1.

2.04 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.

2. 1/4-inch grommets in corners for mounting.

3. Nominal size, 7 by 10 inches.

D. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."

E. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 – EXECUTION

3.01 APPLICATION AND INSTALLATION

A. Install asset identification products as indicated, in accordance with manufacturer's written instructions.

B. Substrate for adhesive plastic laminate tags shall be prepared in accordance with the manufacturer's recommendations prior to application of tags.

C. Brass tags shall be affixed to assets with stainless steel braided cable secured with a crimp style fastener.

D. Coordination: Where identification is to be applied to surfaces which require finish, install identification after completion of painting.

E. Regulations: Comply with governing regulations and requests of governing authorities for identification of assets.

F. Asset/Systems Identification: Install engraved plastic laminate signs on each major unit of equipment in building.

1. Except as otherwise indicated, provide single line of text, 1/2-inch high lettering on 1-1/2-inch high sign (2-inches high where 2 lines are required), white lettering in black field. Provide text matching terminology and numbering of the Contract documents and Shop Drawings.

G. Install signs at locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not or cannot penetrate substrate.

H. Equipment and devices shall be identified by asset name and tag numbers, where indicated on the Drawings, and shall be utilized on all nameplates.

END OF SECTION

SECTION 02220
SITE DEMOLITION

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and demolish, modify, remove and dispose of work shown on the Drawings and as specified herein.

B. Included, but not limited to, are demolition, modifications and removal of existing materials, equipment or work necessary to install the new work as shown on the Drawings and as specified herein and to connect with existing work in approved manner.

C. Demolition, modifications and removals which may be specified under other Sections shall conform to requirements of this Section.

D. Demolition and modifications include:

1. MCC 6

2. Electrical Control Panel No. 5 (Top of internal back panel, relay and wiring only)

3. Demolition of Local Control Stations

4. Conduits and Conductors

1.02 RELATED WORK

A. Electrical work is included in Section 16020.

B. Instrumentation and Controls is included in Section 13300.

C. Control Panel Enclosures is included in Section 13330.

1.03 SUBMITTALS

A. Submittals shall be submitted to the Engineer for review and acceptance prior to construction in accordance with Special Provisions Section 21- Submittals.

B. Proposed methods and operations of demolition of the equipment, structures, and modifications prior to the start of work. Include in the schedule the coordination of shutoff, capping and continuation of service as required.

C. Furnish a detailed sequence of demolition and removal work to ensure the uninterrupted progress of the Owner's operations.

D. Before commencing demolition work, all modifications necessary to bypass the affected equipment shall be completed. Actual work shall not begin until the Engineer has inspected and approved the modifications and authorized commencement of the demolition work in writing.

1.04 JOB CONDITIONS

A. Protection:

1. Execute the demolition and removal work to prevent damage or injury to equipment, occupants thereof and adjacent features which might result from falling debris or other causes, and so as not to interfere with the use, and free and safe passage to and from adjacent structures.

2. Closing or obstructing of roadways, sidewalks and passageways adjacent to the work by the placement or storage of materials will not be permitted and all operations shall be conducted with minimum interference to traffic on these ways.

3. Erect and maintain barriers, lights, sidewalk sheds and other required protective devices.

B. Scheduling:

1. Carry out operations so as to avoid interference with operations and work in the existing facilities.

C. Notification:

1. At least 48 hours prior to commencement of a demolition or removal, notify the Engineer in writing of proposed schedule therefor. Owner shall inspect the existing equipment and to identify and mark those items which are to remain the property of the Owner. No removals shall be started without the permission of the Engineer.

D. Conditions of Structures:

1. The Owner and the Engineer assume no responsibility for the actual condition of the structures to be demolished or modified.

2. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner insofar as practicable. However, variations or activities may occur prior to the start of demolition work.

E. Repairs to Damage:

1. Promptly repair damage caused to adjacent facilities by demolition operation when directed by Engineer and at no additional cost to the Owner. Repairs shall be made to a condition at least equal to that which existed prior to construction.

F. Traffic Access:

1. Conduct demolition and modification operations and the removal of equipment and debris to ensure minimum interference with roads, streets, walks both onsite and offsite and to ensure minimum interference with occupied or used facilities.

2. Special attention is directed towards maintaining safe and convenient access to the existing facilities by plant personnel and plant associated vehicles.

3. Do not close or obstruct streets, walks or other occupied or used facilities without permission from the Engineer. Furnish alternate routes around closed or obstructed traffic in access ways.

1.05 RULES AND REGULATIONS

A. The 2012 International Building Code for Northern Nevada shall control the demolition, modification or alteration of the existing buildings or structures.

B. No building or structure, or any part thereof, shall be demolished until an application has been filed with the Building Inspector and a permit issued. The fee for this permit shall be the Contractor's responsibility.

1.06 DISPOSAL OF MATERIAL

A. Salvageable material and equipment listed hereinafter shall become the property of the Owner. Dismantle all such items to a size that can be readily handled and deliver them to a designated storage area.

B. The following materials and items of equipment shall remain the property of the Owner and stored where directed on the site. Any such material damaged due to improper handling will not be accepted and the replacement value of the material deducted from the payment to the Contractor.

1. All copper materials as part of any removed equipment including bus-work and cables shall be returned to the TMWRF Warehouse.

2. Before proceeding with disposal, the Owner shall have first right of salvage for all electrical equipment demolished as indicated by the Contract documents. The Contractor is responsible with coordinating with the Owner before removing equipment from the plant site.

C. All other material and items of equipment shall become the Contractor's property and must be removed from the site.

D. The storage or sale of removed items on the site will not be allowed.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 GENERAL

A. All materials and equipment removed from existing work shall become the property of the Contractor, except for those which the Owner has identified and marked for his/her use. All materials and equipment marked by the Owner to remain shall be carefully removed, so as not to be damaged, cleaned and stored on or adjacent to the site in a protected place specified by the Engineer or loaded onto trucks provided by the Owner.

B. Dispose of all demolition materials, equipment, debris and all other items not marked by the Owner to remain, off the site and in conformance with all existing applicable laws and regulations.

C. Pollution Controls:

1. Use water sprinkling, temporary enclosures and other suitable methods to limit the amount of dust and dirt rising and scattering in the air to the lowest practical level. Comply with governing regulations pertaining to environmental protection.

    a. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, electrocution hazard and pollution.

    b. Clean adjacent structures, facilities, and improvements of dust, dirt and debris caused by demolition operations. Return adjacent areas to conditions existing prior to the start of the work.

D. Building Demolition:

1. Unless otherwise approved by Engineer, proceed with demolition from the top of the structure to the ground. Complete demolition work above each floor or tier before disturbing supporting members of lower levels.

2. Demolish concrete and masonry in small sections.

3. Remove structural framing members and lower to ground by means of hoists, derricks, or other suitable methods.

4. Break up and remove foundations and slabs-on-grade, unless otherwise shown to remain.

5. Locate demolition equipment throughout the structure and remove material so as to not impose excessive loads to supporting walls, floors or framing.

3.02 STRUCTURAL REMOVALS

A. Remove structures to the lines and grades shown unless otherwise directed by the Engineer. Where no limits are shown, the limits shall be 4-in outside the item to be installed. The removal of masonry beyond these limits shall be at the Contractor's expense and these excess removals shall

be reconstructed to the satisfaction of the Engineer with no additional compensation to the Contractor.

B. All concrete, brick, tile, concrete block, roofing materials, reinforcement, structural or miscellaneous metals, plaster, wire mesh and other items contained in or upon the structure shall be removed and taken from the site, unless otherwise approved by the Engineer. Demolished items shall not be used in backfill adjacent to structures or in pipeline trenches.

C. After removal of parts or all of masonry walls, slabs and like work which tie into new work or existing work, the point of junction shall be neatly repaired so as to leave only finished edges and surface exposed.

3.03 MECHANICAL REMOVALS

A. Mechanical removals shall consist of dismantling and removing of existing piping, equipment and other appurtenances as specified, shown, or required for the completion of the work. It shall include cutting, capping, and plugging as required.

B. Existing process, water, chemical, gas, fuel oil and other piping not required for the new work shall be removed where shown or where it will interfere with new work. Piping not indicated to be removed or which does not interfere with new work shall be removed to the nearest solid support, capped and left in place. Chemical and fuel lines and tanks shall be purged and made safe prior to removal or capping. Where piping that is to be removed passes through existing walls, it shall be cut off and properly capped on each side of the wall.

3.04 ELECTRICAL REMOVALS

A. Electrical removals shall consist of the removal of existing motor control center, conduits and wires, panelboards, and miscellaneous electrical equipment all as shown on the Contract Drawings, specified herein, or required to perform the work.

B. All existing electrical equipment and fixtures to be removed shall be removed with such care as may be required to prevent unnecessary damage, to keep existing systems in operation and to maintain the integrity of the grounding systems.

C. Conduits and wires shall be abandoned or removed where shown. All wires in abandoned conduits shall be removed, salvaged and stored. Abandoned conduits concealed in floor or ceiling slabs or in walls, shall be cut flush with the slab or wall at the point of entrance. The conduits shall be suitable plugged and the area repaired in a flush, smooth and approved manner. Exposed conduits and their supports shall be disassembled and removed from the site. Repair all areas of work to prevent rust spots on exposed surfaces.

D. Where shown or otherwise required, wiring in the underground duct system shall be removed. All such wiring shall be salvaged and stored as specified. Verify the function of all wiring before disconnection and removing it. Ducts which are not to be reused shall be plugged where they enter buildings and made watertight.

E. Where shown, direct-burial cable shall be abandoned. Such cable shall be disconnected at both ends of the run. Where it enters a building or structure the cable shall be cut back to the point of

F. entrance. All opening in buildings for entrance of abandoned direct-burial cable shall be patched and made watertight.

G. Lighting fixtures shall be removed or relocated as shown. Fixtures not relocated shall be removed from the site. Relocated fixtures shall be carefully removed from their present location and rehung where shown.

H. Wall switches, receptacles, starters and other miscellaneous electrical equipment, shall be removed and disposed of off the site as required. Care shall be taken in removing all equipment so as to minimize damage to architectural and structural members. Any damage incurred shall be repaired.

3.05 CLEAN-UP

A. Remove from the site all debris resulting from the demolition operations as it accumulates. Upon completion of the work, all materials, equipment, waste and debris of every sort shall be removed and premises shall be left, clean, neat and orderly.

END OF SECTION

SECTION 03600
GROUT

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install grout complete as shown on the Drawings and as specified herein.

1.02 RELATED WORK

A. Demolition and removals are included in Division 2.

B. Modifications to existing concrete are included in Division 3.

1.03 SUBMITTALS

A. Submittals shall be submitted to the Engineer for review and acceptance prior to construction in accordance with Special Provisions Section 21- Submittals.

B. Shop drawings and product data showing materials of construction and details of surface preparation, mixing and installation for:

1. Commercially manufactured non-shrink cementitious grout [and self-leveling cementitious underlayment grout]. Include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to the specified ASTM standards, and Material Safety Data Sheet.

C. Qualifications

1. Submit documentation that grout manufacturers have a minimum of 10 years' experience in the production and use of the grouts proposed.

1.04 REFERENCE STANDARDS

A. ASTM International

1. ASTM C33 - Standard Specification for Concrete Aggregates

2. ASTM C150 - Standard Specification for Portland Cement

3. ASTM C531 - Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts and Monolithic Surfacings and Polymer Concretes

4. ASTM C827 - Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures

5. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation

6. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)

7. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.

8. ASTM E329 - Standard specification for agencies engaged in the testing and/or inspection of materials used in construction

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

A. Qualifications

1. Grout manufacturers shall have a minimum of 10 years' experience in the production and use of the type of grout proposed.

B. Pre-installation Meeting

1. At least ten working days before grouting, hold a pre-installation meeting to review the requirements for surface preparation, mixing, placing and curing procedures for each product proposed for use. Notify all parties involved with grouting, including the Engineer, of the meeting at least ten working days prior to its scheduled date.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the jobsite in original, unopened packages, clearly labeled with the manufacturer's name, product identification, batch numbers and printed instructions.

B. Store materials in full compliance with the manufacturer's recommendations. Limit total storage time from date of manufacture to date of installation to six months or the manufacturer's recommended storage time, whichever is less.

C. Remove immediately from the site material which becomes damp, contains lumps, or is hardened and replace with acceptable material at no additional cost to the Owner.

D. Deliver non-shrink cementitious grout and self-leveling cementitious underlayment grout as a pre-portioned blend in prepackaged mixes requiring only the addition of water.

1.07 DEFINITIONS

A. Non-shrink Grout: A commercially manufactured product that does not shrink in either the plastic or hardened state, is dimensionally stable in the hardened state and bonds to a clean base plate.

B. Self-Leveling Cementitious Underlayment Grout: A commercially manufactured portland cement based, non-shrinking, self-leveling underlayment.

PART 2 – PRODUCTS

2.01 GENERAL

A. The use of a manufacturer's name and product or catalog number is for the purpose of establishing the standard of quality desired.

B. Like materials shall be the products of one manufacturer or supplier in order to provide standardization of appearance.

2.02 MATERIALS

A. Non-shrink Cementitious Grout

1. Non-shrink cementitious grouts: Conform to ASTM C1107. Grouts shall be portland cement based, contain a pre-proportioned blend of selected aggregates and shrinkage compensating agents and require only the addition of water. Non-shrink cementitious grouts shall not contain expansive cement or metallic particles. The grouts shall exhibit no shrinkage when tested in conformity with ASTM C827.

   a. General purpose non-shrink cementitious grout: Conform to the standards stated above. SikaGrout 212 by Sika Corp.; Set Grout by BASF Building Systems; NS Grout by The Euclid Chemical Co.; Five Star Grout by Five Star Products, Inc., or equal.

   b. Flowable (Precision) non-shrink cementitious grout: Conform to the standards stated above. Masterflow 928 by BASF Building Systems; Hi-Flow Grout by The Euclid Chemical Co.; SikaGrout 212 by Sika Corp.; Five Star Grout by Five Star Products, Inc., or equal.

B. Concrete Grout

1. Proportion with Type II cement, coarse and fine aggregates, water, water reducing admixture and air entraining agent to produce a mix having an average strength of 3500 psi at 28 days (2500 psi nominal strength). Coarse aggregate size shall be 3/8-in maximum. Slump shall not exceed 5-in. Minimum cement content shall be 540 lbs per cubic yard and maximum water to cement ratio shall be 0.45.

2. Add synthetic reinforcing fibers to the concrete grout mix at the rate of 1.5 lbs of fibers per cubic yard of grout. Add fibers from the manufacturer's pre- measured bags and according to the manufacturer's recommendations to ensure complete dispersion of the fiber bundles as single monofilaments within the concrete grout.

C. Water

1. Potable water free of oil, acid, alkali, salts, chlorides (except those attributable to drinking water), organic matter, or other deleterious substances.

PART 3 – EXECUTION

3.01 PREPARATION

A. Place grout where indicated or specified over existing concrete and cured concrete which has attained its specified design strength unless otherwise approved by the Engineer.

B. Concrete surfaces to receive grout shall be clean and sound; free of ice, frost, dirt, dust, grease, oil, form release agent, laitance and paints and free of all loose material or foreign matter which may affect the bond or performance of the grout.

C. Roughen concrete surfaces by chipping, sandblasting, or other dry mechanical means to bond the grout to the concrete. Remove loose or broken concrete. Irregular voids or projecting coarse aggregate need not be removed if they are sound, free of laitance and firmly embedded into the parent concrete.

1. Air compressors used to clean surfaces in contact with grout shall be the oil-less type or equipped with an oil trap in the airline to prevent oil from being blown onto the surface.

D. Remove all loose rust, oil or other deleterious substances which may affect the bond or performance of the grout from metal embedments or bottom of baseplates prior to the installation of the grout.

E. Wash concrete surfaces clean and then keep moist for at least 24 hours prior to the placement of non-shrink cementitious or cement grout. Saturation may be achieved by covering the concrete with saturated burlap bags, use of a soaker hose, or flooding the surface or other method acceptable to the Engineer. Upon completion of the 24-hour period, remove visible water from the surface prior to grouting.

F. Non-shrink epoxy grouts do not require saturation of the concrete substrate. Do not wet concrete surfaces to receive non-shrink epoxy grout. Surfaces in contact with epoxy grout shall be completely dry before grouting.

G. Provide forms for grout. Line or coat forms with release agents recommended by the grout manufacturer. Provide forms anchored in place and shored to resist the forces imposed by the grout and its placement.

1. Forms for all grout other than concrete grout shall be designed to allow the formation of a hydraulic head and shall have chamfer strips built into forms.

H. Level and align the structural or equipment bearing plates in accordance with the structural requirements or the recommendations of the equipment manufacturer, as applicable.

I. Support equipment during alignment and installation of grout by shims, wedges, blocks or other approved means. The shims, wedges and blocking devices shall be prevented from bonding to the grout by bond breaking coatings and removed after grouting unless otherwise approved by the Engineer. Grout voids created by the removal of shims, wedges and blocks.

3.02 INSTALLATION - GENERAL

A. Mix, apply and cure products in strict compliance with the manufacturer's recommendations and these specifications.

B. Provide staffing and equipment available for rapid and continuous mixing and placing. Keep all necessary tools and materials ready and close at hand.

C. Maintain temperatures of the base plate, supporting concrete, and grout between 40 and 90 degrees F during grouting and for at least 24 hours after placement, until grout compressive strength reaches 1000 psi or as recommended by the grout manufacturer, whichever is longer. Do not allow differential heating or cooling of baseplates and grout during the curing period.

D. Take special precautions for hot weather or cold weather grouting as recommended by the manufacturer when ambient temperatures and/or the temperature of the materials in contact with the grout are outside of the 40 to 90 degrees F range.

E. Install grout to preserve the isolation between the elements on either side of the joint where grout is placed in the vicinity of an expansion or partial contraction joint.

F. Reflect all existing underlying expansion, partial contraction and construction joints through the grout.

3.03 INSTALLATION - NON-SHRINK CEMENTITIOUS GROUTS AND CEMENT GROUTS

A. Mix in accordance with manufacturer's recommendations. Do not add cement, sand, pea gravel or admixtures without prior approval by the Engineer.

B. Do not mix by hand. Mix in a mortar mixer with moving blades. Pre-wet the mixer and empty excess water. Add pre-measured amount of water for mixing, followed by the grout. Begin with the minimum amount of water recommended by the manufacturer and then add the minimum additional water required to obtain workability. Do not exceed the manufacturer's maximum recommended water content.

C. Placements greater than 3-in in depth shall include the addition of clean, washed pea gravel to the grout mix when approved by the manufacturer. Comply with the manufacturer's recommendations for the size and amount of aggregate to be added.

D. Provide forms as specified in Paragraph 3.01G. Place grout into the designated areas and prevent segregation and entrapment of air. Do not vibrate grout to release air or to consolidate the material. Fill all spaces and provide full contact between the grout and adjoining surfaces. Provide grout holes and vent holes as necessary.

E. Place grout rapidly and continuously to avoid cold joints. Do not place grout in layers. Do not add additional water to the mix (re-temper) after initial stiffening.

F. Just before the grout reaches its final set, cut back the grout to the substrate at a 45 degree angle from the lower edge of bearing plate unless otherwise ordered and approved by the Engineer. Finish this surface with a wood float or brush finish.

G. Begin curing immediately after form removal, cutback, and finishing. Keep grout moist and within its recommended placement temperature range for at least 24 hours after placement, until grout compressive strength reaches 1000 psi or as recommended by the manufacturer, whichever is longer. Saturate the grout surface by use of saturated burlap bags, soaker hoses or ponding. Provide sunshades. If drying winds inhibit the ability of a given curing method to keep grout moist, erect wind breaks until wind is no longer a problem or curing is finished.

3.04 INSTALLATION - CONCRETE GROUT

A. Inspect slabs scheduled to receive concrete grout. Scarify existing slab surfaces to receive concrete grout. Protect and keep the surface clean until placement of concrete grout.

B. Remove debris and clean the surface by sweeping and vacuuming of all dirt and other foreign materials. Pressure wash the surface. Do not flush debris into tank drain lines.

C. Saturate the concrete surface for at least 24 hours prior to placement of the concrete grout by use of saturated burlap bags, soaker hoses or ponding. Remove excess water just prior to placement of the concrete grout. Place a cement slurry immediately ahead of the concrete grout so that the slurry is moist when the grout is placed. Work the slurry over the surface with a broom until it is coated with approximately 1/16 to 1/8-in thick cement paste.

D. Place concrete grout to final grade using the scrapers of the installed mechanical equipment as a guide for surface elevation and to eliminate high and low spots. Unless specifically approved by the equipment manufacturer, mechanical scraper mechanisms powered by their motors shall not be used as a finishing machine or screed to push grout.

E. Provide grout control joints as indicated on the Drawings.

F. Steel trowel finish and cure the concrete per manufacturer's recommendations.

3.05 INSTALLATION – SELF-LEVELING CEMENTITIOUS UNDERLAYMENT GROUT

A. Perform work generally as follows but conform to installation procedures as submitted and approved.

B. Removal of flooring and underlying fill concrete material are included under Division 2. Provide additional substrate preparation as required to ensure proper bond of the grout system.

C. Prime the prepared substrate with the system primer and remove all puddles. Allow to dry completely.

D. Mix underlayment grout with water and the approved aggregate only and in the approved proportions to be flowable and self-leveling.

E. Install in one lift for all locations and allow to level. Completely fill the required areas allowing no voids in the grout thickness. Slope to floor drains as required.

F. Cure in conformance with manufacturer's instructions. Do not allow conditions which would permit premature drying.

G. Protect the grouted areas as approved until finish material is applied under Division 9

3.06 SCHEDULE

A. The following list indicates where the particular types of grout are to be used:

1. General purpose non-shrink cementitious grout: Use at all locations where non-shrink grout is indicated on the Drawings, except for base plates greater in area than 3-ft wide by 3-ft long.

2. Flowable (precision) non-shrink cementitious grout: Use under all base plates greater in area than 3-ft wide by 3-ft long. Use at all locations indicated on the Drawings to receive flowable (precision) non-shrink grout. Flowable (precision), non-shrink, cementitious grout may be substituted for general purpose non-shrink cementitious grout.

3. Cement grout: Use where indicated on the Drawings.

END OF SECTION

SECTION 03930

CONCRETE REHABILITATION

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and cut, repair or otherwise modify parts of existing concrete structures or appurtenances as shown on the Drawings and as specified herein.

B. Work under this Section shall also include bonding new concrete to existing concrete.

C. No existing structure or concrete shall be shifted, cut, removed, or otherwise altered until authorization is given by the Engineer.

D. When removing materials or portions of existing structures and when making openings in existing structures, all precautions shall be taken and all necessary barriers, shoring and bracing and other protective devices shall be erected to prevent damage to the structures beyond the limits necessary for the new work, protect personnel and to prevent damage to the structures or contents by falling or flying debris. Unless otherwise permitted, shown or specified, line drilling will be required in cutting existing concrete.

1.02 RELATED WORK

A. Demolition of existing structures is included in Division 2.

B. Concrete, concrete reinforcement and accessories are included in Division 3.

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM)

1. ASTM C881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

2. ASTM C882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Sheer.

3. ASTM C883 - Standard Test Method for Effective Shrinkage of Epoxy-Resin Systems Used with Concrete.

4. ASTM D570 - Standard Test Method for Water Absorption of Plastics.

5. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.

6. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.

7. ASTM D732 - Standard Test Method for Shear Strength of Plastics by Punch Tool.

8. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

B. International Concrete Repair Institute (ICRI):

1. ICRI Guideline No. 03732 – Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.

C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.04 SUBMITTALS

A. Submittals shall be submitted to the Engineer for review and acceptance prior to construction in accordance with Special Provisions Section 21- Submittals.

B. Manufacturer's technical literature on all product brands proposed for use, to the Engineer for review. The submittal shall include the manufacturer's installation and/or application instructions.

C. When substitutions for acceptable brands of materials specified herein are proposed, submit brochures and technical data of the proposed substitutions to the Engineer for approval before delivery to the project.

PART 2 – PRODUCTS

2.01 MATERIALS

A. General:

1. Materials shall comply with this Section and any state or local regulations.

B. Epoxy Bonding Agent:

1. General:

a. The epoxy bonding agent shall be a two-component, solvent-free, asbestos-free moisture insensitive epoxy resin material used to bond plastic concrete to hardened concrete complying with the requirements of ASTM C881, Type II and the additional requirements specified herein.

2. Material:

a. Properties of the cured material:

1) Compressive Strength (ASTM D695): 8500 psi minimum at 28 days.

2) Tensile Strength (ASTM D638): 4000 psi minimum at 14 days.

3) Flexural Strength (ASTM D790 - Modulus of Rupture): 6300 psi minimum at 14 days.

4) Shear Strength (ASTM D732): 5000 psi minimum at 14 days.

5) Water Absorption (ASTM D570 - 2-hour boil): One percent maximum at 14 days.

6) Bond Strength (ASTM C882) Hardened to Plastic: 1500 psi minimum at 14 days moist cure.

7) Effective Shrinkage (ASTM C883): Passes Test.

8) Color: Gray.

3. Approved manufacturers include: Sika Corporation, Lyndhurst, NJ - Sikadur 32, Hi-Mod; BASF, Cleveland, OH - Concresive Liquid (LPL) or equal.

C. Epoxy Paste:

1. General:

a. Epoxy Paste shall be a two-component, solvent-free, asbestos free, moisture insensitive epoxy resin material used to bond dissimilar materials to concrete such as setting railing posts, dowels, anchor bolts and all-threads into hardened concrete and shall comply with the requirements of ASTM C881, Type I, Grade 3 and the additional requirements specified herein. It may also be used to patch existing surfaces where the glue line is 1/8-in or less.

2. Material:

a. Properties of the cured material:

1) Compressive Properties (ASTM D695): 10,000 psi minimum at 28 days.

2) Tensile Strength (ASTM D638): 3,000 psi minimum at 14 days. Elongation at Break - 0.3 percent minimum.

3) Flexural Strength (ASTM D790 - Modulus of Rupture): 3,700 psi minimum at 14 days.

4) Shear Strength (ASTM D732): 2,800 psi minimum at 14 days.

5) Water Absorption (ASTM D570): 1.0 percent maximum at 7 days.

6) Bond Strength (ASTM C882): 2,000 psi at 14 days moist cure.

7) Color: Concrete gray.

3. Approved manufacturers include:

b. Overhead applications: Sika Corporation, Lyndhurst, NJ - Sikadur Hi-mod LV 31; Master Builders, Inc., Cleveland, OH - Concresive 1438 or equal.

c. Sika Corporation, Lyndhurst, N.J. - Sikadur Hi-mod LV 32; Master Builders, Inc., Cleveland, OH - Concresive 1438 or equal.

D. Non-Shrink Precision Cement Grout, Non-Shrink Cement Grout, Non-Shrink Epoxy Grout and Polymer Modified mortar are included in Section 03600.

E. Sealant:

1. Polyurethane elastomeric sealants shall be two-component, self-leveling or non-sag as required by the application. Sealant shall produce a tough, flexible, long-lasting seal with excellent adhesion, elasticity, tear resistance and abrasion resistance. Sealant shall resist deterioration caused by weather, joint movement, pedestrian and vehicular traffic, oils, dilute acids and dilute alkalines. The sealant shall be designed for a maximum joint movement of plus or minus 50 percent of the joint width. Self-leveling sealants may be used in horizontal joints and non-sag sealants can be used in horizontal and vertical joints. Colors for sealants shall be selected by the ENGINEER from standard colors. Allow for up to three colors to be selected. Sealants for use in liquid containing structures shall be ANSI/NSF 61 certified for use in contact with potable water. Sealant shall be Sikaflex 2C NS (non-sag) or SL (self-leveling) by Sika Corp., Lyndhurst, NJ, or approved equal.

2. Use a manufacturer-recommended epoxy based primer prior to installing sealant in liquid containing structures. The primer used in liquid containing structures shall be ANSI/NSF 61 certified for use in contact with potable water. Primer shall be Sikaflex 429 by Sika Corp., Lyndhurst, NJ, or approved equal.

F. Cement crack repair compound:

1. Cement crack repair compound shall be a non-shrink, high-bond-strength, hydraulic cement crystalline waterproofing compound for concrete patching and repair. It shall have a minimum compressive strength of 2,100 psi at 24 hours and 4,500 psi at 28 days. Repair compound shall be Xypex Patch'n Plug by Xypex Chemical Corporation, Richmond, BC, Canada, or approved equal.

G. Cementitious repair mortar:

1. For shallow repairs of vertical or overhead concrete surfaces, cementitious repair mortar shall be a two-component, polymer-modified, Portland cement, fast-setting, non-sag mortar. It shall contain a penetrating corrosion inhibitor. Repair mortar shall be Sikatop 123 PLUS by Sika Corp., Lyndhurst, NJ, or approved equal.

2. For deeper repairs of horizontal, vertical or overhead concrete surfaces, cementitious repair mortar shall be a two-component, polymer-modified, Portland cement, fast-setting, screed mortar. It shall contain a penetrating corrosion inhibitor and be ANSI/NSF 61 certified for use in contact with potable water. The repair mortar may be extended with 3/8-in coarse aggregate in accordance with manufacturer's

recommendations, and may be used in a form and pour application. Repair mortar shall be Sikatop 111 PLUS by Sika Corp., Lyndhurst, NJ, or approved equal.

PART 3 – EXECUTION

3.01 GENERAL

A. Modify and/or repair concrete as specified herein, or necessary to permit completion of the Work, and as directed by the Engineer. Finishes, joints, reinforcements, sealants, etc, are specified in respective Sections. All work shall comply with other requirements of this Section and as shown on the Drawings.

B. All commercial products specified in this Section shall be stored, mixed and applied in strict compliance with the manufacturer's recommendations.

C. In all cases where concrete is repaired in the vicinity of an expansion joint or control joint the repairs shall be made to preserve the isolation between components on either side of the joint.

D. When drilling holes for dowels/bolts at new or existing concrete, drilling shall stop if rebar is encountered. As approved by the Engineer, the hole location shall be relocated to avoid rebar. Rebar shall not be cut without prior approval by the Engineer. Where possible, rebar locations shall be identified prior to drilling using "rebar locators" so that drilled hole locations may be adjusted to avoid rebar interference.

3.02 CONCRETE REMOVAL

A. Concrete designated to be removed to specific limits as shown on the Drawings or directed by the Engineer, shall be done by line drilling at limits followed by chipping or jack-hammering as appropriate in areas where concrete is to be taken out. Remove concrete in such a manner that surrounding concrete or existing reinforcing to be left in place and existing in place equipment is not damaged. Sawcutting at limits of concrete to be removed shall only be done if indicated on the Drawings, or after obtaining written approval from the Engineer. When sawcutting is performed, do not overcut corners.

B. Where existing reinforcing is exposed due to saw cutting/core drilling and no new material is to be placed on the sawcut surface, a coating or surface treatment of epoxy paste shall be applied to the entire cut surface to a thickness of 1/4-in.

C. In all cases where the joint between new concrete or grout and existing concrete will be exposed in the finished work, except as otherwise shown or specified, the edge of concrete removal shall be a 1-in deep saw cut on each exposed surface of the existing concrete.

D. Concrete specified to be left in place which is damaged shall be repaired by approved means to the satisfaction of the Engineer.

E. The Engineer may from time to time direct the Contractor to make additional repairs to existing concrete. These repairs shall be made as specified or by such other methods as may be appropriate.

3.03 CONNECTION SURFACE PREPARATION

A. Connection surfaces shall be prepared as specified below for concrete areas requiring patching, repairs or modifications as shown on the Drawings, specified herein, or as directed by the Engineer.

B. Remove all deteriorated materials, dirt, oil, grease, and all other bond inhibiting materials from the surface by dry mechanical means, i.e. - sandblasting, grinding, etc, as approved by the Engineer. Be sure the areas are not less than 1/2-in in depth. Irregular voids or surface stones need not be removed if they are sound, free of laitance, and firmly embedded into parent concrete, subject to the Engineer's final inspection. Surfaces that will be in contact with freshly placed concrete shall be roughened to minimum Concrete Surface Profile (CSP) 9 per ICRI Guideline 03732 with minimum 1/4-in amplitude.

C. If reinforcing steel is exposed, it must be mechanically cleaned to remove all contaminants, rust, etc, as approved by the Engineer. If half of the diameter of the reinforcing steel is exposed, chip out behind the steel. The distance chipped behind the steel shall be a minimum of 1/2-in. Reinforcing to be saved shall not be damaged during the demolition operation.

D. Reinforcing from existing demolished concrete which is shown to be incorporated in new concrete shall be cleaned by mechanical means to remove all loose material and products of corrosion before proceeding with the repair. It shall be cut, bent or lapped to new reinforcing as shown on the Drawings and provided with 1-in minimum cover all around.

E. The following are specific concrete surface preparation "methods" to be used where called for on the Drawings, specified herein or as directed by the Engineer.

1. Method A: After the existing concrete surface at connection has been roughened and cleaned, thoroughly saturate and maintain saturation for a period of at least 12 hours. Brush on a 1/16-in layer of cement and water mixed to the consistency of a heavy paste. Immediately after application of cement paste, place new concrete or grout mixture as detailed on the Drawings.

2. Method B: After the existing concrete surface has been roughened and cleaned, apply epoxy bonding agent at connection surface. The field preparation and application of the epoxy bonding agent shall comply strictly with the manufacturer's recommendations. Place new concrete or grout mixture to limits shown on the Drawings within time constraints recommended by the manufacturer to ensure bond.

3. Method C: Drill a hole 1/4-in larger than the diameter of the dowel. The hole shall be blown clear of loose particles and dust just prior to installing epoxy. The drilled hole shall first be filled with epoxy paste, then dowels/bolts shall be buttered with paste then inserted by tapping. Unless otherwise shown on the Drawings, deformed bars shall be drilled and set to a depth of ten bar diameters and smooth bars shall be drilled and set to a depth of fifteen bar diameters. If not noted on the Drawings, the ENGINEER will provide details regarding the size and spacing of dowels.

4. Method D: Combination of Method B and C.

3.04 GROUTING

A. Grouting shall be as specified in Section 03600.

3.05 CRACK REPAIR

A. All concrete cracks in non-liquid-containing structures greater than 0.020-in in width shall be repaired as directed by the ENGINEER.

3.06 HONEYCOMBING/ROCK POCKETS

A. Defective and honeycombed areas as determined by the Engineer shall be repaired.

1. Remove honeycomb and defective concrete to sound concrete and 1-inch minimum depth. The sides of all removal and repair areas shall be square.

2. Roughen surface by bush-hammering or chiseling to minimum Concrete Surface Profile (CSP) 9 per ICRI Guideline 03732 with minimum 1/4-in amplitude.

3. Thoroughly clean the surface of loose or weakened materials by water-blasting (preferable) or sandblasting.

4. 12 hours before and again immediately prior to the concrete or mortar being deposited, saturate the joints and adjacent concrete surfaces to at least 12-in past the joint with water.

5. Pack the void with either 4,000 psi concrete using ½-in maximum rock size, SikaTop 123 PLUS (or approved equal), or SikaTop 111 PLUS (or approved equal) extended with aggregate as allowed per the Manufacturer's recommendations.

END OF SECTION

SECTION 13300

INSTRUMENTATION AND CONTROLS – GENRAL PROVISIONS

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall procure the services of a Process Control System Supplier (PCSS) to provide labor and services to permanently arrange and test I/O components that were temporarily installed for a previous project. This work is required to achieve a fully integrated and operational system as specified herein, in the Specification Sections listed below, and in related drawings, except for those services and materials specifically noted.

1. Section 16950 – Electrical Testing
2. Section 13330 – Control Panel Enclosures and Panel Equipment

B. Items specifically excluded from the scope include the following:

1. Procurement of I/O cards.
2. DCS programming

C. Auxiliary and accessory devices necessary for system operation or performance, such as transducers, relays, signal amplifiers, intrinsic safety barriers, signal isolators to interface with existing equipment or equipment provided by others under other Sections of these specifications, shall be included whether they are shown on the Drawings or not.

D. All equipment and installations shall satisfy applicable Federal, State and local codes.

1.02 RELATED WORK

A. Instrumentation and Controls conduit, cable and wiring systems are specified in Division 16.

B. Relevant equipment Sections in Divisions 13 and 16.

1.03 SUBMITTALS

A. Submittals shall be submitted to the Engineer for review and acceptance prior to construction in accordance with Special Provisions Section 21- Submittals.

B. General Requirements:

1. Shop drawings shall demonstrate that the equipment and services to be furnished comply with the provisions of these specifications and shall provide a complete record of the equipment as manufactured and delivered.

2. Submittals shall be complete; giving equipment specifications, details of connections, wiring, ranges, installation requirements, and specific dimensions. Submittals consisting of only general sales literature shall not be acceptable.

3. Substitutions on functions or type of equipment specified shall not be acceptable unless specifically noted.

4. Exceptions to the Specifications or Drawings shall be clearly defined in a Deviation List. The Deviation List shall consist of a paragraph by paragraph review of the Specifications indicating acceptance or any proposed deviations, the reason for exception, the exact nature of the exception and the proposed substitution so that an evaluation may be made by the Engineer. If no exceptions are taken to the specifications or drawings the PCSS shall make a statement as such. If there is no statement by the PCSS, then it is acknowledged that no exceptions are taken.

C. Input/Output (I/O) List Submittal:

1. Submit, within 60-days after Notice to Proceed, a complete system Input/Output (I/O) address list for equipment connected to the control system under this Contract.

2. I/O list shall be based on the Drawings and requirements in the Specifications.

3. The I/O list shall be submitted in both a Microsoft Excel readable electronic file format and an 8-1/2 inch by 11-inch hard copy.

4. The I/O list shall reflect all active and spare I/O points. Add points to accommodate spare I/O as required in the specifications.

5. The I/O list shall be arranged such that the control panel has a dedicated worksheet. At a minimum, I/O worksheet shall include the following information:

   a. TAG NUMBER(S): As indicated on the Drawings, the identifier assigned to a device that performs a function in the control system. As part of this information, the loop number of the tag shall be broken out to allow for sorting by loop.

   b. DESCRIPTION: A description of the function of the device (text that includes signal source, control function, etc.) Include the text "Spare Points" for all I/O module points that are not connected to equipment.

   c. PHYSICAL LOCATION: The Control Panel designation of where the I/O point is wired to.

   d. Physical POINT ADDRESS: Point (or Channel) assignment for each I/O point.

   e. I/O TYPE: use DO - Discrete Output, DI - Discrete Input, AO - Analog Output, AI - Analog Input, PI - Pulse Input, or PO - Pulse Output.

   f. RANGE/STATE: The range in engineering units corresponding to an analog 4-20 mA signal, or, the state at which the value of the discrete points is "1."

   g. ENGINEERING UNITS: The engineering units associated with the Analog I/O.

6. The I/O list shall be sorted in order by:

   a. Physical location.

b. I/O Type.

c. Loop Number.

d. Device Tag.

7. Once the I/O list is approved, the PLC I/O addresses shall not be modified without approval by the Engineer.

8. For I/O layout requirements, see the reference drawings. Note: Layout on drawings are provided for reference only – PCSS is responsible for final layout based on the manufacturer's recommendations, and coordination with the Owner's IT Group.

9. Refer to the sections below for specific Hardware submittal requirements:

   a. 13330 - Control Panels and Panel Mounted Equipment.

10. For each hardware package component specified in the sections above, submit a cover page that lists, at a minimum, date, specification number, product name, manufacturer, model number, Location(s), and power required. Preferred format for the cover page is ISA-TR20.00.01-2001 (updated in 2004-2006), general data sheet; however, other formats will be acceptable provided they contain all required information.

D. Panel Layout Drawings and Wiring Diagrams Submittal:

1. Refer to the Control Panels section for submittal requirements.

E. Testing Plan Submittals:

1. Refer to Section 16950 - Testing for specific testing submittal requirements.

   a. Provide record documentation of the system.

   b. Include the calibration forms developed as specified in Section 16950 - Testing.

2. As-Built Drawings:

   a. Complete as-built drawings, including all drawings and diagrams specified in this section under the "Submittals" section. These drawings shall include all termination points on all equipment the system is connected to, including terminal points of equipment not supplied by the PCSS.

   b. As-built documentation shall include information from submittals, as described in this Specification, updated to reflect the as-built system. Errors in or modifications to the system resulting from the Factory and/or Functional Acceptance Tests shall be incorporated in this documentation.

3. Electronic O&M Information:

   a. Provide electronic files for all drawings produced. Drawings shall be in AutoCAD ".dwg" format and in Adobe Acrobat format. Drawings shall be provided using the

AutoCAD eTransmit feature to bind external references, pen/line styles, fonts, and the drawing file into individual zip files.

1.04 COORDINATION MEETINGS

A. As required by the Owner, coordination meetings shall be scheduled as described herein. The meetings shall be held at the Owner's designated location and shall include attendance by the Owner, the Engineer, the Contractor, the PCSS's Project Engineer, if applicable. Prepare and distribute an agenda for this meeting a minimum of one week before the scheduled meeting date. Meeting shall be scheduled a minimum of one week before the requested meeting date.

1. A project kickoff coordination meeting shall be held within two weeks after submitting the Project Plan. The purpose of the meeting shall be to discuss the PCSS's Project Plan, to summarize the PCSS's understanding of the project; discuss any proposed substitutions or alternatives; schedule testing and delivery deadline dates; provide a forum to coordinate hardware issues; and request any additional information required from the Owner. The meeting will last up to one business day.

2. Regular on-site meetings when the PCSS staff is at the plant site.

1.05 REFERENCE STANDARDS

A. Publications are referred to in the text by basic designation only. Where a date is given for reference standards, that edition shall be used. Where no date is given for reference standards, the latest edition in effect at the time of bid opening shall apply.

B. International Society of Automation (ISA):

1. ISA S5.2, Binary Logic Diagrams for Process Operations.

2. ISA S5.3, Graphic Symbols for Distributed Control/Shared Display Instrumentation Logic and Computer Systems.

3. ISA S5.4, Instrument Loop Diagrams.

4. ISA S20, Specification Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves.

5. ISA RP60.3, Human Engineering for Control Centers.

6. ISA RP60.6, Nameplates, Labels, and Tags for Control Centers.

7. ISA-99, Industrial Automation and Control Systems Security.

C. National Electrical Manufacturers Association (NEMA).

D. National Fire Protection Agency (NFPA):

1. NFPA 70, National Electrical Code (NEC).

2. NFPA 79, Industrial Control Equipment.

E. Underwriters Laboratories, Inc. (UL):

1. UL 508 - Industrial Control Equipment - for custom fabricated equipment.

2. A nationally recognized testing laboratory, as approved by the Authority having jurisdiction, may substitute for UL listing on commercial off the shelf products.

1.06 QUALITY ASSURANCE

A. The Process Control System Supplier (PCSS) shall be a "systems integrator" regularly engaged in the design and the installation of instrumentation systems and their associated subsystems as they are applied to the municipal water and wastewater industry. For the purposes of this Specification Section, a "systems integrator" shall be interpreted to mean an organization that complies with all the following criteria:

1. Employs personnel on this project who have successfully completed ISA or manufacturers training courses on general process instrumentation and configuration and implementation of the specific programmable controllers, computers, and software proposed for this project. Key personnel shall hold ISA CCST Level 1 certification or have a minimum of 10 years of verifiable plant startup experience. Key personnel shall include, as a minimum, the lead field technician.

2. Has successfully completed work of similar or greater complexity on at least three previous projects within the last five years. Successful completion shall be defined as a finished project completed on time, without any outstanding claims or litigation involving the PCSS. Potential references shall be for projects where the PCSS's contract was of similar size to this project.

3. Has been actively engaged in the type of work specified in this Section for a minimum of five years.

B. The PCSS shall maintain a permanent, fully staffed and equipped service facility within 50 miles of the project site with full time employees capable of designing, fabricating, installing, calibrating, and testing the systems specified herein. At a minimum, the PCSS shall respond to on-site problems within 12 hours of notice. Provide an on-site response within 4 hours of notification starting at two months before scheduled start-up to two months after startup completion.

C. PCSS shall hold a valid UL-508 certification for their panel fabrication facility.

D. Actual installation of the instrumentation system need not be performed by the PCSS's employees; however, the PCSS as a minimum shall be responsible for the technical supervision of the installation by providing on site supervision to the installers of the various components.

E. The selected PCSS shall be one of the following:

1. George T. Hall or approved equal.

F. Being listed in this specification does not relieve any potential PCSS from meeting the qualifications specified in this Section.

1.07 DELIVERY, STORAGE AND HANDLING

A. Shipping Precautions:

1. After completion of shop assembly, factory test and approval of all equipment, cabinets, panels and consoles shall be packed in protective crates and enclosed in heavy duty (5 mil) polyethylene envelopes or secured sheeting to provide protection from damage, dust and moisture. Dehumidifiers shall be placed inside the polyethylene coverings. The equipment shall then be skid-mounted for final transport. Lifting rings shall be provided for moving without removing protective covering. Boxed weights shall be shown on shipping tags together with instructions for unloading, transporting, storing and handling at the job site.

2. Manufacturer's special instructions for field handling, storage and installation required for protection, shall be securely attached to the packaging for each piece of equipment prior to shipment. The instructions shall be stored in resealable plastic bags or other means of protection.

3. If any apparatus has been damaged, such damage shall be repaired at no additional cost to the Owner.

1.08 NOMENCLATURE AND IDENTIFICATION

A. Panel Nameplates:

1. See Section 13330 and 01672.

1.09 WARRANTY

A. Provide one-year warranty on all products and installation.

1.10 PROJECT/SITE REQUIREMENTS

A. Environmental Requirements. Refer to Section 16020 and Electrical Drawings for specific environmental and hazardous area classifications.

B. Elevation: Equipment shall be designed to operate at the project ground elevation.

C. Temperature:

1. Outdoor areas' equipment shall operate between -30 to 50 C degrees ambient.

2. Equipment located in indoor locations shall operate between 10 to 35 C degrees ambient minimum.

3. Storage temperatures shall range from 0 to 50 C degrees ambient minimum.

4. Additional cooling or heating shall be furnished if required by the equipment as specified herein.

D. Relative Humidity. Air-conditioned area equipment shall operate between 20 to 95-percent relative, non-condensing humidity. All other equipment shall operate between 5 to 100-percent relative, condensing humidity.

PART 2 – PRODUCTS

2.01 GENERAL

A. All electronic equipment shall be of the manufacturer's latest design, utilizing printed circuitry and epoxy or equal coating to prevent contamination by dust, moisture and fungus. The field mounted equipment and system components shall be designed for installation in dusty, humid and slightly corrosive service conditions.

B. Fasteners for securing control panels and enclosures to walls and floors shall be either hot- dipped galvanized after fabrication or stainless steel. Provide stainless steel fasteners only in corrosive areas rated NEMA 4X on the Drawings unless otherwise required elsewhere. Provide minimum size anchor of 3/8-inch.

C. All equipment, cabinets and devices furnished shall be heavy-duty type, designed for continuous industrial service. The system shall contain similar products of a single manufacturer, and shall consist of equipment models, which are currently in production. All equipment provided shall be of modular construction and shall be capable of field expansion.

D. All electronic/digital equipment shall be provided with radio frequency interference protection.

E. Electrical:

1. Equipment shall operate on a 60 Hertz alternating current power source at a nominal 120 volts, plus or minus 10 percent, except where specifically noted. Regulators and power supplies required for compliance with the above shall be provided between power supply and interconnected instrument loop. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.

2. With the exception for field device network connected devices, all electronic instrumentation shall utilize linear transmission signals of isolated 4 to 20 mA DC (milliampere direct current) capable of driving a load up to 750 ohms, unless specified otherwise. However, signals between instruments within the same panel or cabinet may be 1-5 VDC (volts direct current).

3. Outputs of equipment that are not of the standard signals as outlined, shall have the output immediately raised and/or converted to compatible standard signals for remote transmission. No zero-based signals will be allowed.

4. Materials and equipment shall be UL approved whenever such approved equipment and materials are available.

5. All equipment furnished shall be designed and constructed so that in the event of power interruption, the systems specified herein shall go through an orderly shutdown with no loss of memory, and shall resume normal operation without manual resetting when power is restored, unless otherwise noted.

2.02 ELECTRICAL SURGE PROTECTION

A. General - Surge protection shall be provided to protect the electronic instrumentation system from induced surges propagating along the signal and power supply lines from lightning, utility, or the plant electrical system. The protection systems shall be such that the protective level shall not interfere with normal operation, but shall be lower than the instrument surge withstand level. Protection shall be maintenance free and self-restoring. Devices shall have a response time of less than 50 nanoseconds and be capable of handling a discharge surge current (at an 8x20µs impulse waveform) of at least 8 kA.

B. Provide protection of all 120 VAC power feeds into control panels, instruments, and control room equipment. Surge arresters shall be Transtector ACP-100BW Series, Phoenix Contact "Mains-PlugTrab", MCG Surge Protection 400 Series, Citel DS40 series, or equal.

C. Inductive Loads - Provide coil surge suppression devices, such as varistors or interposing relays, on all process controller outputs or switches rated 120 VA or less that drive solenoid, coil, or motor loads.

PART 3 – EXECUTION

3.01 GENERAL INSTALLATION

A. Accessory equipment shall be installed in accordance with manufacturer instructions. The indicated locations of equipment and similar devices indicated are approximate only. Exact locations of all devices shall be as approved by the Owner and the Engineer during construction. Obtain in the field, all information relevant to the placing of process control equipment and in case of interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner at no additional cost to the Owner.

B. Provide brackets and hangers required for mounting of equipment.

C. The shield on each process instrumentation cable shall be continuous from source to destination and be grounded at only one ground point for each shield.

D. Investigate each space in the building through which equipment must pass to reach its final location. If necessary, ship material in sections sized to permit passing through restricted areas in the building. Provide on-site service to oversee the installation, the placing and location of system components, their connections to the process equipment panels, cabinets and devices, subject to the Engineer's approval. Certify that field wiring associated with the equipment is installed in accordance with best industry practice. Coordinate work under this Section with that of the electrical work specified under applicable sections of Division 16.

3.02 TESTING

A. Refer to Section 16950.

3.03 PROCESS CONTROLLER (DCS) INPUT/OUTPUT (I/O) SCHEDULE

A. Process controller I/O schedule itemizes the process controller Local and Remote I/O associated with the hardware provided under this contract. Provide additional I/O signals and hardware as required to furnish a complete and functional system and submit that revised list as defined in the submittal section.

B. If assigned in this I/O schedule, do not modify the DCS I/O addresses without approval by the Owner.

END OF SECTION

SECTION 13330

CONTROL PANEL ENCLOSURES AND PANEL EQUIPMENT

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Refer to Section 13300.

B. Demolish the components on the top part of the back panel of ECP-5 as specified herein and shown on the Drawings. Coordinate this activity with the Owner's IT Group.

C. Contractor shall rearrange as necessary the components located below the top portion of the back panel. These components were installed on a temporary basis for a previous project. The Contractor shall not procure any I/O cards unless coordinated and authorized by the Owner's IT Group.

1.02 SUBMITTALS

A. Submittals shall be submitted to the Engineer for review and acceptance prior to construction in accordance with Special Provisions Section 21- Submittals.

B. Descriptive literature, bulletins, catalog cuts and Drawings for the equipment specified herein.

C. Complete bill of materials for the equipment.

D. Spare parts list.

E. Panel Layout Drawings and Wiring Diagrams Submittal:

1. Contractor shall provide to PCSS approved submittals in order for PCSS to provide complete wiring diagrams showing all wiring connections in the I/O system. This includes but is not limited to terminal block numbering, relay contact information, equipment, and control panel names. These drawings shall be included in Final O&M submittal. Leaving this information blank on Final Documentation drawings is not acceptable.

2. Panel Layout Drawings: Submit Drawings for all panels, consoles, and equipment enclosures specified. Panel assembly and elevation drawings shall be drawn to scale and detail all equipment in or on the panel. Panel drawings shall be 11"x17" in size. At a minimum, the panel drawings shall include the following:

   a. Interior and exterior panel elevation drawings to scale.

   b. Nameplate schedule.

   c. Conduit access locations.

   d. Panel construction details.

e. Cabinet assembly and layout drawings to scale. Assembly drawing shall include a bill of material on the drawing with each panel component clearly defined. Bill of material shall be cross-referenced to the assembly drawing so that a non-technical person can readily identify all components of the assembly by manufacturer and model number.

f. Fabrication and painting specifications including color (or color samples).

g. Construction details, NEMA ratings, intrinsically safe barrier information, gas sealing recommendations, purging system details, etc. for panels located in hazardous locations or interfacing to equipment located in hazardous areas.

h. For every control panel, heating and cooling calculations for each panel supplied indicating conformance with cooling requirements of the supplied equipment and environmental conditions. Calculations shall include the recommended type of equipment required for both heating and cooling.

i. Submit evidence that all control panels shall be constructed in conformance with UL 508 and bear the UL seal confirming the construction. Specify if UL compliance and seal application shall be accomplished at the fabrication location or by field inspection by UL inspectors. Costs associated with obtaining the UL seal and any inspections shall be borne by Contractor.

3. Panel Wiring Diagrams: Panel wiring diagrams depicting wiring within and on the panel as well as connections to external devices. If ISA Loop Wiring Diagrams are specified below, equipment external to the control panel and related external connections do not need to be shown on the Panel Wiring Diagrams. Panel wiring diagrams shall include power and signal connections, UPS and normal power sources, all panel ancillary equipment, protective devices, wiring and wire numbers, and terminal blocks and numbering. Field device wiring shall include the device ISA-tag and a unique numeric identifier. Diagrams shall identify all device terminal points that the system connects to, including terminal points where I/O wiring lands on equipment not supplied by the PCSS. Wiring labeling used on the drawings shall match that shown on the Contract Documents or as developed by the PCSS and approved by the Engineer. I/O wiring shall be numbered with rack number, slot number, and point number. Two-wire and four-wire equipment shall be clearly identified and power sources noted. Submit final wire numbering scheme. Panel drawings shall be 11" x17" in size.

4. ISA Loop Wiring Diagrams: Not required.

1.03 COORDINATION MEETINGS

A. Refer to Section 13300.

1.04 REFERENCE STANDARDS

A. Refer to Section 13300.

1.05 QUALITY ASSURANCE

A. Refer to Section 13300.

1.06 DELIVERY, STORAGE AND HANDLING

A. Refer to Section 13300.

1.07 NOMENCLATURE AND IDENTIFICATION

A. Refer to Section 13300.

1.08 MAINTENANCE

A. Refer to Section 13300.

B. Test Equipment:

1. Refer to Section 13300.

1.09 WARRANTY

A. Refer to Section 13300.

PART 2 – PRODUCTS

2.01 GENERAL

A. Refer to Section 13300.

2.02 LIGHTNING/SURGE PROTECTION

A. Refer to Section 13300.

2.03 CONTROL PANEL GENERAL MODIFICATION REQUIREMENTS

A. Dimensions within this Section and on Contract Drawings are for general reference only. Ensure that final sub panel arrangements accommodate all required equipment for a fully integrated and operational system as specified herein and in Contract Documents.

B. Devices designated for rear-of-panel mounting shall be arranged within the panel according to respective panel drawings and in a manner to allow for ease of maintenance and adjustment. Heat generating devices such as power supplies shall be located at or near the top of the panel.

C. Components shall be mounted in a manner that shall permit servicing, adjustment, testing, and removal without disconnecting, moving, or removing any other component. Components mounted on the inside of panels shall be mounted on removable plates and not directly to the enclosure. Mounting shall be rigid and stable unless shock mounting is required otherwise by the manufacturer to protect equipment from vibration. Component mounting shall be oriented in accordance with manufacturer's recommendations. Internal components shall be identified with suitable plastic or metal engraved nametags mounted adjacent to (not on) each component identifying the component in accordance with the drawing, specifications, and PCSS's data.

D. Exterior panel mounted equipment shall be installed with suitable gaskets, faceplates, etc. required to maintain the NEMA rating of the panel.

E. Nameplates:

1. Panels and panel devices shall be supplied with suitable nameplates, which identify the panel and individual devices as required. Unless otherwise indicated, each device nameplate shall include up to three lines with the first line containing the device tag number as shown on the drawings, the second line containing a functional description (e.g., Recirculation Pump No. 1), and the third line containing a functional control description (e.g., Start).

2. Unless escutcheon plates are specified or unless otherwise noted on the Drawings, nameplates shall conform with Section 01672 – Asset Identification and Labeling. Nameplate fasteners and mounting shall be adhesive or stainless-steel screws for cabinet mounted nameplates

3. For every panel, provide a panel nameplate with a minimum of 1-in high letters. Provide legend plates or 1-in by 3-in engraved nameplates with 1/4-in lettering for identification of door mounted control devices, pilot lights, and meters.

4. Single Lamacoid nameplates with multiple legends shall be used for grouping of devices such as selector switches and pilot lights that relate to one function.

F. Mounting Elevations:

1. ISA Recommended Practice RP60.3 shall be used as a guide in layout and arrangement of panels and panel mounted components. Dimensions shall account for all housekeeping pads that panels will sit on once they are installed.

2. Installation of panel components shall conform to component manufacturers' guidelines.

2.04 ENVIRONMENTAL CONTROL

A. Panel shall be modified to provide with louvers, heat sinks, forced air ventilation, or air conditioning units as required to prevent temperature buildup inside of panel. Internal temperature of all panels shall be regulated to a range of 45-Deg F to 104-Deg F under all conditions. Under no circumstances shall panel cooling or heating equipment compromise the NEMA rating of the panel.

B. For panels mounted with their backs directly adjacent to a wall, louvers shall be on the sides.

C. Forced air ventilation fans, where used, shall provide a positive internal pressure within the panel, and shall be provided with washable or replaceable filters. Fan motors shall operate on 120-volt, 60-Hz power.

D. For panels with internal heat that cannot be adequately dissipated with natural convection and heat sinks, or forced air ventilation, an air conditioner shall be provided.

2.05 CORROSION CONTROL

A. Panels shall be protected from internal corrosion using corrosion-inhibiting vapor capsules as manufactured by Northern Technologies International Corporation, Model Zerust VC; Hoffman Model AHCI; or equal.

2.06 CONTROL PANEL - INTERNAL CONSTRUCTION

A. Internal Electrical Wiring:

1. Interconnecting wiring shall be stranded, type MTW, and shall have 600-volt insulation and be rated for not less than 90 degrees Celsius. Wiring for systems operating at voltages more than 120-VAC shall be segregated from other panel wiring either in a separate section of a multi-section panel or behind a removable Plexiglas or similar dielectric barrier. Panel layout shall be developed such that technicians shall have complete access to 120-VAC and lower voltage wiring systems without direct exposure to higher voltages.

2. Power distribution wiring on the line side of fuses or breakers shall be 12 AWG minimum. Control wiring on the secondary side of fuses shall be 16 AWG minimum. Electronic analog circuits shall utilize 18 AWG shielded, twisted pair, cable insulated for not less than 600-volts.

3. Power distribution blocks shall be covered with protective guards to meet "finger-safe" requirements of IP20.

4. Power and low voltage DC wiring systems shall be routed in separate wireways. Crossing of different system wires shall be at right angles. Different system wires routed parallel to each other shall be separated by at least 6-inches. Different wiring systems shall terminate on separate terminal blocks. Wiring troughs shall not be filled to more than 60 percent visible fill.

5. Terminations:

   a. Wiring shall terminate onto single tier terminal blocks, where each terminal is uniquely and sequentially numbered. Direct wiring between field equipment and panel components is not acceptable.

   b. Multi-level terminal blocks or strips are not acceptable unless they are approved by the Engineer in advance of panel wiring diagrams. If approved, they shall be mounted on angled din rail elevated from the back panel.

   c. Terminal blocks shall be arranged in vertical rows and separated into groups (power, AC control, DC signal). Each group of terminal blocks shall have a minimum of 25-percent spares.

   d. Terminal blocks shall be the compression type, fused, unfused, or switched as shown on the Contract Drawings or specified elsewhere in Division 13.

   e. Discrete inputs and outputs (DI and DO) shall have two terminals per point with adjacent terminal assignments. All active and spare PLC and controller points shall be wired to terminal blocks.

f. Analog inputs and outputs (AI and AO) shall have three terminals per shielded pair connection with adjacent terminal assignments for each point. The third terminal is for shielded ground connection for cable pairs. Ground the shielded signal cable at the DCS cabinet. All active and spare DCS controller points shall be wired to terminal blocks.

g. Wire and tube markers shall be the sleeve type with heat impressed letters and numbers.

h. Only one side of a terminal block row shall be used for internal wiring. Field wiring side of the terminal shall not be within 6-inches of the side panel or adjacent terminal or within 8-inches of the bottom of free standing panels, or within 3-inches of stanchion mounted panels, or 3-inches of cable shunting rings.

6. Wiring to hand switches and other devices, which are live circuits independent of the panel's normal circuit breaker protection, shall be clearly identified as such.

7. Wiring shall be clearly tagged and color coded. Tag numbers and color coding shall correspond to panel wiring diagrams and loop drawings prepared by the PCSS. Power wiring, control wiring, grounding, and DC wiring shall utilize different color insulation for each wiring system used. Color coding scheme shall be:

   a. Incoming 120-VAC Hot – Black.

   b. 120-VAC Hot wiring downstream of panel circuit breaker – Red.

   c. 120-VAC neutral – White.

   d. Ground – Green.

   e. DC power or control wiring – Blue.

   f. DC analog signal wiring – Black (+), White (-).

   g. Foreign voltage – Yellow.

8. Provide surge protectors on all incoming power supply lines at each panel per requirements of Section 13300.

9. Wiring trough for supporting internal wiring shall be CABLE SHUNTING RING from Rittal Part No. DK7111.000 or approved equal.

10. Each panel shall have a single tube, fluorescent light fixture, 20-Watt in size, mounted internally to the ceiling of the panel. Light fixture shall be switched and shall be complete with the lamp.

11. Each panel shall be provided with an isolated copper grounding bus for all signal and shield ground connections. Shield grounding shall be in accordance with the instrumentation manufacturer's recommendations.

12. Each panel shall be provided with a separate copper power grounding bus (safety) in accordance with the requirements of the National Electrical Code.

13. Each panel shall have control, signal, and communication line surge suppression in accordance with Section 13300.

B. Relays not provided under Division 16 and required for properly completing the control function specified in Division 13, or shown on the Drawings shall be provided under this Section.

C. Orientation of devices including DCS and I/O when installed shall be per the manufacturer's recommendations. Orientation of the DCS I/O modules shall approved by the Owner.

2.07 24 VDC POWER SUPPLIES

A. Provide a 24-VDC power supply in the control panel to power field instruments, panel devices, etc., as required. Equip the power supply with a power on/off circuit breaker.

B. The 24 VDC power supply shall meet the following requirements:

1. Input power: 115-VAC, plus or minus 10-percent, 60 Hz.

2. Output voltage: 24-VDC.

3. Output voltage adjustment: 5-percent.

4. Line regulation: 0.05 percent for 10-volt line change.

5. Load regulation: 0.15 percent no load to full load.

6. Ripple: 3-mV RMS.

7. Operating temperature: 32 to 140-degrees Fahrenheit.

C. Size the 24-VDC power supply to accommodate the design load plus a minimum 25 percent spare capacity.

D. If power supply on/off status signal is shown, provide a relay contact (internal to the power supply or external if the power supply is not so equipped) to indicate on/off status of the power supply.

E. Provide output overvoltage and overcurrent protective devices with the power supply to protect instruments from damage due to power supply failure and to protect the power supply from damage due to external failure.

F. Mount the 24-VDC power supply such that dissipated heat does not adversely affect other panel components.

G. Manufacturer(s):

1. Acopian.

2. Lambda.

3. Or equal.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Panels shall be installed at locations as shown on the Contract Drawings.

B. Refer to Section 13300.

3.02 TESTS

A. Refer to Section 13300.

END OF SECTION

SECTION 16020

ELECTRICAL

PART 1 – GENERAL

A. Furnish all labor, materials and equipment required to install complete and make operational, electrical and process instrumentation systems as specified, as shown on the Contract Drawings.

B. The work shall include furnishing and installing the following:

1. Conduit, wire and field connections for all motors, motor controllers, control devices, control panels and electrical equipment furnished under other Divisions of these Specifications.

C. Each bidder or their authorized representatives shall, before preparing their proposal, visit all areas of the existing buildings and structures in which work under this bid is to be performed and inspect carefully the present installation. The submission of the proposal by this bidder shall be considered evidence that they have visited the site, buildings and structures and noted the locations and conditions under which the work will be performed and that they take full responsibility for a complete knowledge of all factors governing his/her work.

1.02 SUBMITTALS

A. Submittals shall be submitted to the Engineer for review and acceptance prior to construction in accordance with Special Provisions Section 21- Submittals.

B. Shop drawings for equipment, materials and other items furnished under Division 16.

C. Check shop drawings for accuracy and contract requirements prior to submittal. Shop drawings shall be stamped with the date checked and a statement indicating that the shop drawings conform to Specifications and Drawings. This statement shall also list all exceptions to the Specifications and Drawings. Shop drawings not so checked and noted shall be returned.

D. The Engineer's check shall be for conformance with the design concept of the project and compliance with the Specifications and Drawings. Errors and omissions on approved shop drawings shall not relieve the Contractor from the responsibility of providing materials and workmanship required by the Specifications and Drawings.

E. All dimensions shall be field verified at the job site and coordinated with the work of all other trades.

F. Material shall not be ordered or shipped until the shop drawings have been approved. No material shall be ordered or shop work started if shop drawings are marked with "APPROVED AS NOTED - CONFIRM," "APPROVED AS NOTED - RESUBMIT" or "NOT APPROVED", or other similar language.

G. Operation and Maintenance Data:

1. Submit operations and maintenance data for equipment furnished under this Division. The manuals shall be prepared specifically for this installation and shall include catalog data sheets, drawings, equipment lists, descriptions, parts lists, etc., to instruct operating and maintenance personnel unfamiliar with such equipment.

1.03 CONTRACT PERFORMANCE REQUIREMENTS

A. Electric equipment, materials and installation shall comply with the latest edition of the National Electrical Code (NEC) and with the latest edition of the following codes and standards:

1. National Electrical Safety Code (NESC).
2. Occupational Safety and Health Administration (OSHA).
3. National Fire Protection Association (NFPA).
4. National Electrical Manufacturers Association (NEMA).
5. American National Standards Institute (ANSI).
6. Insulated Cable Engineers Association (ICEA).
7. Instrument Society of America (ISA).
8. Underwriters Laboratories (UL).
9. Factory Mutual (FM).
10. National Electrical Testing Association (NETA).

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.04 ENCLOSURE TYPES

A. Unless otherwise specified electrical enclosures shall have the following ratings:

1. NEMA 1 for dry, non-process indoor above grade locations.
2. NEMA 3R for outdoor non-corrosive areas.
3. NEMA 4X for outdoor corrosive areas.

1.05 CODES, INSPECTION AND FEES

A. Equipment, materials and installation shall comply with the requirements of the local authority having jurisdiction.

B. Obtain all necessary permits and pay all fees required for permits and inspections.

1.06 PRIORITY OF THE CONTRACT DOCUMENTS

A. If, during the performance of the work, the Contractor finds a conflict, error or discrepancy between or among one or more of the specification sections or between or among one or more of the specification sections and the Drawings, furnish the higher performance requirements. The higher performance requirement shall be considered the equipment, material, device or

B. installation method which represents the most stringent option, the highest quality or the largest quantity.

C. In all cases, figured dimensions shall govern over scaled dimensions, but work not dimensioned shall be as directed by the Engineer and work not particularly shown, identified, sized, or located shall be the same as similar work that is shown or specified.

D. Detailed Drawings shall govern over general drawings, larger scale Drawings take precedence over smaller scale Drawings, Change Order Drawings shall govern over Contract Drawings and Contract Drawings shall govern over Shop Drawings.

E. If the issue of priority is due to a conflict or discrepancy between the provisions of the Contract Documents and any referenced standard, or code of any technical society, organization or association, the provisions of the Contract Documents will take precedence if they are more stringent or presumptively cause a higher level of performance. If there is any conflict or discrepancy between standard specifications, or codes of any technical society, organization or association, or between Laws and Regulations, the higher performance requirement shall be binding on the Contractor, unless otherwise directed by the Engineer.

F. In accordance with the intent of the Contract Documents, the Contractor accepts the fact that compliance with the priority order specified shall not justify an increase in Contract Price or an extension in Contract Time nor limit in any way, the Contractor's responsibility to comply with all Laws and Regulations at all times.

1.07 TESTS AND SETTINGS

A. Test systems and equipment furnished under Division 16 and repair or replace all defective work and equipment. Refer to the individual equipment sections for additional specific testing requirements.

B. Make adjustments to the systems and instruct the Owner's personnel in the proper operation of the systems.

C. In addition to the specific testing requirements listed in the individual sections, the following minimum tests and settings shall be performed.

1. Mechanical inspection, testing and settings of circuit breakers, disconnect switches, protection relays, motor starters, overload relays, control circuits and equipment for proper operation.

2. Check the full load current draw of each motor. Check ampere rating of thermal overloads for motors and submit a typed record to the Engineer of the same, including MCC cubicle location and driven load designation, motor service factor, horsepower, and Code letter. If incorrect thermal overloads are installed replace same with the correct size overload.

3. Check power and control power fuse ratings. Replace fuses if they are found to be of the incorrect size.

4. Check settings of the motor circuit protectors. Adjust settings to lowest setting that will allow the motor to be started when under load conditions.

5. Check motor nameplates for correct phase and voltage. Check bearings for proper lubrication.

6. Check rotation of motors prior to testing the driven load. Disconnect the driven equipment if damage could occur due to wrong rotation. If the rotation is for the driven equipment is not correct, disconnect the motor lead connections at the motor terminal box and reconnect for proper rotation.

7. Check interlocking, control and instrument wiring for each system and/or part of a system to prove that the system will function properly as indicated by control schematic and wiring diagrams.

8. Verify all terminations at transformers, equipment, panels and enclosures by producing a 1, 2, 3 rotations on a phase-sequenced motor when connected to "A," "B" and "C" phases.

9. Test the grounding system using the three-point fall in potential method.

10. Test all 600-Volt wire insulation with a meg-ohm meter after installation. Make tests at not less than 500-V. Submit a written test report of the results to the Engineer.

D. Testing shall be scheduled and coordinated with the Owner at least two weeks in advance. Provide qualified test personnel, instruments and test equipment.

1.08 SIZE OF EQUIPMENT

A. Investigate each space in the structure through which equipment must pass to reach its final location. Coordinate shipping splits with the manufacturer to permit safe handling and passage through restricted areas in the structure.

B. The equipment shall be kept upright at all times during storage and handling. When equipment must be tilted for passage through restricted areas, brace the equipment to ensure that the tilting does not impair the functional integrity of the equipment.

1.09 RECORD DRAWINGS

A. As the work progresses, legibly record all field changes on a set of project contract drawings, hereinafter called the "record drawings."

B. Record drawings shall accurately show the installed condition of the following items:

1. One-line Diagram(s).

2. Raceways and pull boxes.

3. Conductor sizes and conduit fills.

4. Panel Schedule(s).

5. Control Wiring Diagram(s).

6. Plan view, sizes and locations of motor control centers and panelboards.

C. Submit a schedule of existing and any new control wiring raceways and wire numbers, including the following information:

1. Circuit origin, destination and wire numbers.

2. Field wiring terminal strip names and numbers.

D. As an alternate, point-to-point connection diagrams showing the same information may be submitted in place of the schedule of control wiring raceways and wire numbers.

E. Submit the record drawings and the schedule of control wiring raceways and wire numbers (or the point-to-point connection diagram) to the Engineer.

1.10 EQUIPMENT INTERCONNECTIONS

A. Review shop drawings of equipment furnished under other Divisions of this Specification and prepare coordinated wiring interconnection diagrams or wiring tables. Submit copies of wiring diagrams or tables with Record Drawings.

B. Furnish and install all equipment interconnections.

1.11 MATERIALS AND EQUIPMENT

A. Materials and equipment shall be new.

B. Material and equipment of the same type shall be the product of one manufacturer and shall be UL listed.

C. Warrant all equipment furnished under Division 16. Refer to individual equipment Sections for additional warranty items.

1.12 DEMOLITION

A. Survey the existing electrical systems and equipment identified for removal with representatives from the other trades prior to performing any demolition work. Identify all conduit and equipment to be removed with tags or paint.

B. Where a piece of equipment is to be removed, all associated wiring and conduit shall also be removed.

C. Equipment, building or structures scheduled for complete demolition shall be made safe from electrical shock hazard prior to demolition. Disconnect all electrical power, communications, alarm and signal system.

D. Equipment scheduled to be turned over to the Owner shall be carefully disconnected, removed and delivered to the Owner at a location within 50 miles of the existing site. Provide labor, hoisting and transportation of the equipment. All other miscellaneous electrical materials, devices, etc., associated with the equipment being turned over shall be demolished and removed from the site. The following equipment shall be turned over to the Owner:

1. Molded Case Circuit Breakers

2. Any copper bus work removed as part of any equipment shall be returned to TMWRF warehouse.

E. Remove electrical work associated with equipment scheduled for demolition except those portions indicated to remain or be reused.

F. Unless otherwise specifically noted, remove unused exposed conduit and support systems back to point of concealment including abandoned conduit above accessible ceiling finishes. Remove unused wiring back to source (or nearest point of usage).

G. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned or being removed. Provide blank covers for abandoned outlets which are not removed.

H. Disconnect and remove abandoned panelboards, disconnect switches, control stations, distribution equipment, etc.

I. Repair adjacent construction and finishes damaged during demolition and extension work.

J. Where electrical systems pass through the demolition areas to serve other portions of the premises, they shall remain or be suitably relocated and the system restored to normal operation.

K. Coordinate electrical power outages to the electrical systems and equipment with the Owner. Where duration of proposed outage cannot be allowed by the Owner (4-hour duration maximum), phase the retrofit work to allow the system or equipment to be re-connected to the electrical power system within the time frame allowed by the Owner or provide temporary power connections as required to maintain service to the systems or equipment. The temporary power can be from one of the two feeders feeding MCC-6, or another part of the facility not affected by the outage provided there is sufficient spare capacity.

L. Continuous service is required on all circuits and outlets affected by these changes, except where the Owner will permit an outage for a specific time. Obtain Owner's consent before removing any circuit from continuous service.

M. All of the electrical and process equipment to be removed or relocated under this contract has been identified on the Drawings. The removal and or relocation of existing conduit, wire and equipment has not been detailed on the Drawings. Survey the affected equipment and building areas before submitting bid proposal.

N. Trace out existing wiring that is to be relocated, or removed and perform the relocation or removal work as required for a complete operating and safe system.

O. Remove exposed conduits, wireways, outlet boxes, pull boxes and hangers made obsolete by the alterations, unless specifically designated to remain. Patch surfaces and provide blank covers for abandoned outlets which are removed.

P. All equipment, materials, controls, motor starters, branch and feeder breakers, panelboards, transformers, wiring, raceways, etc., furnished and installed to temporarily keep circuits energized shall be removed when the permanent installation is fully operational.

1.13 DISPOSITION OF REMOVED MATERIALS AND EQUIPMENT

A. It is intended that material and equipment indicated to be removed and disposed of by the Contractor shall, upon removal, become the Contractor's property and shall be disposed of off the site by the Contractor, unless otherwise directed by the Owner. A receipt showing acceptable disposal of any legally regulated materials or equipment shall be given to the Owner.

B. PCBs, mercury and PCB/mercury contaminated equipment shall be removed, packaged, shipped and disposed of in accordance with all State and Federal regulations. Obtain the services of a firm licensed and regularly engaged in the removal of PCBs and PCB contaminated equipment. The firm shall be licensed in the State or States in which the contaminated material is handled, shipped and disposed. Pay all fees associated with the removal of the contaminated material and equipment and provide documentation showing acceptable disposal.

C. Should the Contractor discover PCB or mercury contaminated equipment that was not identified; they shall cease work on or about the equipment and notify the Engineer immediately. The Contractor shall then proceed with the work as directed by the Engineer.

D. The following electrical equipment shall be removed and shall be moved by the Contractor to a location on the site for storage as directed by the Owner:

1. Molded Case Circuit Breakers

2. Motor Starters

3. Existing cables shall be turned to the owner for first right of refusal. Owner might elect to use the copper for its salvage value.

4. Owner will salvage the equipment for copper and then contractor shall dispose of the equipment.

5. TMWRF has the first choice on salvage rights.

1.14 INTERPRETATION OF DRAWINGS

A. Unless specifically stated to the contrary, the Contract Drawings are not intended to show exact locations of conduit runs. Coordinate the conduit installation with other trades and the actual supplied equipment.

B. Install each 3-phase circuit in a separate conduit, unless otherwise shown on the Contract Drawings.

C. Unless otherwise approved by the Engineer, conduit shown exposed shall be installed exposed; conduit shown concealed shall be installed concealed.

D. Where circuits are shown as "home-runs" all necessary fittings and boxes shall be provided for a complete raceway installation. Where home-runs indicate conduit is to be installed concealed or exposed the entire branch circuit shall be installed in the same manner. Unless otherwise indicated install branch circuit conduits exposed in process/industrial type spaces and concealed in finished spaces.

E. Except where dimensions are shown, the locations of equipment, fixtures, outlets and similar devices shown on the Drawings are approximate only. Exact locations shall be determined by the Contractor and approved by the Engineer during construction. Obtain information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner.

F. Circuit layouts are not intended to show the number of fittings, or other installation details. Furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting and other electrical systems shown.

G. Redesign of electrical or mechanical work, which is required due to the Contractor's use of an alternate item, arrangement of equipment and/or layout other than specified herein, shall be done by the Contractor at his/her own expense. Redesign and detailed Contract Drawings shall be submitted to the Engineer for approval. No additional compensation will be provided for changes in the work, either his/her own or others, caused by such redesign.

H. It is the intent of these Specifications that the Electrical Systems shall be suitable in every way for the service required. All materials and all work that may be implied as being incidental to the work of this Section shall be furnished at no additional cost to the Owner.

I. Raceways and conductors for lighting, switches, receptacles and other miscellaneous low voltage power and signal systems as specified are not shown on the Drawings. Raceways and conductors shall be provided as required for a complete and operating system. Homeruns, as shown on the Drawings, are to assist the Contractor in identifying raceways to be run exposed and raceways to be run concealed. Raceways shall be installed concealed in all finished spaces and may be installed exposed or concealed in all process spaces. Raceways installed exposed shall be near the ceiling or along walls of the areas through which they pass and shall be routed to avoid conflicts with HVAC ducts, cranes hoists, monorails, equipment hatches, doors, windows, etc. Raceways installed concealed shall be run in the center of concrete floor slabs, above suspended ceilings, or in partitions as required.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 SLEEVES AND FORMS FOR OPENINGS

A. Provide and place all sleeves for conduits penetrating floors, walls, partitions, etc. Locate all necessary slots for electrical work and form before concrete is poured.

B. Exact locations are required for stubbing-up and terminating concealed conduit. Obtain shop drawings and templates from equipment vendors or other subcontractors and locate the concealed conduit before the floor slab is poured.

C. Where setting drawings are not available in time to avoid delay in scheduled floor slab pours, the Engineer may allow the installations of such conduit to be exposed. Requests for this deviation shall be submitted in writing. No additional compensation for such change will be allowed.

D. Seal all openings, sleeves, penetrations, and slots.

3.02 CUTTING AND PATCHING

A. Cutting and patching shall be done in a thoroughly workmanlike manner. Saw cut concrete and masonry prior to breaking out sections.

B. Core drill holes in concrete floors and walls as required.

C. Install work at such time as to require the minimum amount of cutting and patching.

D. Do not cut joists, beams, girders, columns or any other structural members.

E. Cut opening only large enough to allow easy installation of the conduit.

F. Patching to be of the same kind and quality of material as was removed.

G. The completed patching work shall restore the surface to its original appearance or better.

H. Patching of waterproofed surfaces shall render the area of the patching ompletely waterproofed.

I. Remove rubble and excess patching materials from the premises.

J. When existing conduits are cut at the floor line of wall line, they shall be filled with grout of suitable patching material.

3.03 INSTALLATION

A. Any work not installed according to the Specifications shall be subject to change as directed by the Engineer. No extra compensation will be allowed for making these changes.

B. Electrical equipment shall be protected at all times against mechanical injury or damage by water. Electrical equipment shall not be stored outdoors. Electrical equipment shall be stored indry permanent shelters. Do not install electrical equipment in its permanent location until structures are weather-tight. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and tested as directed by the Engineer, or shall be replaced at no additional cost at the Engineer's discretion.

C. Equipment that has been damaged shall be replaced or repaired by the equipment manufacturer, at the Engineer's discretion.

D. Repaint any damage to factory applied paint finish using touch-up paint furnished by the equipment manufacturer. The entire damaged panel or Section shall be repainted , at no additional cost to the Owner.

E. Coordinate the conduit installation with other trades and the actual supplied equipment.

F. Install each 3-phase circuit in separate conduit.

G. Unless otherwise approved by the Engineer, conduit installed interior to the building shall be installed exposed; conduit installed exterior to the building shall be concealed.

H. Exact locations of electrical equipment shall be determined by the Contractor and approved by the Engineer during construction. Obtain information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner.

3.04 MANUFACTURERS SERVICE

A. Provide manufacturer's services for testing and start-up and training of the following equipment:

1. 480 Volt Motor Control Centers: 3 days 1 trip minimum.

    a. Testing and startup shall not be combined with training. Testing and start-up time shall not be used for manufacturer’s warranty repairs.

END OF SECTION

SECTION 16110

RACEWAYS, BOXES, FITTINGS AND SUPPORTS

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Furnish and install raceway as shown on the Drawings and as specified herein.

B. Home runs indicated are to assist the contractor in identifying raceways to be installed concealed or exposed. Raceways identified to be installed exposed on the Contract Drawings shall be run near the ceilings or along the walls of the areas through which they pass and shall be routed to avoid conflicts with HVAC ducts, cranes and hoists, lighting fixtures, doors and hatches. Raceways indicated to be run concealed shall be run in the center of concrete floor slabs, in partitions, or above hung ceilings, as required.

C. Raceways and conductors are not shown completely on the Drawings, including but not limited to raceways and conductors: between lighting, switches, receptacles, other miscellaneous low voltage and signal systems, except where they are required to pass through a restricted or designated space. Home runs indicated, are to assist the Contractor in identifying raceways to be installed concealed or exposed. Raceways and conductors shall be provided for complete and operating systems. Raceways indicated to be run exposed on the Contract Drawings shall be run near the ceilings or along the walls of the areas through which they pass and shall be routed to avoid conflicts with HVAC ducts, cranes and hoists, lighting fixtures, doors and hatches, etc. Raceways indicated to be run concealed shall be run in the center of concrete floor slabs, in partitions, or above hung ceilings, as required.

D. Furnish all labor, materials, equipment, accessories and components and install a complete seismic restraint and support system for raceway systems as indicated on the Contract Drawings and as specified herein.

1. All supports, hangers, bracing and appurtenances shall conform to the latest applicable requirements of the Nevada State Building Code except as supplemented or modified by the requirements specified in this Section.

E. The electrical subcontractor shall engage the services of an independent professional engineer registered in the State with specific experience in the design of seismic restraints and supports for electrical supporting systems hereinafter referred to as support engineer.

F. Furnish all labor, materials, equipment and incidentals and install a complete system of raceway hangers, supports, concrete inserts and anchor bolts including all metallic hanging and supporting devices for supporting non-buried conduit for the layout as shown on the Drawings and as specified herein.

1.02 SUBMITTALS

A. Submittals shall be submitted to the Engineer for review and acceptance prior to construction in accordance with Special Provisions Section 21- Submittals.

B. Manufacturers' names and product designation or catalog numbers with marked cut sheets of all materials specified.

C. Submittals shall include a representative catalog cut for each different type of raceway hanger or support indicating the materials of construction, important dimensions and range of loads and & sizes for which that hanger is suitable.

D. Submit calculations and detailed drawings, where standard hangers and/or supports are not suitable. Contract Drawings and calculations shall be signed and sealed by an independent professional engineer registered in the State of Nevada.

1. As a minimum, included the following information on the drawings:

a. Codes and specification to which structural design conforms.

b. Support material, member sizes, connection and locations.

c. Vertical and horizontal support reaction under the various design loading combinations.

E. Submittals shall include complete raceway layout drawings indicating type of hanger and/or support, location, magnitude of load transmitted to the structure and type of anchor, guide and other conduit supporting appurtenances including structural fasteners.

F. Submit complete design data for conduit support systems to show conformance with this Section.

1.03 QUALITY ASSURANCE

A. All hangers, supports and appurtenances shall be of approved standard design where possible and shall be adequate to maintain the supported load in proper position under all operating conditions.

1.04 DELIVERY, STORAGE AND HANDLING

A. All supports and hangers shall be crated, delivered and uncrated so as to protect against any damage.

B. All parts shall be properly protected so that no damage or deterioration shall occur during a prolonged delay from the time of shipment until installation is completed.

C. Finished metal surfaces not galvanized, that are not of stainless steel construction, or that are not coated, shall be grease coated, to prevent rust and corrosion.

PART 2 – PRODUCTS

2.01 RACEWAYS AND FITTINGS

A. Steel Conduit and Fittings:

1. Rigid metal conduit (GRS), couplings, factory elbows and fittings shall be heavy wall steel tubing with a hot-dipped galvanized finish inside and out after threading and shall comply with ANSI C 80.1 and UL/6.

2. Acceptable manufacturers:

   a. Allied Tube & Conduit Corp.

   b. LTV Steel Tubular Products Corp.

   c. Triangular PWC Inc.

   d. Or equal.

3. Rigid metal and intermediate metal conduit fittings shall be of the threaded type, and shall be steel or malleable iron, with a hot-dipped galvanized finish. Thread-less fittings and split couplings are not allowed except in specific applications as approved by the Engineer.

B. PVC Coated Rigid Steel Conduit and Fittings:

1. PVC coated rigid steel conduit shall be heavy wall steel tubing with a hot-dipped galvanized finish inside and out after threading with a minimum 0.040-in thick, polyvinyl chloride coating permanently bonded to it and an internal chemically cured urethane or enamel coating. The rigid steel conduit shall comply with ANSI C80.1 and UL/6 prior to coating.

2. PVC coated couplings, factory elbows and fitting shall be furnished with a PVC coating bonded to steel the same thickness as used on the PVC coated conduit. The ends of all couplings, fittings, etc. shall have a minimum of one pipe diameter in length of PVC overlap.

3. Acceptable manufacturers:

   a. “OCAL” as manufactured by Thomas & Betts

   b. "Plasti-Bond Red" as manufactured by Robroy Industries

   c. Triangle PWC Inc

   d. Or equal

C. Liquid-tight Flexible Metal Conduit, Couplings and Fittings:

1. Liquid-tight flexible metal conduit shall be square locked, galvanized steel flexible conduit with a moisture proof, flame resistant, polyvinyl chloride jacket, for use with rigid metal conduit systems. Sealtite, Type UA, manufactured by the Anaconda Metal Hose Div.; Anaconda American Brass Co.; American Flexible Conduit Co., Inc.; Universal Metal Hose Co. or equal.

2. Liquid-tight conduit fittings shall be hot-dipped mechanically galvanized, positive grounding, screw in type. Provide external bonding lugs on sizes 1-1/4-in and larger. Box

connectors shall have insulated throats as manufactured by the Thomas & Betts Co.; Crouse-Hinds Co. or equal.

3. Acceptable Manufacturers:

   a. American Flexible Conduit Co.

   b. Anaconda Metal Hose/ANAMET Inc.

   c. Electri-flex Co.

   d. Thomas & Betts

   e. O-Z Gedney

   f. Or equal

2.02 BOXES AND FITTINGS

A. Dry and Damp Location Boxes and Fittings:

1. Outlet boxes shall be zinc-galvanized, extra depth, pressed steel with knockouts and of size and type suitable for the intended application.

2. Boxes that are less than 100 cubic inches in size used for junction or pull boxes shall be zinc galvanized pressed steel not less than 14 USS gauge with appropriate blank covers, minimum size 4-11/16-in square by 2-1/8-in deep.

3. Boxes that are 100 cubic inches and larger shall be constructed of hop dip galvanized sheet steel without knockouts. Covers shall be secured with round head brass machine screws. All joints shall be welded and ground smooth.

4. Terminal cabinets shall be NEMA 12 sheet steel unless otherwise shown on the Drawings. Boxes shall be painted and have continuously welded seams. Welds shall be ground smooth and galvanized. Box bodies shall be flanged and shall not have holes or knockouts. Box bodies shall not be less than 14-gauge metal and covers shall not be less than 12-gauge metal. Terminal boxes shall be furnished with latching hinged doors, terminal mounting straps and brackets. Terminal blocks shall be rated not less than 20A, 600V.

5. Acceptable Manufacturers:

   a. Appleton

   b. Raco

   c. Steel City

   d. Hoffman

   e. Electromate Division of Robroy Ind.

f. Wiegmann

B. Wet Location Boxes and Fittings:

1. NEMA 4 terminal boxes, junction boxes, pull boxes, etc., shall be sheet Type-316 stainless steel unless otherwise shown on the Drawings. Boxes shall have continuously welded seams and mounting feet. Welds shall be ground smooth. Boxes shall be flanged and shall not have holes or knockouts. Box bodies shall not be less than 14-gauge metal and covers shall not be less than 12 gauge metal. Covers shall be gasketed and fastened with stainless steel clamps. Terminal boxes shall be furnished with hinged doors, terminal mounting straps and brackets. Terminal blocks shall be NEMA type, not less than 20 Amps, 600 Volt.

2. Cast or malleable iron device boxes shall be Type FD. Boxes and fittings shall have cadmium-zinc finish with cast covers and stainless-steel screws.

3. Cast aluminum device boxes shall be Type FD. Boxes and fittings shall be copper free aluminum with cast aluminum covers and stainless-steel screws

4. Acceptable Manufacturers:

a. Appleton

b. Crouse-Hinds

c. Steel City

d. Hoffman

e. Electromate - Division of Robroy Ind.

f. Or equal

C. Corrosive Location Boxes:

1. NEMA 4X PVC coated outlet boxes shall be used with PVC coated conduit shall be furnished with a PVC coating bonded to the metal, the same thickness as used on the coated steel.

2. Acceptable manufacturers:

a. “OCAL” as manufactured by Thomas & Betts

b. "Plasti-Bond Red" as manufactured by Robroy Industries

c. Triangle PWC Inc

d. Or equal

3. NEMA 4X terminal boxes, junction boxes and pull boxes shall be 316 stainless steel with stainless steel hardware and gasketed covers. Terminal boxes shall be furnished with hinged

doors, terminal mounting straps and brackets. Terminal blocks shall be NEMA type, not less than 20 Amps, 600 Volt.

4. Acceptable Manufacturers:

   a. Hoffman

   b. Stahlin - Division of Robroy Ind.

   c. English Electric

   d. Or equal

D. Miscellaneous Fittings:

1. Flexible couplings shall be type ECGJH as manufactured by the Crouse-Hinds Co.; Appleton Electric Co.; Killark Electric Manufacturing Co. or equal.

2. Conduit hubs shall be as manufactured by Myers Electric Products, Inc. or equal.

3. Conduit wall seals for new concrete walls below grade shall be O.Z./Gedney Co., Type WSK; Linkseal; Spring City Electrical Manufacturing Co., Type WDP or equal.

4. Conduit wall seals for cored holes shall be Type CSMC as manufactured by the O.Z./Gedney Co. or equal.

5. Conduit wall and floor seals for sleeved openings shall be Type CSMI as manufactured by the O.Z./Gedney Co. or equal.

6. Combination expansion-deflection fittings embedded in concrete shall be Type XD as manufactured by the Crouse-Hinds Co.; Type DX as manufactured by O.Z./Gedney Co.; Type DF as manufactured by Appleton Electric Co. or equal.

7. Combination expansion-deflection fittings installed exposed shall be Type XD as manufactured by Crouse-Hinds Co.; Type DX as manufactured by O.Z. Gedney Co.; Type DF as manufactured by Appleton Electric Co. or equal.

8. 8 Explosion proof fittings shall be as manufactured by the Crouse-Hinds Co.; Appleton Electric Co.; O.Z./Gedney Co. or equal.

9. 8 Conduit sealing bushings shall be O.Z./Gedney, Type CSB or equal.

10. 9. Grounding bushings shall be malleable iron with integral insulated throat rated for 150 degrees C, with solderless lugs as manufactured by Crouse Hinds/Cooper, Series HGLL; Appleton, Series GIB; O.Z./Gedney, Type HBLG or equal.

2.03 HARDWARE

A. Conduit Mounting Equipment:

1. In dry indoor areas, hangers, rods, backplates, beam clamps, channel, etc shall be galvanized iron or steel.

2. PVC coated steel channel with stainless steel hardware shall be used in areas designated "WET" or "CORROSIVE" on the Drawings and in outdoor locations. Fiberglass channel shall be resistant to the chemicals present in the area in which it is used.

3. Furnish any and all necessary supports, brackets, conduit sleeves, racks and bracing as required. All boxes and hardware shall be galvanized zinc plated steel except that stainless steel shall be used in areas designated as “WET” or “CORROSIVE” on the Drawings.

B. Conduit Identification Plates:

1. Conduit identification plates shall be embossed stainless steel with stainless steel band, permanently secured to the conduit without screws.

2. Identification plates shall be as manufactured by the Panduit Corp. or equal.

C. Wall and Floor Slab Opening Seals:

1. Wall and floor slab openings shall be sealed with a UL approved expending material which equals or exceeds the fire rating of the wall or floor construction as manufactured by the Thomas & Betts Corp.; Pro Set Systems; Neer Mfg. Co.; Specified Technologies, Inc. or equal.

D. Cold Galvanizing Compound:

1. Cold galvanizing compound shall be as manufactured by ZRC Products Company, a Division of Norfolk Corp. or equal.

E. Conduit Supports:

1. Trapezes:

a. In dry indoor areas, beams, channels, struts, hangers, bracing, rods, beam clamps, accessories and components shall be galvanized steel.

b. PVC coated steel beams, channels, struts or fiberglass beams, channels, struts with stainless steel hangers, bracing, rods, beam clamps, accessories and components shall be used in areas designated “WET”, “DAMP” and “CORROSIVE” where indicated and in outdoor locations. Fiberglass channels shall be resistant to the chemicals resent in the area in which it is used.

2. Flush Mounted Supports:

a. In dry indoor areas, channels, struts, accessories and components shall be galvanized steel.

b. PVC coated steel channels, struts or fiberglass channels, struts with stainless, accessories and components shall be used in areas designated “WET”, “DAMP” and

"CORROSIVE" where indicated and in outdoor locations. Fiberglass channels, struts shall be resistant to the chemicals present in the area in which it is used.

3. Conduit Racks:

   a. In dry indoor areas, conduit racks, accessories and components shall be galvanized steel.

   b. PVC coated steel conduit racks or fiberglass conduit racks with stainless, accessories and components shall be shall be used in areas designated "WET", "DAMP" and "CORROSIVE" where indicated and in outdoor locations. Fiberglass channels shall be resistant to the chemicals present in the area in which it is used.

4. Conduit Hangers:

   a. In dry indoor areas, conduit clamps, rods, beam clamps, bracing, accessories and components shall be galvanized steel.

   b. Stainless steel conduit clamps, rods, beam clamps, bracing, accessories and components shall be shall be used in areas designated "WET", "DAMP" and "CORROSIVE" where indicated and in outdoor locations.

1. Adjustable steel and plastic band hangers, adjustable band hangers, adjustable swivel ring hangers and J-hangers shall not be allowed.

2. All hangers, bracing, rods, beam clamps, accessories and components shall be as manufactured by the Carpenter & Paterson Inc.; Grinnell Corporation; B-Line Systems Inc. or equal.

3. Design of supplemental structural steel required for attachment to the building structural support system shall be the full responsibility of the Support Engineer.

PART 3 – EXECUTION

3.01 RACEWAY APPLICATIONS

A. Refer to Table 16110-1 for specific raceway application requirements.

B. All conduit of a given type shall be the product of one manufacturer.

3.02 BOX APPLICATIONS

A. Unless otherwise specified herein or shown on the Drawings, all boxes shall be metal.

B. Exposed switch, receptacle and lighting outlet boxes and condulet fittings shall be cast or malleable iron.

C. All conduit bodies and pulling outlets shall comply with NEC wire bending space requirements. Mogul type fittings shall be used for sizes 2-1/2-in and larger.

Table 16110-1: Raceway Application Guidelines

Location/Circuit Type	Raceway Type
Process areas - non-corrosive, non-hazardous locations designated as DAMP or WET on the Drawings.	Exposed conduit for power wiring, lighting, switch, and receptacle circuits - Galvanized rigid steel (GRS)
Corrosive areas – Primary sedimentation basins, and TWAS basins.	Exposed conduit for power wiring, lighting, switch, and receptacle circuits –PVC coated rigid steel.
Hazardous areas - all locations - Class 1, Division 1 and 2.	Exposed conduit for power wiring, lighting, switch, and receptacle circuits - Galvanized rigid steel (GRS) . PVC coated rigid steel for corrosive areas.

3.03 FITTINGS APPLICATIONS

A. Combination expansion-deflection fittings shall be used where exposed conduits cross structure expansion joints or in straight runs where expansion is anticipated. Combination expansion-deflection fittings shall be installed where embedded conduits cross structural expansion joints. Refer to Structural Drawings for expansion joint locations. Provide bonding jumpers around fittings.

B. All underground conduit penetrations at walls or other structures shall be sealed watertight. Conduit wall seals and sleeves shall be used in accordance with the manufacturer's installation instructions and the details shown on the Drawings.

C. Conduit sealing bushings shall be used to seal conduit ends exposed to the weather and at other locations shown on the Drawings.

3.04 INSTALLATION

A. No conduit smaller than 3/4-in electrical trade size shall be used, nor shall any have more than the equivalent of three 90-degree bends in any one run. Pull boxes shall be provided as required by the NEC after every 270-degrees of bends and for straight run not to exceed 200 feet or as directed.

B. No wire shall be pulled until the conduit system is complete in all details; in the case of concealed work, until all rough plastering or masonry has been completed; in the case of exposed work, until the conduit system has been completed in every detail.

C. All conduit which may under any circumstance contain liquids such as water, condensation, liquid chemicals, etc., shall be arranged to drain away from the equipment served. If conduit drainage is not possible, conduit seals shall be used to plug the conduits. The ends of all conduits shall be temporarily plugged to exclude dust, moisture and debris from entering during construction.

D. Conduit ends exposed to the weather shall be sealed with conduit sealing bushings.

E. Conduits noted as spare shall be capped or plugged at both ends with easily removable fittings.

F. Conduit terminating in NEMA 3R, 4, 4X and 12 enclosures shall be terminated with Myers type conduit hubs.

G. Conduit terminating in pressed steel boxes shall have double locknuts and insulated bushings.

H. Conduits containing equipment grounding conductors and terminating in sheet steel boxes shall have insulated throat grounding bushings.

I. Conduits shall be installed using threaded fittings except for PVC.

J. The use of running threads is prohibited. Where such threads are necessary, a 3-piece union shall be used.

K. All conduits entering or leaving a motor control center, switchboard or other multiple compartment enclosure shall be stubbed up into the bottom horizontal wireway or other manufacturer's designated area, directly below the vertical section in which the conductors are to be terminated. The 3-in extension of conduit above the floor slab or concrete equipment pad may be reduced to a dimension that suits the equipment manufacturer's installation requirements if the 3-in stub-up interferes with the equipment being provided.

L. Rigid galvanized steel conduits buried in earth shall be completely painted with bitumastic.

M. Rigid galvanized steel conduits which have been field cut and threaded shall be painted with cold galvanizing compounds.

N. PVC coated rigid galvanized steel conduit shall be used for elbows at risers at the utility pole for electrical and telephone service conduits. Rigid galvanized steel conduit shall be used at utility pole for electrical and telephone service and fire alarm conduits to a height of 10-ft above finished grade. Furnish and install weather heads at service pole riser if required by utility company.

O. PVC coated rigid galvanized steel elbows shall be used for pad-mounted transformer stub-ups.

P. Conduit sealing and drain fittings shall be installed on all conduits entering and leaving any area containing noxious gases to prevent contamination into clean areas via the conduit system. Areas requiring this protection are: rooms where chlorine or ammonia are stored, generated or heated. A sealing compound installation schedule shall be presented Engineer for approval. Each installation shall be signed off by the Contractor and the Engineer and each fitting shall be legibly marked with red paint to indicate that the sealing compound has been installed.

Q. Liquid-tight flexible metal conduit shall be used for all motor terminations, the primary and secondary of transformers, and other equipment where vibration is present or may require removal. The length of liquid-tight flexible metal conduit shall not exceed 36" when used for vibration isolation, and shall not exceed 72" in length when attaching to luminaires. Non-metallic flexible conduit shall only be allowed for use with rigid PVC conduit systems.

R. Flexible couplings shall be used in hazardous locations for all motor terminations and other equipment where vibration is present.

S. PVC coated rigid steel conduit shall be used as a transition section where concrete embedded conduit stubs out of floor slabs or through below grade walls or where conduit installed under building slabs on grade stub out of floors. The PVC coated rigid steel conduit shall extend a minimum of 3-in into and out of the floor slab, concrete pad, or wall to allow for proper threading of the conduit.

T. Conduit supports, other than for underground raceways, shall be spaced at intervals not exceeding the distance required by the NEC to obtain rigid construction.

U. Single conduits shall be supported by means of one-hole pipe clamps in combination with one-screw back plates, to raise conduits from the surface. Multiple runs of conduits shall be

V. supported on fabricated channel trapeze type racks with steel horizontal members and threaded hanger rods. The rods shall be not less than 3/8-in diameter. Surface mounted panel boxes, junction boxes, conduit, etc., shall be supported by spacers to provide a minimum of 1/2-in clearance between wall and equipment.

W. Conduit Supports (Other than Underground Raceways):

1. Trapezes:

   a. Conduit support trapezes shall be vertically supported every 10-ft or less, as required to obtain rigid conduit construction.

   b. Lateral seismic restraints (Sway Bracing) shall be spaced 30-ft or less.

   c. Horizontal seismic restraints shall be spaced at 40-ft or less. There shall be at least one horizontal restraint per horizontal run.

   d. Attachment to structural steel shall be by beam clamps or welded beam attachment. C-clamps will not be allowed for vertical hangers. Side beam clamps with beam hooks shall be used for seismic restraint only.

   e. Attachment to concrete shall be cast-in-place inserts, cast-in place welded plates with welded studs or stainless-steel adhesive anchors.

2. Flush Mounted Supports:

   a. Support shall be spaced 10-ft or less, as required to obtain rigid conduit construction.

   b. Attachment to concrete shall be with cast-in-place inserts, cast-in place welded plates with welded studs or stainless adhesive anchors.

3. Conduit Racks:

   a. Support shall be spaced 10-ft or less, as required to obtain rigid conduit construction.

   b. Horizontal seismic restraints shall be spaced at 30-ft or less.

   c. Attachment to concrete shall be with cast-in-place inserts, cast-in place welded plate with welded studs or stainless adhesive anchors.

4. Conduit Hangers:

   a. Conduit hangers shall be vertical supported 10-ft or less, as required to obtain rigid conduit construction.

b. Lateral seismic restraints (Sway Bracing) shall be spaced 20-ft or less.

c. Horizontal seismic restraints shall be spaced at 30-ft or less. There shall be at least one horizontal restraint per horizontal run.

d. Attachment to structural steel shall be by beam clamps or welded beam attachment. C-clamps will not be allowed for vertical hangers. Side beam clamps with beam hooks shall be used for seismic restraint only.

e. Attachment to concrete shall be cast-in-place inserts, cast-in place welded plates with welded studs or stainless-steel adhesive anchors.

5. All reinforcing bars shall be located by the Electrical Subcontractor with the use of a rebar locator prior to installing adhesive capsule type anchors. Mark the location of all reinforcing bars in an area bounded by a line drawn at least 18-in from the edge of the support bearing/weld plates on all four sides of the bearing/weld plates prior to fabricating and installing bearing/weld plates.

6. Where interference occurs, adjust anchor locations to clear reinforcing bars and alter support configuration at no additional cost to the Authority.

X. Miscellaneous steel for the support of fixtures, boxes, transformers, starters, contactors, panels and conduit shall be furnished and installed. Channel supports shall be ground smooth and fitted with plastic end caps.

Y. Steel channels, flat iron and channel iron shall be furnished and installed for the support of all electrical equipment and devices, where required, including all anchors, inserts, bolts, nuts, washers, etc., for a rigid installation. Channel supports shall be ground smooth and fitted with plastic end caps.

Z. Provide sway braces for cable trays and busducts. Sway braces shall be U-channel supports installed at a 45-degree angle from the tray or busduct and anchored to the concrete ceiling structure or structural support system. Braces shall be provided on 20-ft spacing centers. Alternate the direction of the bracing supports.

AA. Conduits terminating at a cable tray or busduct shall be supported independently from the busduct or cable tray. Provide a conduit support within 1-ft of the cable tray or busduct. The weight of the conduit shall not bear on the cable tray or busduct.

BB. All conduits on exposed work, within partitions and above suspended ceilings, shall be run at right angles to and parallel with the surrounding wall and shall conform to the form of the ceiling. No diagonal runs will be allowed. Bends in parallel conduit runs shall be concentric. All conduits shall be run perfectly straight and true.

CC. Where conduits pass through openings in walls or floor slabs, the remaining openings shall be sealed against the passage of flame and smoke in accordance with UL requirements and the details shown on the Drawings. The sealing method shall have a UL fire rating, which equals or exceeds the fire rating of the wall or floor construction.

DD. Conduits shall not cross pipe shafts, access hatches or vent duct openings. They shall be routed to avoid such present or future openings in floor or ceiling construction.

EE. Conduits passing from heated to unheated spaces, exterior spaces, refrigerated spaces, cold air plenums, etc., shall be sealed with "Duxseal" as manufactured by Manville or seal fitting to prevent the accumulation of condensation.

FF. Conduits shall be located a minimum of 3-in from steam or hot water piping. Where crossings are unavoidable, the conduit shall be kept at least 1-in from the covering of the pipe crossed.

GG. Mandrels shall be pulled through all existing conduits which will be reused and through all new conduits 2-in in diameter and larger prior to installing conductors.

HH. 3/16-in polypropylene pull lines shall be installed in all new conduits noted as spares or designated for future equipment. Conduit noted as spare shall be capped or plugged at both ends with easily removable fittings.

II. Where no type or size is indicated for junction boxes, pull boxes or terminal cabinets, they shall be sized in accordance with the requirements of NEC Article 314. Enclosure type and material shall be as specified herein.

JJ. Pull or junction boxes shall be furnished and installed where shown on the Drawings, in every 200 feet of straight conduit runs or in runs where more than the equivalent of four 90-degree bends occur or at any point necessary for wire pulling and splicing. Splices shall not be made in pulling elbows.

KK. A conduit identification plate shall be installed on all power, instrumentation, alarm and control conduits at each end of the run and at intermediate junction boxes, manholes, etc. Conduit plates shall be installed before conductors are pulled into the conduits. Exact identification plate location shall be coordinated with the Engineer at the time of installation to provide uniformity of placement and ease of reading. When a master conduit numbering system is used, the conduit t a g numbers shall be exactly as shown on the drawings, if a master conduit numbering system is not used the conduit identification tags shall provide detailed "to" and "from" information.

LL. Place inner duct in the conduit and allow to rest in place for a minimum of 72-hours prior to cutting each end to length.

MM. Place the correct number of maximum sized inner ducts for the conduit with minimum 1/8-in clearance.

END OF SECTION

SECTION 16120

WIRE AND CABLE 600V MAXIMUM

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Furnish, install and test all wire, cable and appurtenances as shown on the Contract Drawings and as specified herein.

1.02 RELATED WORK (NOT USED)

1.03 SUBMITTALS

A. Submittals shall be submitted to the Engineer for review and acceptance prior to construction in accordance with Special Provisions Section 21- Submittals.

B. Samples of proposed wire. Each sample shall have the size, type of insulation and voltage stenciled on the jacket.

C. Installed unapproved wire shall be removed and replaced at no additional cost to the Owner.

1.04 DELIVERY, STORAGE AND HANDLING

A. Carefully handle all conductors to avoid kinks and damage to insulation.

1.05 WARRANTY

A. The manufacturer shall warrant the cable against defects for a period of one (1) year from date of installation and shall remove and replace defective cables at his/her own expense during this warranty period.

PART 2 – PRODUCTS

2.01 GENERAL

A. Wires and cables shall be of annealed, 98-percent conductivity, soft drawn copper.

B. All conductors shall be stranded, except that lighting and receptacle wiring may be solid.

C. Except for control, signal and instrumentation circuits, wire smaller than No. 12 AWG shall not be used.

D. Wire shall have 600-Volt-insulation except where indicated otherwise.

E. Conductors installed in plenums shall be marked PLENUM RATED.

F. All wire of a given type shall be the product of a single manufacturer.

2.02 BUILDING WIRE

A. Wire for lighting, receptacles and other circuits not exceeding 150-Volts to ground shall be NEC type XHHW-2 as manufactured by General Cable, American Insulated Wire Corp., Southwire Co., or equal.

B. Wire for circuits over 150-Volts to ground within buildings and structures shall be NEC type XHHW-2 as manufactured by General Cable, American Insulated Wire Corp., Southwire Co., or equal.

C. Wire for circuits over 150-Volts to ground used underground or for service entrance shall be NEC type XHHW-2, as manufactured by General Cable, American Insulated Wire Corp., Southwire Co., or equal.

D. Bare copper ground wire shall be stranded, tinned soft or annealed copper electrical wire ASTM B33 alloy coated soft copper electrical wire ASTM B189.

E. Equipment grounding conductors shall be NEC Type THW green and sized in accordance with NEC Table 250-122. Ground grid conductors shall be insulated unless shown otherwise on the Contract Drawings.

2.03 CONTROL, STATUS AND ALARM WIRE

A. Wire shall be No.14 AWG NEC type THHN/THWN, stranded as manufactured by The Okonite Co., General Cable., American Insulated Wire Corp., Southwire Co., or equal.

B. 2.04 INSTRUMENTATION WIRE

C. Wire for process instrumentation signals (i.e. 1-5 VDC, 4-20 mA DC), R.T.D., potentiometer and similar signals shall be:

1. Single pair cable:

   a. Conductors: 2 No. 16 stranded and twisted on 2-in lay

   b. Insulation: PVC 600-Volt, 105-degrees C-rating.

   c. Shield: 100% Aluminum/polyester foil with drain wire

   d. Jacket: PVC with UL Subject 13, UL 1581 and manufacturers' identification

   e. Max overall diameter: 0.262-in

   f. Miscellaneous: UL Listed as Instrument Tray Cable/Power Limited Tray Cable (PLTC) for use in accordance with Article 727 and Article 725 of the NEC.

   g. Manufacturers: Belden No. 1030A; Manhattan No. M39119; General Cable No. C0456, The Okonite Co., or equal

2. Three conductor (tri-plex) cable:

a. Conductors: 3 No. 16 stranded and twisted on 2-in lay

b. Insulation: PVC with 600-Volt, 105-degrees C-rating

c. Shield: 100% Aluminum/polyester foil with drain wire

d. Jacket: PVC with UL Subject 13, UL 1581 and manufacturers' identification

e. Max overall diameter: 0.276-in

f. Miscellaneous: UL Listed as Instrument Tray Cable/Power Limited Tray Cable (PLTC) for use in accordance with Article 727 and Article 725 of the NEC.

g. Manufacturers: Belden No. 1031A; Manhattan No. M39120; General Cable No. C0457, The Okonite Co., or equal

3. Multiple pair cables (where shown on the Contract Drawings):

a. Conductor: Multiple 2 No. 22 stranded and twisted on a 2-in lay

b. Insulation: PVC with 600-Volt, 105-degrees C-rating

c. Shield: Individual pairs shielded with 100-percent mylar tape and drain wire

d. Jacket: PVC with UL Subject 13, UL 1581 manufacturers' identification

e. Miscellaneous: UL Subject 13, Type PLTC

f. f. Manufacturers: Belden No. 9330, 9331, 9332, 9333, 9335, 9337; Manhattan No. M39149, M39150, M39151, M39152, M39154, M39156. General Cable No. C0551, C0552, C0553, C0554, C0555, C0556

1. Local Area Network (LAN) Ethernet cable shall be designed for use with a high-speed (100 Mbps/Gbps) Ethernet communications network. The twisted pair cable shall have nominal impedance of 100 ohms at 1-Mhz and a maximum attenuation of 10 dB per 1000 feet at 1 Mhz. The twisted pair cable shall be plenum rated and shall have a minimum of four 24 AWG solid copper conductor pairs. All RJ-45 terminations on the twisted pair cable shall be done as specified by the manufacturer. Terminations shall provide strain relief on the cable jacket. Strain relief on the wire and /or wire insulation shall not be acceptable. Cable and connections shall meet or exceed Category 5 ratings and upon completion of the network installation, the system shall be tested to Category 5 standards. Category 5 cable shall be as manufactured by Belden; Phoenix, Digital, Seicor, or equal.

2.04 SPLICES (POWER CONDUCTORS)

A. Unless otherwise indicated on the Drawings, splices shall not be made in the cables without prior written approval of the Engineer. Where splicing is approved by the Engineer, splicing materials for all 600 Volt splices shall be made with long barrel, tin plated copper compression (hydraulically pressed) connectors and insulated with heavy wall heat shrinkable tubing. The conductivity of all completed connections shall be not less than that of the uncut conductor. The insulation resistance

of all completed connections of insulated conductors shall be not less than that of the uncut conductor.

B. Wire lugs shall be tin plated copper, long barrel compression type (hydraulically pressed) for wire sizes No. 8 AWG and larger. Lugs for No. 10 AWG and smaller wire shall be locking spade type with insulated sleeve. Lugs shall be as manufactured by the Thomas and Betts Co.; Burndy; Amp; or equal.

C. Compression type connectors shall be insulated with a heat shrink boot or outer covering and epoxy filling. Splice kits shall be as manufactured by Raychem (Tyco); Ideal Industries; 3M Co. or equal.

D. Solderless pressure connectors shall be self-contained, waterproof and corrosion-proof units incorporating prefilled silicone grease to block out moisture and air. Connectors shall be sized according to manufacturer's recommendations. The connectors shall be UL listed and CSA approved, as manufactured by King Innovation; Ideal Industries, Inc., or equal.

2.05 TERMINATION AND SPLICES (CONTROL, STATUS AND ALARM CONDUCTORS)

A. Termination connectors shall be of the locking fork-end (upturned leg ends) type as manufactured by Ideal Industries; 3M Co.; Panduit Corp. or equal.

B. Insulated compression type connectors shall be of the expanded vinyl insulated parallel or pigtail type as manufactured by Ideal Industries; 3M Co.; Panduit Corp. or equal.

C. Solderless pressure connectors shall be self-contained, waterproof and corrosion-proof units incorporating prefilled silicone grease to block out moisture and air. Connectors shall be sized according to manufacturer's recommendations. The connectors shall be UL listed and CSA approved, as manufactured by King Innovation; Ideal Industries, Inc or equal.

2.06 TERMINATIONS (INSTRUMENTATION CABLES)

A. Termination connectors shall be of the locking fork-end (upturned leg ends) type as manufactured by Ideal Industries; 3M Co.; Panduit Corp. or equal.

2.07 WIRE AND CABLE MARKERS

A. Wire and cable markers shall be type-written heat shrinkable type as manufactured by the W.H. Brady Co., Thomas & Betts Co., SMS; 3M Co., STD-TAG, or equal.

B. Wire and cables with diameters exceeding the capacity of the "Omni-Grip" shall be marked with pre-printed, self-adhesive vinyl tapes as manufactured by the W.H. Brady Co., Panduit Corp., 3M Co., or equal.

2.08 WALL AND FLOOR SLAB OPENING SEALS

A. Wall and floor slab openings shall be sealed with UL approved expanding material which equals or exceeds the fire rating of the wall or floor construction such as "FLAME-SAFE" as manufactured by the Thomas & Betts Corp., Pro Set Systems, Neer Mfg. Co., Specified Technologies Inc., or equal.

PART 3 – EXECUTION

3.01 PREPARATION (NOT USED)

3.02 INSTALLATION

A. Uniquely identify all wires, cables and each conductor of multi-conductor cables (except lighting and receptacle wiring) at each end and in all manholes, hand holes and pull boxes with wire and cable markers.

B. Use lubrications to facilitate wire pulling. Lubricants shall be UL approved for use with the insulation specified.

C. Provide multi-conductor control and signal cables within the underground system. Cables shall be installed continuous from building to building without splices. Individual control conductors and twisted shielded pairs signal cables will not be allowed in underground systems.

D. The crimping tools used in securing the conductor in the compression type connectors or terminal lugs shall be those made for that purpose and for the conductor sizes involved. The crimping tool shall be the ratchet type which prevents the tool from opening until the crimp action is completed. Such tools shall be a product of the connector manufacturer.

E. Install an equipment grounding conductor in all raceways.

F. Seal openings in slabs and walls through which wires and cables pass.

G. Pull cables from the direction that requires the least tension. Use a feed-in tube and sheave designed for cable installation. Use sheaves with radii that exceed the cable manufacturer's recommended minimum bending radius. Use a dynamometer and constant velocity power puller. Velocity should not be less than 15-ft./min. or more than 50-ft./min. Do not exceed the cable manufacturer's maximum recommended tension.

H. If cable cannot be terminated immediately after installation, install heat shrinkable end caps.

I. Fireproof exposed cables in manholes, vaults, pullboxes, switchgear and other areas not protected by conduit where medium voltage cables are present. Use fire-proofing tape and glass tape in accordance with the manufacturer's instructions. Fire-proofing tape shall be installed with one half-lapped layer of Scotch Brand 77 Electric Arc and Fireproofing Tape (3M Corp., or equal). Tape shall be secured with a two-layer band of Scotch Brand 69 Glass Electrical Tape (3M Corp., or equal) over the last wrap.

3.03 WIRE COLOR CODE

A. All wire shall be color coded or coded using electrical tape in sizes where colored insulation is not available. Where tape is used as the identification system, it shall be applied in all junction boxes, manholes and other accessible intermediate locations as well as at each termination.

B. The following coding shall be used:

System	Wire	Color
240/120 Volts	Neutral	White
Single-Phase, 3 Wire	Line 1	Black
	Line 2	Red
208Y/120, Volts	Neutral	White
3 Phase, 4 Wire	Phase A	Black
	Phase B	Red
	Phase C	Blue
240/120 Volts	Neutral	White
3-Phase, 4-Wire Delta, center tap, ground on phase coil A-C	Phase A	Black
	Phase B (High)	Orange
	Phase C	Blue
480Y/277 Volts 3 Phase, 4 Wire	Neutral	White
	Phase A	Brown
	Phase B	Orange
	Phase C	Yellow

C. Neutral or ground wires that terminate in a Panelboard and require color tape shall have the color tape extend at least 6-in from the termination point.

3.04 TERMINATIONS AND SPLICES

A. Power conductors: Unless otherwise indicated on the Drawings, no splices may be made in the cables without prior written approval of the Engineer. Where splicing is approved, terminations shall be die type or set screw type pressure connectors as specified. Splices (where allowed) shall be die type compression connector and waterproof with heat shrink boot or epoxy filling for copper conductors # 4 AWG and larger. Splices shall be solderless pressure connectors with insulating covers for copper conductors # 6 AWG and smaller. Aluminum conductors (where specified) shall employ terminations and splices specifically designed for aluminum conductors.

B. Control Conductors: Termination on saddle-type terminals shall be wired directly with a maximum of two conductors. Termination on screw type terminals shall be made with a maximum of two spade connectors. Splices (where allowed) shall be made with insulated compression type connectors.

C. Instrumentation Signal Conductors (including graphic panel, alarm, low and high-level signals): terminations same as for control conductors. Splices allowed at instrumentation terminal boxes only.

D. Except where permitted by the Engineer no splices will be allowed in manholes, handholes or other below grade located boxes.

E. Splices shall not be made in push button control stations, control devices (i.e., pressure switches, flow switches, etc.), conduit bodies, etc.

3.05 INSTRUMENTATION CABLES

A. Instrumentation cables shall be installed in rigid steel raceways as specified. All circuits shall be installed as twisted pairs or tri-plexed. In no case shall a circuit be made up using conductors from different pairs or tri-plexes. Tri-plex shall be used wherever three wire circuits are required.

B. Terminal blocks shall be provided at all instrument cable junction and all circuits shall be identified at such junctions.

C. Shielded instrumentation wire, coaxial, data highway, I/O and fiber optic cables shall be run without splices between instruments, terminal boxes, or panels.

D. Ground shielding on instrumentation wires at one end only as recommended by the instrument manufacturer and isolated at all other locations. Terminal blocks shall be provided for

E. inter-connecting shield drain wires at all junction boxes. Where individual circuit shielding is required, each shield circuit shall be provided with its own block.

F. Install shielded instrumentation wire in conduit and pull boxes that contain only shielded instrumentation wire. Instrumentation cables shall be separated from all other (i.e. power, control, etc.) cables in manholes by enclosing them within rigid steel raceways and boxes.

G. Shielded cable terminations at each end shall be provided with heat shrinkable tubing placed over the exposed shield and conductors. The tubing shall extend 1-in minimum over the jacket end and extend 0.5-in minimum from the jacket end over the exposed conductors.

3.06 FIELD TESTING

A. Test all 600 Volt wire insulation with a meg-ohm meter after installation and prior to termination. Make tests at not less than 1000 Volts DC. Test duration shall be one minute. Submit a written test report of the results to the Engineer. Notify the Engineer in writing 48 hours prior to testing.

B. Field testing and commissioning shall be done in accordance with the latest revision of the "Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems" published by the International Electrical Testing Association (NETA Standard ATS-2009) unless otherwise modified by this Section. Minimum wire insulation resistance shall not be less than 250 Meg-ohms.

END OF SECTION

SECTION 16191

MISCELLANEOUS EQUIPMENT

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Furnish and install all miscellaneous equipment as shown on the Drawings and as specified herein.

1.02 EQUIPMENT LIST

A. This Section provides the requirements for miscellaneous equipment typically employed in a facility, however, not all components specified in this Section are necessarily utilized on this project.

1.03 SUBMITTALS

A. Submittals shall be submitted to the Engineer for review and acceptance prior to construction in accordance with Special Provisions Section 21- Submittals.

B. Detailed catalog information or drawings describing electrical and physical characteristics of all equipment specified in sufficient detail to show compliance with the Drawings and Specifications.

1.04 REFERENCE STANDARDS

A. Equipment enclosures shall have NEMA ratings suitable for the location in which they are installed, as specified in Section 16020.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Disconnect Switches:

1. Disconnect switches shall be heavy-duty, quick-make, quick-break, visible blades, 600-Volt, 3 Pole with full cover interlock, interlock defeat and flange mounted operating handle. All current carrying parts shall be copper

2. NEMA 4 enclosures shall be painted steel.

3. NEMA 4X enclosures shall be stainless steel.

4. Switches shall be as manufactured by the Square D Co., General Electric, Eaton Electrical, or equal.

B. Fused Disconnect Switches:

1. Fused disconnect switches shall be heavy-duty, quick-make, quick-break, visible blades, 600 Volt, 3 Pole with full cover interlock, interlock defeat and flange mounted operating handle. All current carrying parts shall be copper.

2. Fuses shall be rejection type, 600 Volts, 200,000 A.I.C., dual element, time delay, Bussman Fusetron, Class RK-5 or equal.

3. NEMA 4 enclosures shall be painted steel.

4. NEMA 4X enclosures shall be stainless-steel .

5. Switches shall be as manufactured by the Square D Co., General Electric, Eaton Electrical, or equal.

C. Horsepower Rated, Toggle Switch Type Disconnect Switch:

1. Toggle type disconnect switches shall be manufactured of thermoplastic materials with screw-type terminals. The switches shall be rated 600 VAC and 20A at 600 VAC.

2. Toggle type disconnect switches shall be similar to a manual non-reversing starter without overloads and shall be 3 Pole, capable of "on-off" control of a 10-horsepower motor at 460-VAC.

3. Enclosure shall be provided with lock off provisions.

4. NEMA 4 enclosures shall be die-cast zinc.

5. Switches shall be as manufactured by the Square D Co., Siemens Electrical Products, Eaton Electrical or equal.

D. Control Stations:

1. Control stations shall be heavy-duty type, with full size (30mm) operators. Stop buttons shall have a lockout latch that can be padlocked in the open position.

2. NEMA 4 enclosures shall be painted steel.

3. NEMA 4X enclosures shall be stainless-steel.

4. Control stations shall be Square D Class 9001, similar by Eaton Electrical, General Electric Co., or equal.

E. General Purpose Dry Type Transformers:

1. Transformers shall be dry type, two-winding with kVA and voltage ratings as shown on the Contract Drawings. Transformer shall incorporate a 220-degree C insulation system and be designed not to exceed 115-degrees C temperature rise above a 40-degree C ambient full load.

2. Four full capacity taps shall be furnished, two 2-1/2 percent above and two 2-1/2 percent below rated primary voltage.

3. Windings shall be copper.

4. Transformers shall be built in accordance with ANSI C89.2, and shall be UL listed.

5. Transformers shall be energy efficient type, meeting the efficiency levels specified in NEMA Standard TP1-2002. Efficiency shall be tested in accordance with TP1-2002.

6. Transformers shall be furnished in NEMA 1 enclosures unless otherwise noted on the Drawings. Areas where a NEMA 4X and/or stainless-steel enclosure is required, the transformer shall be of the TENV type.

7. Transformers shall be furnished with hot-dipped galvanized mounting hardware. In NEMA 4X areas or where stainless-steel enclosures are required, hardware shall be Type 316 stainless-steel.

8. Transformers shall have common core construction with low hysteresis and eddy current losses. The core flux density shall be below the saturation point to prevent overheating caused by harmonic distortion.

9. Transformer impedance shall be a minimum of 3 percent and a maximum of 5 percent.

10. Provide vibration isolators for transformers rated 112.5 kVA and higher.

11. Provide ground lug on frame and strap ground core assembly to frame of enclosure.

12. The neutral bus shall be sized and configured for 200-percent of secondary full load current.

13. Transformers shall be manufactured by Square D Co., General Electric Co., Eaton Electrical, or equal.

F. Surge Protective Devices (SPD)

1. SPDs shall be UL 1449, 3rd Edition listed.

2. Each protection device shall have a capacitive filtering system connected in each Line to Neutral (L→N)(Wye) mode or Line to Line (L→L)(Delta) mode to provide EMI/RFI noise attenuation.

3. Protection modes: The SPD shall provide Line to Neutral (L→N)(Wye), Line to Ground (L→G)(Wye or Delta), Line to Line (L→L)(Delta) and Neutral to Ground (N→G)(Wye) protection.

4. SPD shall contain a technology that utilizes multiple thermally protected metal oxide varistors (MOV) per mode.

5. All primary transient paths shall utilize copper wire, aluminum bus bar and lugs of equivalent capacity to provide equal impedance interconnection between phases. No plug-in module or components shall be used in surge carrying paths.

6. MCC SPDs shall be:

a. SPD shall be a multi-stage parallel protector. Refer to one-line diagram and panelboard schedule to confirm voltages. SPD's minimum surge current capacity shall be 160 kA per phase (L-N plus L-G) and 200 kA per mode (L-N, L-G, L-L and N-G).

b. SPD shall be modular design with field replaceable modules per phase. Each protection module shall have a visual indicator that signifies that the protection circuitry is powered. The unit shall not be taken off line to verify integrity of system. Redundant status indicators shall be mounted on the front of the door that monitors the system protection circuitry.

c. SPD shall be labeled as minimum Type 2. Every component of every mode, including N-G, shall be protected by internal thermal protection. SPDs relying upon external or supplementary installed safety overcurrent protection do not meet the intent of this specification.

d. SPD shall provide the following monitoring features: dry contacts, digital surge counter and audible alarm with alarm disable switch. Equipment shall utilize a NEMA 12 enclosure.

e. SPD shall be provided with an integral disconnect switch.

f. SPDs shall be as manufactured by Eaton, LEA International Inc., or approved equal.

G. Wireway:

1. NEMA 1 wireway shall be painted steel with screw covers.

2. NEMA 4 and 4X wireway shall be stainless steel with gasketed screw covers and stainless-steel screws.

3. NEMA 1 wireway shall be Square-Duct as manufactured by the Square D Co.; NEMA 4 and 4X shall be Bulletin F-22 as manufactured by the Hoffman Engineering Co., Appleton, Killark, or equal.

H. Control Relays:

1. Control relays shall be heavy duty machine tool type, with 10-Amp, 300-Volt convertible contacts. Number of contacts and coil voltage shall be as shown on the Drawings. General use relays shall be General Electric Co., Catalog No. CR120B; similar by Square D Co.; Allen-Bradley Co., or equal. Latching relays shall be General Electric Co., Catalog No. CR120BL; similar by Square D Co.; Allen-Bradley Co. or equal.

2. Time delay relays shall be pneumatic, 600-Volt, 20-amp contacts, with calibrated knob operated adjustment. On delay and off delay types and timing ranges shall be as shown on the Drawings. Relays shall be Agastat Model 7012 or 7022; similar by Square D Co., Eaton Electrical, or equal.

I. Terminal Blocks:

1. Terminal blocks shall be NEMA type rated at 20-amperes minimum, 600-Volt, channel mounted, with tubular screw and pressure plate.

2. Terminal blocks shall be Bulletin 1492 as manufactured by the Allen-Bradley Co., ABB, Kukla, or equal.

J. Equipment Identification Nameplates:

1. All field mounted electrical equipment such as disconnects, push button stations, etc., shall be provided with a weather resistant engraved laminoid equipment identification nameplate screwed or bolted adjacent to the device. Nameplate shall identify the mechanical equipment controlled exactly as shown on the electrical single-line drawings (i.e, P-95 Cooling Water Pump No. 1).

K. Equipment Mounting Stands:

1. Equipment mounting stands shall be custom fabricated from 1/4-in steel plate and 4-in steel channel, as shown on the Drawings. For NEMA 4X areas or where stainless-steel enclosures are required mounting stands and channels shall be Type 316 stainless-steel.

2. Hot dip galvanizing shall conform to the requirements of Division 5.

L. Rubber Floor Mats:

1. Furnish and install a non-conductive elastomer compound rubber floor mat extending the full length and placed in front of and in back of the new MCC06.

2. Mats shall be in accordance with ASTM D178, Type II, Class 2, 1/4-in thick minimum, 36-in wide with corrugated surface and shall be branded continuously on the back.

3. Mats shall have the following ratings:

a. a. Voltage phase to phase: 17,000 V RMS

b. b. AC Proof Test Voltage: 20,000 V RMS

c. c. DC Proof Test Voltage: 50,000 V Average

4. Type II mats shall be ozone, flame and oil resistant.

5. Install mats in one continuous piece. Where equipment faces each-other and is less than 6-ft apart, provide one width of mat.

6. Mats shall be stored without distortion, free from direct sun light or sources of ozone and at a temperature not to exceed 95-degrees F (35-degrees C).

M. Arc Flash Protection Warning Signs: Arc Flash Study will be performed by others and any implementation of labels and revision of breaker settings will be performed by others.

N. Electric Warning Sign:

1. Provide and install using stainless steel fasteners a total of 2 restrictive signs that conform with OSHA regulations for accident prevention. Size of sign: 10-in high by 14-in wide. Sign shall state "DANGER HIGH VOLTAGE". Sign shall be constructed of High Performance Plastic (HPP) by the Seton Name Plate Corp., Global Equipment Co., World- wide Sign Co., or equal.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Mounting Stands:

1. Field mounted disconnects, pushbutton control stations, alarm panels, enclosed starters and circuit breakers, transformers, automatic transfer switches, wireways, contactors, terminal boxes, junction and pull boxes shall be mounted on galvanized or stainless-steel stands as specified. Where clearance requirements for stands may not be maintained, the Engineer may direct electric control equipment to be wall-mounted adjacent to the driven equipment, but in no case shall the distance from the drive motor to the control station exceed 3-ft, all at no additional cost to the Owner.

2. All floor mounting stands, bracing, anchor bolts and appurtenances furnished to support equipment loads, dynamic loads, wind loads and seismic forces shall conform to the latest applicable requirements of the State Building Code in effect at the time of Bid.

3. All wall mounted brackets, bracing, bolts and appurtenances to support equipment loads dynamic loads, wind loads and seismic forces shall conform to the latest applicable requirements of the State Building Code in effect at the time of Bid.

4. Channel supports shall be ground smooth and fitted with plastic end caps.

B. All panelboards located in pedestal cabinets or outdoors and panelboards that have branch circuits feeding exterior to the building shall be equipped with lightning arresters and surge capacitors.

3.02 FIELD TESTING

A. Before supplying power to the alarm panels, the following tests shall be done: Verify that all wiring connection interfaces that are required are present. Check for secure connections. Using a continuity device, verify that all discrete inputs and output to and from the control panel are wired in correct polarity and are operating in the correct state of operation (normally open or closed state). Check for any direct short circuits across all voltage supply sources. As each of the above tests are performed, the Electrical Contractor shall highlight and initial each circuit that is tested. This set of prints shall be signed and left inside the enclosure.

B. Check mechanical interlocks for intended operation. Make any adjustments required.

C. In the event of an equipment fault in the panel, notify the Engineer immediately. After the cause of the fault has been identified and corrected, a joint inspection of the equipment shall be conducted by the Contractor and Engineer. Repair or replace the equipment as directed by the Engineer prior to placing the equipment back into service at no additional cost to the Owner.

END OF SECTION

SECTION 16280

LOW VOLTAGE ACTIVE HARMONIC FILTER SYSTEM

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. This specification defines the electrical and mechanical characteristics and performance requirements for Active Harmonic Filter (AHF) and current transformers (CT's) used with the AHF.

1.02 RELATED DOCUMENTS

A. Section 13330 – Control Panel Enclosures and Panel Equipment

B. Section 16020 – Electrical Specifications

C. Section 16480 – Low Voltage Motor Control Center

D. Section 16191 – Miscellaneous Equipment

1.03 REFERENCES

A. The AHF shall be designed in accordance with the applicable sections of the following documents. When a conflict arises between these documents and statements made herein, the statements made in this specification shall govern.

1. UL1449 – 4rd Edition (2014), C22.2 No. 233.1-87 (Surge withstand capacity)

2. CSA 22.2, No. 14 & 66 [CSA requirements for power electronics]

3. ANSI IEEE Std 519-2014 [Harmonic limits]

4. UL 508 [UL requirements for power conversion equipment]

5. IEC 60529, IP00, IP20 (NEMA 1) [type of enclosure]

6. NEMA 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)

1.04 SUBMITTALS

A. Submittals shall be submitted to the Engineer for review and acceptance prior to construction in accordance with Special Provisions Section 21- Submittals.

B. Shop drawings shall be furnished for engineering approval prior to factory assembly of AHF. These drawings shall consist of enclosure outline drawings. The enclosure drawings shall include front, side, top, and bottom views of the enclosures with overall dimensions, and conduit entrance locations.

C. Standard catalog sheets shall be furnished for each different size and enclosure assembly of AHF showing voltage, current rating.

D. Standard catalog sheets shall be provided for the CT's utilized.

E. Documents to be provided upon delivery of AHF shall include two (2) sets of Installation Manuals. Manuals shall include a functional description of equipment with block diagrams, safety precautions, and installation instructions.

1.05 WARRANTY

A. The AHF manufacturer shall warrant products against defects in material and workmanship for a period of 18 months from date of shipment or one year from the date of installation, whichever occurs first.

1.06 QUALITY ASSURANCE

A. Prior to shipment, the manufacturer shall fully test the performance at full current and voltage while functioning as a harmonic correction device to assure compliance with equipment specifications defined herein.

B. A certified report shall be provided to the owner of successful completion of performance tests, upon request.

PART 2 – PRODUCT

2.01 2.01 MANUFACTURERS

A. The manufacturer of the AHF shall be Eaton Corporation or approved equal. Substitutions must be submitted in writing three weeks prior to original bid date with supporting documentation demonstrating that the alternate manufacturer meets all aspects of the specification herein.

B. Passive devices employing power factor capacitors and line reactors with contactor or thyristor switching of stages are not permitted.

2.02 2.02 GENERAL DESCRIPTION

A. The AHF shall be defined as a power electronic device consisting of power semiconductors known as insulated gate bipolar transistors (IGBT) that switch into the AC lines to modulate its output to mitigate detrimental harmonic current and correct the displaced reactive current for the power source. A DC bus shall store power for power semiconductor switching. A microprocessor shall control the operation of the power converter. The converter design shall be a three-level design to optimize performance and minimize heat losses. The AHF shall be packaged with an autotransformer at rated mains voltage above 480-VAC.

2.03 CONSTRUCTION

A. AHF chassis mount shall be provided such that the AHF is provided as part of a Motor Control Center.

2.04 2.04 SEISMIC QUALIFICATION

A. A certificate of compliance shall be provided for each size and enclosure type to the seismic provisions of the IBC (International Building Code) and ASCE/SEI 7 (American Society of Civil Engineers/Structural Engineering Institute Seismic Performance Requirements).

B. The seismic ratings shall meet the site-specific requirements of the installed location as determined by the latest edition of IBC, NFPA 5000, CBC (California Building Code), and ASCE/SEI 7.

C. Seismic code compliance testing shall be in accordance with ICC ES AC156 Shake-Table Test Acceptance Criteria protocol with an importance factor of at least 1.5.

D. All anchorage, lateral bracing, and mounting guidelines shall be specified with AHF instruction documentation and/or markings.

E. The manufacturer shall exhibit a seismic qualification label on the equipment stating compliance to these requirements.

2.05 2.05 APPLICATION DATA

A. TDD and THDv performance shall be limited to not more than 5% as contributed by the loads at the location of each AHF.

B. THDi performance shall be limited to not more than 3% as long as AHF is 50% or more loaded and all nonlinear loads have 3% or larger input impedance. A THDi set point may be set to optimize THDi performance.

C. Displacement power factor (PF) shall be corrected to 0.95 or better at the location of each AHF.

D. All nonlinear loads shall have input line reactors included that are rated 3% or higher impedance (inductance).

2.06 2.06 ENVIRONMENTAL RATINGS

A. AHF shall be designed to operate continuously in an environment of 0^0 to 40^0 C ambient temperatures.

B. Storage conditions shall have a temperature range of -40^0 to 65^0 C and be clean and dry.

C. AHF shall with stand a relative humidity of not more than 95%, non-condensing.

D. AHF shall be full rated at a maximum altitude of 1000-meters (3300-feet). Above 1000 meters, a derating factor of 1% per 100-meters shall apply.

E. AHF shall not exceed an audible noise level of 80 decibels at one meter from enclosure.

F. System environmental conditioning requirement shall not exceed 7.1kW at 480VAC.

2.07 2.07 RATINGS

A. AHF shall be designed to operate from an input voltage of 380 to 480 VAC, plus 10% minus 15%.

B. AHF shall be designed to operate with a voltage frequency of 60 Hertz +/- 3 Hertz.

C. AHF shall be phase rotation insensitive. AHF shall detect phase rotation and align output accordingly.

D. AHF heat losses defined as maximum kW loss divided by maximum kvar output, and shall not exceed more than 3.5% at 480VAC.

2.08 2.08 PROTECTION

A. AHF shall be UL listed according to UL508 and CSA listed according to CSA 22.2, No. 14 & 66.

B. AHF floor mount units shall include a door-interlocked circuit breaker rated at a minimum 100 kAIC (UL rated) up to 600-VAC.

C. AHF shall be designed with a current limiting function to protect the IGBT's.

1. When the current limit level is attained, a message shall be displayed indicating the output capacity is at-maximum capacity and actuate the at-maximum capacity relay.

2. Operation shall continue indefinitely at this level without trip or degradation of AHF.

D. AHF shall have automatic restart capability upon power loss return and fault resets.

1. Fault trip limit shall occur after 5 restarts within a 5-minute period.

2. Automatic restart shall occur for the following faults and may include other faults: AC line over voltage, AC line under-voltage, AC line power loss, and AC line phase imbalance, over temperature, under temperature, and DC bus over voltage.

E. Upon occurrence the fault trip limit, AHF shall stop output current production and lock out restart until the fault is manually cleared.

F. AHF shall incorporate an over-temperature output roll back that reduces the total output current to reduce power component heating to maintain maximum current correction within the electrical system.

G. AHF shall incorporate protective shutdown when air inlet temperature reaches 51° C.

2.09 GRAPHIC DISPLAY TERMINAL

A. AHF shall have a door mounted human machine interface (HMI) with touch screen control rated NEMA 4-12 (IP65), dust tight and liquid resistant. (AHF is not suitable for outdoor use.)

B. HMI shall provide run/stop control from every screen.

C. HMI shall provide an oscilloscope feature to display specific parameters.

1. HMI shall display the mains voltage and current waveforms.

2. Performance trend information shall be displayed for load total rms current, load rms harmonic current per phase, AHF output harmonic current per phase, AC mains voltage per phase, THDi, TDD, THDv, load rms reactive current, and AHF output rms reactive current.

3. Bar graphs shall be provided for display of the mains and load harmonic current amplitudes per harmonic order.

4. Selected internal waveforms shall be provided for diagnostic and performance checks.

5. All parameter adjustment shall be made via HMI and are password protected.

6. HMI shall record and display an event log with time and date stamp. Event log shall be cleared manually by the user. A minimum 100 events shall be stored.

D. HMI shall provide external communications via a RJ45 connector.

1. Modbus TCP/IP provides remote run/stop and display of all operating parameters, set up parameters and diagnostic functions.

E. HMI shall have a safety feature that locks out all other forms of control during service and commissioning.

1. HMI must relinquish control to any other method of control.

F. HMI shall display a flashing warning screen in the event of a fault with full fault description. Error codes alone shall not be acceptable.

G. HMI shall download all pertinent parameters to a externally accessible USB memory device to permit remote diagnostic evaluations and to save unit set up parameters.

H. HMI shall include an on-board Commissioning Guide with automatic detection features.

1. AHF shall automatically check and indicate AC line phase rotation.

2. AHF shall automatically test for current transformers (CT) phase rotation and polarity. If installation is incorrect AHF shall compensate for phase rotation and orientation of CT's. If proper alignment cannot be achieved, a fault warning and lock out of operation shall occur.

3. AHF shall automatically calibrate the CT for optimum harmonic cancellation performance.

4. AHF shall perform a system integrity test at full capacity for a period of 15 minutes to validate installation.

5. In the event any of the above cannot be reconciled, HMI shall lock out AHF function until commissioning agent corrects, verifies and clears each issue.

2.10 2.10 FUNCTION OF AHF

A. AHF shall monitor the load current utilizing two current transformers (CT's) mounted on the AC lines for three phase loads. If phase to neutral loads are connected on a 4-wire system, three CT's are required.

1. AHF shall analyze the content of the load current for harmonics from the 2nd to the 51st harmonic and determine the reactive current content representing displacement power factor.

2. AHF shall be field selectable to operate as a harmonic filter or provide power factor correction or both.

3. AHF shall be capable of open loop or closed loop operation.

4. AHF amperage output ratings shall be a minimum of 60-Amps at 480-VAC

B. AHF shall provide for load balancing of AC lines current for harmonic and reactive currents regardless of actual load distribution per phase.

C. AHF shall have a NO (normally open) dry contact as secondary run/stop function.

2.11 CURRENT TRANSFORMERS

A. Current transformers shall be installed as defined by design engineer documentation.

B. A minimum of two current transformers per AHF location are required and mounted on phases A & B of the mains. If phase to neutral loads are connected on a 4-wire system, three CT's are required.

C. Current ratings of the current transformers shall be according to full load current rating of the circuit on which installed.

D. The secondary current rating shall be 5 amperes.

E. Current transformers rated for 50 to 400-Hertz shall be used.

F. 1% or better (metering class) accuracy shall be provided.

G. Current transformers shall be dedicated for AHF operation and not shared with other system components.

PART 3 – EXECUTION

3.01 3.01 INSPECTION

A. Verify that the site is ready to receive equipment.

B. Verify site has adequate space to installed provided equipment.

C. Verify site conditions meet and can be maintained to equipment manufacturer's required service conditions.

3.02 3.02 PROTECTION

A. Before and during installation, the equipment shall be protected against site contaminants.

3.03 3.03 INSTALLATION

A. Installation shall comply with manufacturer's instruction, drawings, and recommendations.

B. AHF requiring additional footprint because of side ventilation shall not be acceptable.

C. The AHF manufacturer shall provide a certified technical service representative to review the contractor's installation and commission the AHF. This shall be quoted as a separate line item.

3.04 3.04 TRAINING

A. An on-site training course of 1 day shall be provided for plant maintenance personnel by an authorized representative of the AHF manufacturer. This shall be quoted as a separate line item.

B. Testing and startup shall not be combined with training. Testing and start-up time shall not be used for manufacturer's warranty repairs.

END OF SECTION

SECTION 16480

LOW VOLTAGE MOTOR CONTROL CENTER

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Disconnect and demolish the existing MCC06 as shown on the Contract Drawings.

B. Furnish and install the new MCC06 equipment as shown on the Contract Drawings and as specified herein.

C. Motor Control Center shall fit at the existing location as shown on the Contract Drawings.

D. Existing Conditions (Info Only): The original Motor Control Center is a GE 7700 NEMA 1A unit manufactured by General Electric. An additional General Electric 8000 MCC structure was added in 1983 and an additional Westinghouse Five Star MCC structure was added in 1986.

1.02 RELATED DOCUMENTS

A. Section 02050 – Demolition and Modifications

B. Section 13330 – Control Panel Enclosures and Panel Equipment

C. Section 16020 – Electrical Specifications

D. Section 16191 – Miscellaneous Equipment

E. Section 16280 - Low Voltage Active Harmonic Filter (AHF)

F. Section 16483 – Variable Frequency Drive (VFD)

G. Division 03 - Concrete repairs and modifications for equipment pad

H. Division 13 - Distributed Control System (DCS)

1.03 SUBMITTALS

A. Submittals shall be submitted to the Engineer for review and acceptance prior to construction in accordance with Special Provisions Section 21- Submittals.

B. Shop drawings which include the following information:

1. Master drawing index.

2. Front elevation view.

3. Floor plan layout.

4. Top view.

5. Dimensions, weight, and shipping splits.

6. Single line diagrams.

7. Schematic diagrams.

8. Nameplate schedules.

9. Component list including metering, protective devices, accessories and control equipment.

10. Conduit entry/exit locations.

11. Assembly ratings including:

    a. Short-circuit rating;

    b. Voltage;

    c. Continuous current, and;

    d. Bus material and ratings.

12. Major component ratings including:

    a. Voltage;

    b. Continuous current, and;

    c. Interrupting ratings.

13. Cable terminal lug sizes.

14. Product data sheets and catalog numbers for circuit breakers and trip units. List all options, trip adjustments and accessories furnished specifically for this project.

C. Submit the following additional information:

1. Key interlock scheme drawing and sequence of operations

2. Class I-S and II-S motor control centers: custom drawings supplied by the manufacturer shall convey the same information as drawings provided with Class I and II motor control centers, additionally modified to include all existing and new electrical field devices and wiring in the control circuit. Coordinate nomenclature and tagging with Division 13 shop drawings. Provide the following:

    a. Unique control drawings for each unit.

    b. Ratings for all devices.

    c. Wire rung numbers.

d. Spare relay contacts.

e. Identify electrical field devices with loop tag numbers.

f. Identify all field conductors with unique wire numbers at every termination point, including spares.

g. Identify all terminal numbers.

h. Coordinate with shop drawings furnished under other Sections to show the complete circuit.

i. Coordinate with existing equipment to show the complete circuit.

D. Design Data:

1. Provide manufacturer's published time-current curves of the main breaker and feeder devices.

2. Provide seismic anchoring details, coordinated with the equipment mounting provision, prepared and stamped by a licensed professional engineer. Mounting recommendations shall be based upon manufacturer's shake table tests used to verify the seismic design of the equipment.

E. Test Reports:

1. Furnish documentation showing the results of design tests on similar motor-control or motor-circuit protector (MCP) units under actual conditions in lieu of factory tests on the actual units provided.

2. Submit field test reports showing results of testing performed on the actual equipment for this project.

F. Submit manufacturer's installation instructions for the complete assembly and each major component:

a. Shipping, storage, and handling instructions.

b. Installation bulletins

c. Supplemental instruction bulletins.

d. Application software

e. Instructions necessary for proper seismic mounting of the equipment.

G. Statement of Qualifications:

1. When requested, submit qualifications of factory service representatives for approval.

2. When requested, submit an acceptable list of installations with similar equipment to demonstrate compliance with this specification.

H. Manufacturer's Field Report:

1. When requested, submit manufacturer’s field inspection reports.

I. Project Record Documents:

1. Submit record document information.

2. Submit the following information for record purposes:

a. A complete set of manufacturers’ "As Built" shop drawings incorporating all changes made during the manufacturing process.

b. "As Built" point-to-point compartment wiring diagrams. Show wire and terminal numbers.

c. Field wiring interconnection drawings illustrating all field components and electric connections to the systems supplied under this Section.

d. Confirm and record all protective device settings.

3. Furnish electronic copies of motor control center drawings, one-lines, and wiring diagrams in AutoCAD native file format. Drawings shall include any field modifications or changes to reflect actual as built conditions after completion of startup and final acceptance by the Owner.

J. Operation and Maintenance Data:

1. Submit operation and maintenance manuals.

2. Provide equipment operation and maintenance manuals with each shipped assembly including instruction leaflets, instruction bulletins and renewal parts lists for the complete assembly and each major component.

3. Manuals shall include the following as a minimum:

a. A comprehensive index.

b. A list of the equipment supplied, including serial numbers, ranges and pertinent data.

c. Full product specifications for each item.

d. Service, maintenance and operation instructions for each item.

e. Special maintenance requirements specific to this system shall be clearly defined, along with set up and test procedures.

f. Renewal parts list with stock numbers.

1.04 REFERENCES

A. The Motor Control Center and all components shall be designed, manufactured and tested in accordance with the latest applicable standards of NEMA, ANSI/IEEE, NETA, and UL.

B. Where reference is made to one of the above standards, the revision in effect at the time of the bid shall apply.

1.05 QUALITY ASSURANCE

A. Qualifications:

1. The motor control center equipment shall be designed, assembled and tested by the manufacturer of the major components and circuit protective devices used within the motor control center assembly.

2. The manufacturer of this equipment shall have produced similar electrical equipment for a minimum period of five (5) consecutive years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided to demonstrate compliance with this requirement.

B. Regulatory Requirements:

1. Equipment, materials, installation, and workmanship shall be in accordance with the mandatory and advisory provisions of NFPA 70 (NEC) unless more stringent requirements are specified or indicated.

2. The equipment and major components shall be suitable for and certified to meet all applicable seismic requirements of the International Building Code (IBC) for Zone 4 application. Guidelines for the installation consistent with these requirements shall be provided by the manufacturer and be based upon testing of representative equipment. The test response spectrum shall be based upon a 5% minimum damping factor, IBC: a peak of 2.45g's (3.2-11 Hz), and a ZPA of 0.98g's applied at the base of the equipment. The tests shall fully envelop this response spectrum for all equipment natural frequencies up to at least 35 Hz.

C. Certifications:

1. The manufacturer shall maintain a documented ISO 9001 or 9002 quality assurance program implementing suitable procedures and controls to monitor all aspects of production and testing.

2. All sections and devices shall be UL listed and labeled. Service equipment shall be UL labeled as suitable for use as service entrance equipment.

3. The equipment manufacturer shall certify that the equipment will function following a seismic event, including both vertical and lateral required response spectra referenced in the specified codes.

1.06 SYSTEM DESCRIPTION

A. General:

1. It is the intent of these Contract Documents that the Contractor furnish and install, where indicated, totally enclosed, free-standing, dead-front type motor control centers with one or more vertical sections in which combination motor control units, transformers, panels, and associated control equipment units are group-mounted in an integrated assembly as specified herein and as shown on the Contract Drawings.

B. System Responsibility:

1. Equipment specified under this Section shall be furnished as an integrated assembly by the manufacturer who shall have sole responsibility for furnishing all the parts and components required for a complete and operable system.

C. Design Requirements:

1. Wiring method: NEMA Class II-S, Type B.

a. Class II motor control centers shall be the same as Class I motor control centers except with the addition of manufacturer-furnished electrical interlocking and wiring between units per the control system diagrams. Furnish drawings that indicate factory interconnections within the motor control center.

b. Class I-S and II-S motor control centers shall be the same as Class I and Class II motor control centers except custom drawings shall be provided in lieu of standard drawings. Provide control systems engineering to produce custom unit elementary Drawings showing inter-wiring and interlocking between units and to remotely mounted devices. Show all field devices, switches, lights, wire and terminal numbers. Indicate special identifications for electrical devices per the Contract Drawings. AutoCAD produced Drawings shall be provided.

c. Type B wiring: field wiring connects to unit terminal blocks located in or adjacent to each combination motor control unit. Type B wiring for combination motor-control units Size 3 and smaller shall be designated as Type B-D or B-T, as follows:

1) Type B-D: field connections directly to the device terminals located immediately adjacent, and readily accessible, to the vertical wireway.

2) Type B-T: field connections to a load terminal block in, or adjacent to, the unit.

2. Enclosure: NEMA Type 1A unless otherwise noted on the Contract Drawings.

3. The Contract Drawings indicate the approximate horsepower and intended control scheme of the motor driven equipment. Provide the NEMA size starter, circuit breaker trip ratings, control power transformers and thermal overload heater element ratings matched to the motors and control equipment supplied, in compliance with the NEC and the manufacturer's heater selection tables. All variations necessary to accommodate the motors and controls as actually furnished shall be made without extra cost to the Owner.

4. The motor control center shall be arranged so that the uppermost operating handle position shall not exceed 6-ft 6-in from the floor when the equipment is mounted on a 4-in high equipment pad.

5. Equip useable blank spaces with all hardware necessary for the future addition of a unit cubicle, including doors, bus, device supports, mounting plates, and connections.

6. Provide key interlocks as indicated on the Contract Drawings.

D. Performance Requirements:

1. Minimum short circuit interrupting rating:

   a. The assembly shall be rated to withstand mechanical forces exerted during short-circuit conditions when connected directly to a power source having available fault current of 42,000 amperes symmetrical at rated voltage unless otherwise shown on the Contract Drawings.

   b. Performance shall be acceptable if the motor control center complies with the requirements of UL 845.

2. Voltage and current ratings: as indicated on the Contract Drawings.

3. Surge Withstand Capability: per ANSI/IEEE C62.41 without damage.

4. The equipment and components shall operate continuously at its rated current under the following environmental conditions without damage or degradation of operating characteristics or life:
   a. Operating Ambient Temperature: 0-degrees C to 40-degrees C maximum ambient temperature.
   b. Storage Temperature: -40-degrees C to 65-degrees C.
   c. Relative Humidity: 0 to 95%, non-condensing.
   d. Altitude: Operating to 5000-ft, de-rate for higher elevations.
   e. Vibration: Seismic Zone 4.

5. Audible Noise: not to exceed 65 dBA measured 1-meter from surface of equipment.

6. Metering accuracy: minimum accuracy of the complete system, including current sensors, auxiliary CTs, and the meter display, shall be +/- 1% of full scale for current values, and

7. +/- 2% of full scale for power and energy values.

8. Harmonic correction: Meet 5% total harmonic current distortion (THD), 5% total demand distortion (TDD), and <5% total harmonic voltage distortion levels as defined by IEEE-519 at incoming line terminals of the motor control center

   a. Performance of the harmonic correction unit shall be independent of the impedance of the power source.

E. Metering Requirements:

1. Basic metering: display the following minimum metered values at each main breaker location. This metering may be integral to the manufacturer's standard trip unit offering, or may be provided via separate metering devices, however it shall be furnished as a complete and functional package:

    a. Instantaneous value of phase current

    b. Instantaneous value of line-to-line voltage

2. Enhanced metering: meter and display the following values at each main circuit breaker location:

    a. AC Phase Amperes +/- 0.5%

    b. AC Phase Voltage +/- 0.5%

    c. Watts +/- 1.0%

    d. VA +/- 1.0%

    e. Vars +/- 1.0%

    f. Power Factor +/- 2.0%

    g. Frequency +/- 0.1 Hz

    h. Watthours +/- 1.0%

    i. Varhours +/- 1.0%

    j. VA hours +/- 1.0%

    k. k. Watt Demand (10-, 15-, 20-, 25-, 30-, 45-, 60-minute interval)

    l. Voltage (minimum/maximum)

    m. Current (minimum/maximum)

    n. Power (minimum/maximum)

    o. Power Factor (minimum/maximum)

    p. Frequency (minimum/maximum)

    q. Peak Demand

3. Power quality monitoring: display the following values at each main circuit breaker location:

a. %THD (through 31st harmonic)

b. Peak % THD

1.07 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping:

1. Equipment shall be handled and stored in accordance with manufacturer's instructions and NEMA ICS-2.3.

B. Acceptance at Site:

1. The assembly shall be provided with adequate lifting means for moving into the installation position.

C. Storage and Protection:

1. Refer to Section 16020.

1.08 PROJECT/SITE REQUIREMENTS

A. Environmental Requirements:

1. All printed circuit boards shall be conformably coated to provide environmental robustness.

B. Field Measurements:

1. Contractor shall be responsible for measuring and confirming the new motor control center will fit as shown on the Contract Drawings.

1.09 MAINTENANCE

A. Provide the following materials in the quantity specified. Materials shall match those installed in all respects and where possible shall come from the same production lot. Materials shall be properly packaged for long storage and containers shall be clearly and indelibly labeled on the exterior.

1. One quart of touch-up paint.

2. One dozen each of cover bolts, spring nuts and door fasteners.

B. Spare Parts:

1. Provide the following spare parts in the quantities specified

a. 12 Fuses of each type and size.

b. 1 Spare static trip device.

c. 6 Pilot lamps of each type.

d. 1 size one starter coils.

e. 6 replacement overload heaters of each size range used.

f. 6 overload relays for each size used.

g. 3 motor circuit protectors for each size used.

h. 1 circuit breaker rating plugs for each size used.

2. Spare parts shall be boxed or packaged for long term storage and clearly identified on the exterior of package. Identify each item with manufacturer's name, description and part number.

1.10 WARRANTY

A. The motor control center shall have a one year's manufacturer warranty.

B. Equipment warranty shall start the day the motor control center is commissioned in service.

1.11 NOMENCLATURE AND IDENTIFICATION

A. Provide engraved laminated plastic nameplates for all electrical components and for each control or indicating device. Nomenclature shall be as described in Section 01672 – Asset Identification and Labeling using lettering approximately 3/8-in high for unit identification nameplates and 1/4-in high elsewhere. The nameplates shall use white letters on a black background. The engraving shall extend through the lamination to the core. Nameplates shall be screw fastened.

B. The manufacturer shall fasten a master NEMA nameplate to the front of the motor control center indicating model number, serial number, order number, manufacturing date, bus amperes, volts, overall short circuit rating, etc.

C. Provide permanent electrical hazard warning signs marked per OSHA requirements.

D. Compartments with voltages from sources outside of the compartment shall have a sign mounted inside the compartment door marked "CAUTION - THIS UNIT CONTAINS A VOLTAGE FROM AN EXTERNAL SOURCE". Letters shall be black on a high visibility yellow background.

1.12 MANUFACTURER'S SERVICES

A. Provide services of a manufacturer's service representative for testing and startup, as required in Section 16020.

B. Provide services of a manufacturer's service representative for training, as required in Section 16020.

C. Furnish the services of a manufacturer's representative for a minimum period of one 8-hour day for setup and programming of the power metering devices. The manufacturer's representative shall be factory-trained and shall have a thorough knowledge of the software, hardware, and system programming.

PART 2 – PRODUCTS

2.01 GENERAL

A. Products of the following manufacturers are acceptable. No substitutes will be considered.

1. Eaton

2. Square D

3. Or Accepted Equal

B. Like items of materials/equipment shall be the end products of one manufacturer to provide standardization for appearance, operation, maintenance, spare parts, and manufacturer's service.

2.02 MATERIALS

A. Wiring:

1. Wiring: Stranded copper, minimum size No. 14 AWG, with 600-Volt, 90-degree C, flame retardant, Type MTW thermoplastic insulation. Line side power wiring shall be sized for the full rating or frame size of the connected device.

2. Control wiring terminations: provide insulated locking spade terminals, except where saddle type terminals are provided integral to a device. Current transformer secondary leads shall first be connected to conveniently accessible shorting type terminal blocks before connecting to any other device.

3. Terminal blocks: Groups of control wires leaving the motor control center shall be provided with terminal blocks with numbering strips.

4. Wiring identification: provide heat shrinkable wire markers at each termination point, marked with identification corresponding to appropriate designations on manufacturer's wiring diagrams, color coding per NEMA standards and the NEC. Foreign voltage control wiring shall be yellow.

5. Component identification: fuse blocks, relays, pushbuttons, switches, etc., shall be marked with identification corresponding to appropriate designations on manufacturer's wiring diagrams.

6. Line and load terminations: mechanical type terminals, rated for 75-degrees C, suitable for copper or aluminum cable of the size required for the cables indicated on the Contract Drawings.

7. Grounding lugs: provided in the incoming line section for connection of the main conductor with additional lugs for supplemental grounding conductors as indicated on the Contract Drawings.

B. Buses:

1. Horizontal buses: non-tapered, tin plated copper. Neutral bus, where required, shall be fully rated.

2. Vertical buses: non-tapered, tin plated copper, minimum rating of 300-amperes, securely bolted to the horizontal main bus. Vertical bus shall be completely isolated and insulated by means of a labyrinth design barrier effectively isolating the vertical buses to prevent any fault-generated gases to pass from one phase to another. A shutter mechanism shall isolate the vertical bus when a unit is removed.

3. Bus bracing: exceed the specified equipment short circuit current rating, but not less than 42,000 amperes RMS symmetrical.

4. Bus joints: use high-tensile strength, zinc-plated hardware with front-accessible connections for ease of maintenance.

5. Horizontal ground bus: provide a copper ground bus extending throughout the entire length of the motor control center, firmly secured to each vertical section structure and equipped with lugs for external ground connections, sized for cables shown on the Contract Drawings.

6. Vertical ground bus: provide a tin-plated vertical ground bus rated 300 amperes in each structure, directly connected to the horizontal ground bus via a tin-plated copper connector. Units shall connect to the vertical bus via a tin-plated copper stab.

C. Control and Metering Transformers:

1. Potential transformers: Two-winding, encapsulated type with primary and secondary fuses. Voltage ratings shall be as required for the application. Thermal rating and metering accuracy per ANSI standards.

2. Current transformers: Toroidal type per ANSI and NEMA standards. Metering accuracy shall meet NEMA standard requirements for the particular application.

3. Control power transformers: Two-winding dry type with primary and secondary fuses, sized for the application per NFPA 70 (NEC) to supply power to the actual connected loads. Provide extra capacity as required or where shown on the Contract Drawings.

D. Control Relays – Electromechanical:

1. Control relays and timers: 300-Volt, industrial rated, plug-in socket type, housed in a transparent polycarbonate dust cover, coil indicator light, designed in accordance with UL Standard 508 for motor controller duty. Continuous contact rating shall be 10-Amps resistive, ¼-HP, at 120-VAC, operating temperature minus 10 to plus 55-degrees C.

2. Control relays and timers: heavy duty industrial type rated NEMA A600 with a continuous thermal rating of 10-amperes AC, with a minimum of four convertible contacts, modular design, DIN rail mounted. Provide solid-state timing or latching attachments as required by the control schemes on the Contract Drawings.

3. Provide transient surge suppressors on coils where driven by PLC outputs.

E. Pilot Devices:

1. Control operators: Heavy duty, full size, 30-mm, oil tight, with NEMA A600 contact rating. Types and quantities as shown on the Contract Drawings.

2. Indicator lights: Full size, 30-mm, oil tight, full voltage LED type. Colors and quantities as shown on the Contract Drawings.

3. Auxiliary contacts: Form C, NEMA A600 rating, as required by the control schemes on the Contract Drawings.

4. A unit-mounted device panel shall have space to accommodate six (6) 30-mm oil-tight pilot-control devices or indicating ammeters, voltmeters, or elapsed time meters. To improve maintenance capabilities, the device panel shall withdraw with the unit.

2.03 EQUIPMENT

A. Structure:

1. Motor control centers shall consist of a series of metal enclosed, free-standing, dead front vertical sections bolted together to form double wall construction between sections. Individual vertical sections shall be nominally 90-in high, 20-in wide and 20-in deep unless otherwise shown on the Contract Drawings. Bottom channel sills shall be mounted front and rear of the vertical sections extending the full width of each shipping split. Top of each section shall have removable plates with lifting angle. Make provisions for field installation of additional sections to each end and provide full depth cover plates (rodent barriers) at each end of the motor control center channel sills.

2. Provide continuous top and bottom horizontal wireways extending the full width of the line-up, isolated from the horizontal bus. Provide a 4-in wide, full height, vertical wireway in each section, equipped with a hinged door and cable supports. Vertical wireway shall be isolated from the bus and device compartments. Wireway openings shall have rolled edges or protective grommets.

3. Provide individual, flange formed, pan type door with concealed hinges and quarter turn latches for each device compartment and future space. Doors shall be removable. Door removal shall not be required to withdraw starter units or feeder tap devices.

B. Customer Metering:

1. Where indicated on the Contract Drawings, provide a separate customer metering compartment with a front facing hinged door and include the following:

a. Current transformers for each meter. Current transformers shall be wired to shorting-type terminal blocks.

b. Potential transformers including primary and secondary fuses with disconnecting means for metering as shown on the Contract Drawings.

C. Main Section:

1. The main section shall consist of an incoming cable compartment with main lugs or a main disconnecting device as shown on the Contract Drawings. Main lug terminations shall have

adequate dedicated space for the type and size of cable used and the lugs shall be standard mechanical screw with anti-turn feature. Main breakers shall be provided as indicated on the Contract Drawings and shall be molded case circuit breakers.

D. Unit Compartments:

1. Provide individual compartments for each removable combination starter and feeder tap device unit. Each vertical section shall accommodate a maximum of six compartments. Steel barriers shall isolate the top, bottom and sides of each compartment from adjacent units and wireways. Removable units shall connect to the vertical bus in each section with tin plated, self-aligning, pressure type copper plug connectors. Size five and larger starter units may be wired directly to the bus. Removable units shall be aligned in the structure on guide rails or shelves and secured with a cam latch mechanism or racking screw.

2. Provide individual, isolated compartments for fixed mounted devices such as circuit breakers, cable lugs, metering, relaying and control devices. Main and bus tie circuit breakers shall be wired directly to the main horizontal bus. All bus connections shall be fully rated.

3. Provide the following features:

a. Provision to padlock removable units in a partially withdrawn TEST position, with the bus stabs disengaged.

b. Provision to padlock unit disconnect handles in the OFF position with up to three padlocks.

c. Mechanical interlock with bypass to prevent opening unit door with disconnect in the ON position, or moving disconnect to the ON position while the unit door is open.

d. Mechanical split-type terminal blocks for disconnecting external control wiring.

e. Auxiliary contact on unit disconnects to isolate control power when fed from an external source.

f. Disconnect operating handles and control devices mounted on the removable units.

g. Provide mechanical interlock on reversing contactors of a pivot-type mechanism to prevent closing of one contactor when the other is closed. Coil controller energizes both forward and reverse contactors providing one control point for wiring.

h. Compartments containing motor starters shall have wiring diagrams and heater tables fastened to the compartment door. Compartments containing panelboards shall have circuit directories fastened to the compartment door.

2.04 MOTOR CONTROLLERS

A. Combination Starter Units:

1. Combination starters shall include a motor circuit protector (MCP) in series with a motor controller and an overload protective device. The MCP shall have an adjustable magnetic trip range and a trip test feature. MCP's shall be labeled in accordance with UL489.

B. Electromechanical Motor Starters:

1. Motor starters: three-Pole, 600-Volt, electrically operated, of the types shown on the Contract Drawings, minimum size shall be NEMA Size 1. IEC rated starters shall have continuous current ratings equal to or greater than the continuous current ratings listed in NEMA ICS 2. Starters shall have 120-Volt encapsulated operating coils, an individual control power transformer with primary and secondary fuses, and silver cadmium oxide renewable line contacts.

2. Multi-speed and reversing starters: provide two motor rated contactors mechanically and electrically interlocked so that only one device may be energized at any time.

3. Auxiliary contacts: accommodate up to six auxiliary contacts on NEMA Size 1 and 2 starters, and up to eight for NEMA Size 3 and larger. Contacts shall be rated ten amperes continuous.

a. Provide six external auxiliary contacts of any arrangement normally open or normally closed on NEMA Size 1 and 2 starters.

b. Provide six external auxiliary contacts of any arrangement normally open or normally closed on NEMA Size 3 and larger.

4. Each starter shall be equipped with a fused control power transformer.

5. Motor overload protection: Standard, bimetallic-type with interchangeable heaters, visual trip indication, calibrated for 1.0 and 1.15 service factor motors. Electrically isolated normally open and normally closed contacts shall be provided on the relay. Overload relays for submersible pump motors shall be ambient compensated, quick trip, Class 10. A test trip feature shall be provided for ease of troubleshooting and shall be conveniently operable without removing components or the motor starter. Overload relays shall be manually reset from outside the enclosure by means of an insulated pushbutton.

2.05 MOLDED CASE CIRCUIT BREAKERS

A. Molded case circuit breakers: provide inverse time and instantaneous tripping characteristics, listed per UL 489 for applications at 100% of their continuous ampere rating in their intended enclosure.

B. Trip mechanism: quick-make, quick-break, mechanically trip-free over-center switching mechanism operated by a toggle-type handle. Handle shall indicate breaker position. A push-to-trip button on the front of the circuit breaker shall provide a local manual means to exercise the trip mechanism.

C. Contacts: non-welding silver alloy with arc extinction accomplished via arc chutes.

D. Minimum symmetrical interrupting capacity: not less than overall motor control center interrupting rating. Provide current limiting circuit breakers where indicated or required to meet the specified short circuit rating.

E. Trip units for circuit breakers below 250-ampere frame: thermal-magnetic trip units.

F. Trip units for 250-ampere frame circuit breakers and larger: Adjustable, microprocessor-based, electronic overcurrent trip device with true three phase RMS sensing of sinusoidal and non-sinusoidal currents, and the following minimum features and functions:

1. Rating plugs shall be adjustable and interlocked so they are not interchangeable between frames, and interlocked such that a breaker cannot be closed and latched with the rating plug removed.

2. Trip mode indicators for ground fault, overload and short circuit.

3. An operator interface display panel showing diagnostic information and metering information.

2.06 METERING AND CONTROL

A. Digital Metering:

1. Type: UL listed, CUL, CSA and CE certified microprocessor based, solid state, door mounted digital line meter device with accuracy per ANSI C12.16.

2. Surge withstand rating: meet ANSI standard C37.90.1 for surge withstand.

3. Monitored parameters: display values for each metered parameter and automatically range between units, kilo-units and mega-units for all displayed values.

4. Inputs: Provide external current transformers with rating as indicated on the Contract Drawings. Fused internal self-contained potential transformers for voltages up to 600-volts. Control power shall be supplied internally from the motor control center.

5. Operator interface: faceplate shall be membrane type, rated NEMA 12, with a durable backlit display to allow simultaneous viewing of multiple parameters. The meter shall be completely programmable using the display keypad or via network communications. All set points and recorded minimum and maximums shall be stored in non-volatile memory.

6. Operating temperature range: 0 to 70-degrees C, and 0 to 95 percent relative humidity non-condensing.

2.07 INTEGRATED EQUIPMENT

A. The motor control center manufacturer shall integrate and assemble panelboards, dry type distribution transformers, variable frequency drives, and surge protection into the motor control center as shown on the Contract Drawings.

1. Dry-type distribution transformers, as specified in 16191, shall be secured in a manner that assures the structural integrity of the vertical motor control center section and the

transformer. Adequate ventilation for the transformer and other installed components shall be provided within the motor control center. Transformer shall be high-efficiency NEMA Type TP-1 Energy Star labeled, K factor, harmonic mitigating, or low-noise, etc., as shown on the Contract Drawings.

a. If the primary breaker is in the same assembly, the motor control center manufacturer shall wire the transformer from the feeder over-current device to the primary side of the transformer in accordance with UL and the National Electrical Code utilizing copper conductors. The motor control center manufacturer shall wire the secondary side of the transformer to the load or panelboard shown on the drawings in accordance with UL and the National Electrical Code utilizing copper conductors.

2. Transient voltage surge suppression: as specified in Section 16191.

3. Harmonic Correction Unit as specified in Section 16280.

B. Interrupting ratings of integrated equipment shall be coordinated with the overall interrupting ratings of the motor control center.

2.08 PANELBOARDS

A. Panelboards shall be in accordance with the Underwriter Laboratories, Inc. "Standard for Panelboards" and "Standard for Cabinets and Boxes" and shall be so labeled where procedures exist. Panelboards shall also comply with NEMA Standard for Panelboards and the National Electrical Code.

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

C. 120/240-Volt, single phase, 3 Wire and 120/208-Volt, 3 Phase, 4-Wire panelboards shall be Type AQ as manufactured by the General Electric Company; Type NQOD as manufactured by Square D Co.; Type Pow-R-Line C as manufactured by Eaton, or equal.

D. Rating:

1. All panelboards shall be rated for the intended voltage.

2. Circuit breaker panelboards shall be fully rated for the specified circuit breaker fault current interrupting capacity. Series connected short circuit ratings will not be acceptable.

E. Buses:

1. Bus bars for the mains shall be of copper. Full size neutral bars shall be included. Phase bussing shall be full height without reduction. Cross connectors shall be copper.

2. Neutral bussing shall have a suitable lug for each outgoing feeder requiring a neutral connection.

3. Spaces for future circuit breakers shall be bussed for the maximum device that can be fitted into them.

4. Equipment ground bars shall be furnished.

F. Circuit Breakers:

1. Panelboards shall be equipped with circuit breakers.

2. Circuit breakers shall be molded case, bolt-in type.

3. Each circuit breaker used in 120/240-Volt and 120/208-Volt panelboards shall have an interrupting capacity of not less than 10,000-amperes, RMS symmetrical.

4. Circuit breakers shall be as manufactured by the panelboard manufacturer.

2.09 NETWORK COMMUNICATIONS

A. Provide interface hardware, cabling, and software to enable the following microprocessor-based devices to communicate with the plant-wide Modbus TCP/IP Ethernet network.

1. Metering devices

B. As a minimum transmit the following data from each starter over the network:

1. Percent of operating full load current.

2. Operating status and fault codes.

3. Average current.

4. Fault log.

5. Current level warning (adjustable).

6. Under-load warning (adjustable).

7. Circuit breaker status, on-off-tripped.

C. Communicate metering and trip device data to a plant-wide DCS management network.

2.10 SURFACE PREPARATIONS AND SHOP COATINGS

A. All exterior and interior steel surfaces of the motor control center shall be properly cleaned and provided with a rust-inhibiting phosphatized coating. Color and finish of the motor control center shall be manufacturer's standard light gray.

B. Outdoor equipment shall be painted with two finish coats of polyurethane or epoxy enamel, 1 to 2-mil thickness. Exterior color shall be manufacturer's standard gray.

C. Unpainted non-current carrying parts shall be galvanized to prevent corrosion.

D. Perform manufacturer's standard production testing and inspection in accordance with NEMA and UL standards. If requested by the Engineer, the manufacturer shall submit certified copies of test results to indicate proof of compliance with NEMA and UL Standards.

PART 3 – EXECUTION

3.01 GENERAL

A. Install the motor control center as shown on the Contract Drawings and in accordance with manufacturer's instructions and approved shop drawings.

B. Install the equipment in accordance with NEMA ICS-2.3.

3.02 FIELD CONNECTIONS

A. Provide compression connectors at equipment ground bus.

B. Make wiring interconnections between shipping splits.

C. Install bus splice plates and torque the connections.

D. Install field wiring per Section 16120. Field wiring shall be grouped by circuit and tie wrapped. Terminations shall not be stressed.

E. INSTALLATION

F. Remove temporary lifting angles, lugs and shipping braces. Remove all current transformer shunts after completing secondary circuits.

G. Mount indoor motor control centers on the existing four-inch thick concrete slab, unless otherwise indicated. Edges shall have $^1/_2$-inch chamfer.

H. Unless otherwise indicated, the thickness of the concrete slab shall be increased to eight inches thick for outdoor applications, reinforced with 6-in by 6-in No. 6 mesh placed uniformly 4-in from the top of the slab. Slab shall be placed on a 6-in thick, well-compacted gravel base.

I. The assembly shall be bolted directly to floor sills set level in concrete per manufacturer's recommendations. Floor sills are not required if the floor is level to $^1/_8$-inch per 3-foot distance in any direction. Provide all necessary hardware to secure the assembly in place.

J. Locate conduit and cable entrances in the space designated by the equipment manufacturer. Install conduits to prevent water from entering the enclosure. Bond all conduits including stubs to the equipment ground bus pigtail. Seal voids around conduit openings in the slab with water-and- o i l resistant caulking or sealant. Cut off and bush conduits three inches above slab surface.

K. Where field painting of enclosures is required to correct damage to the manufacturer's factory-applied coatings, provide manufacturer's recommended coatings and apply in accordance with manufacturer's instructions.

L. Repair damage to galvanized coatings using zinc rich paint.

3.03 FIELD TESTING

A. Perform physical, electrical, and mechanical inspections in accordance with the manufacturer's recommendations and the following. Provide all temporary power for testing.

1. Compare motor nameplate data with approved shop drawings. Ensure that overload relays or heater elements are installed and selected for the full load current shown on the nameplate of each motor and the manufacturer's instructions.

2. Confirm correct application of manufacturer's recommended lubricants.

3. Verify appropriate anchorage, required area clearances, and correct alignment.

4. Inspect all doors, panels, and sections for paint, dents, scratches, fit, and missing hardware.

5. Verify that fuse, circuit breaker, and starter sizes and types correspond to approved shop drawings.

6. Verify that current transformer ratios correspond to approved shop drawings.

7. Confirm correct operation and sequencing of electrical and mechanical interlock systems.

8. Inspect insulating materials and structure for evidence of physical damage, reduced clearances, or contaminated surfaces.

9. Check the integrity of all bus mounting means.

10. Verify that field wiring is adequately separated from live busses. Physically secure the field wiring to withstand the effects of fault currents.

11. Check all devices for damage and make all necessary repairs or replacements, prior to energizing.

12. Verify correct barrier and shutter installation and operation.

13. Exercise all active components.

14. Inspect all mechanical indicating devices for correct operation.

15. Verify that vents are clear.

16. Test operation, alignment, and penetration of disconnecting contacts.

17. Inspect control power transformers.

18. Verify all ground connections have been made.

19. Verify operation of space heaters.

20. Verify correct operation of the Harmonic Correction Unit.

B. Perform the following electrical acceptance tests on the motor control center in accordance with NETA ATS:

1. Conduct an electrical insulation resistance test to verify that the equipment and field wiring are free from short circuits and grounds. Test phase-to-ground, phase-to-phase, and phase-to-neutral, with the switches or circuit breakers opened.

2. Insulation-resistance test on control wiring; do not perform this test on wiring connected to solid-state components.

3. Control wiring performance test.

4. Phasing check on double-ended motor control center to ensure correct bus phasing from each source.

5. Conduct earth resistance ground testing.

C. Perform the following electrical acceptance tests on insulated case and molded case circuit breakers with solid state trips in accordance with NETA ATS:

1. Contact resistance tests.

2. Insulation resistance tests.

3. Long-time delay time-current characteristic tests.

4. Verify correct operation of any auxiliary features such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free, and anti-pump function.

D. Perform the following before energizing the equipment in accordance with NEMA ICS-2.3:

1. Re-tighten all accessible electrical connections to the manufacturer's torque values.

2. Re-tighten the wire clamping members of all accessible mechanical (pressure wire) type connectors to the values specified by the manufacturer.

3. Re-tighten conical spring washers according to manufacturer's instructions.

4. Turn all circuit breakers and fusible switches to the OFF position before energizing the bus.

5. Adjust ground fault and instantaneous protective devices to their most sensitive settings during startup. Reset the devices after startup is complete and the equipment has been successfully energized.

6. Reinstall all parts and barriers removed to facilitate wiring and installation.

7. Before closing the enclosure, remove all metal chips, scrap wire, and other debris from the motor control center interior. Remove accumulated dust and dirt by using a brush, vacuum cleaner or clean, lint-free rags.

8. Install covers, close doors, and make certain that no wires are pinched and that all enclosure parts are properly aligned and tightened.

E. Performance Test:

1. Verify complete system operation including all hardware, software and communication devices.

2. Verify networking performance with all interfacing systems by other manufacturers.

3.04 ADJUSTMENT

A. The Contractor shall perform field adjustments of the protective devices as required to place the equipment in final operating condition. The settings shall be in accordance with the approved short circuit and protective device coordination study.

B. The manufacturer's representative shall provide the following services for starting up and programming of the power management system and metering devices:

1. Set all the adjustable or programmable parameters of all devices in the equipment.

2. Coordinate startup with other manufacturers' equipment.

3. Verify the integrity of the data communications network and troubleshoot as necessary.

4. Set all the network addresses of all devices in the equipment.

5. Map the Modbus RTU read registers in the field devices to communicate with the Plant DCS.

3.05 3.06 CLEANING

1. Remove all rubbish and debris from around the equipment. Remove dirt, dust, and concrete spatter from the exterior of the equipment using brushes, vacuum cleaner, and clean, lint free rags.

2. Do not use compressed air for cleaning.

END OF SECTION

SECTION 16483

VARIABLE FREQUENCY DRIVES
(CONSTANT TORQUE)

PART 1 – GENERAL

1.01 SUMMARY

A. This specification describes the electrical, mechanical, environmental, agency and reliability requirements for three-phase, constant torque, Variable Frequency Drives (VFDs) as specified herein and as shown on the contract drawings.

B. Related Sections: All Specification Sections that include Electrical and Instrumentation WORK shall be considered as part of Division 16 WORK. This applies to minor or major work required for a complete and working system. The following are examples of subsections that mare related.

1. Division 16 – Electrical

1.02 REGULATIONS, CODES AND STANDARDS

A. The Variable Frequency Drives and all components shall be designed, manufactured and tested in accordance with the latest applicable standards.

1. Institute of Electrical and Electronic Engineers (IEEE)

a. IEEE 519-1992: Guide for harmonic content and control

2. Underwriters Laboratories (UL508C: Power Conversion Equipment)

a. UL

b. CUL

3. National Electrical Manufacturer's Association (NEMA)

a. ICS 7.0: Industrial Controls & Systems for VFD.

4. IEC 61800-2 and –3. EN 50082-1 and –2

a. Fulfill all EMC immunity requirements

B. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

1.03 SUBMITTALS - FOR REVIEW/APPROVAL

A. Submittals shall be submitted to the Engineer for review and acceptance prior to construction in accordance with Special Provisions Section 21- Submittals.

B. The following information shall be submitted to the Engineer.

1. Dimensioned outline drawing

2. Schematic diagram

3. Power and control connection diagram(s)

4. Descriptive Catalog Cuts / Bulletins

5. Product sheets and detailed catalog numbers with options

6. Harmonic Analysis including methods to meet IEEE 519-1992 requirements.

1.04 SUBMITTALS-FOR CLOSEOUT

A. The following information shall be submitted for record purposes prior to final payment.

1. Final as-built drawings and information for items listed section in 1.04.

2. Installation information.

1.05 QUALIFICATIONS

A. The supplier of the assembly shall be the manufacturer of the electromechanical power components used within the assembly, such as bypass contactors when specified.

B. For the equipment specified herein, the manufacturer shall be ISO 9001 certified.

C. The supplier of this equipment shall have produced similar electrical equipment for a minimum period of ten (10) years. When requested by the Engineer, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.

D. Variable Frequency Drives shall be on the basis of Cutler-Hammer SVX9000 Series for function and quality. Products that are in compliance with the specification and manufactured by others will be considered as "Approved Equal" only if pre-approved by the Engineer fourteen (14) days prior to bid date. Alternate suppliers shall submit documentation showing itemized compliance to the specifications and experience specific to the proposed VFD including a list showing details of the installation, application, location, contact name and telephone number of at least 5 users.

1.06 REGULATORY REQUIREMENTS

1.07 DELIVERY, STORAGE, AND HANDLING

A. Equipment shall be handled and stored in accordance with manufacturer's instructions. One (1) copy of these instructions shall be included with the equipment at time of shipment.

1.08 FIELD MEASUREMENTS

1.09 OPERATION AND MAINTENANCE MANUALS

A. Five (5) copies of the equipment operation and maintenance manuals shall be provided.

B. Operation and maintenance manuals shall include the following information:

1. Instruction books

2. Recommended renewal parts list

3. Drawings and information required by Section 1.06.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Eaton

B. Allen Bradley

C. ·Square D

D. Or Approved Equal

2.02 NAMING SPECIFIC VENDERS DOES NOT IMPLY ACCEPTANCE OF THEIR STANDARD PRODUCTS NOR RELIEVE THEM FROM MEETING THESE SPECIFICATIONS IN THEIR ENTIRETY.

2.03 VARIABLE FREQUENCY DRIVES (VFD)

A. Where shown on the drawings, Variable Frequency Drives 1 through 2000 Horsepower (HP), Constant Torque (CT) / Variable Torque (VT), shall have the following features:

1. The VFD shall be rated for 480-VAC. The VFD shall provide microprocessor-based control for three-phase induction motors. The controller's full load output current rating shall be based on 50° C (CT) / 40° C (VT) ambient and 10 kHz switching frequency below 40-HP (CT) / 50-HP (VT) and 3.6 kHz switching frequency 40-HP (CT) / 50-HP (VT) and above to reduce motor noise and avoid increased motor losses.

2. The VFD shall be of the Pulse Width Modulated (PWM) design converting the utility input voltage and frequency to a variable voltage and frequency output via a two-step operation. Adjustable Current Source VFD are not acceptable. Insulated Gate Bipolar Transistors (IGBT's) shall be used in the inverter section. Bipolar Junction Transistors, GTO's or SCR's are not acceptable. The VFD shall run at the above listed switching frequencies.

3. The VFD shall have efficiency at full load and speed that exceeds 95% for VFD below 15-HP and 97% for drives 15-HP and above. The efficiency shall exceed 90% at 50% speed and load.

4. The VFD shall maintain the line side displacement power factor at no less than 0.96, regardless of speed and load.

5. The VFD shall have a one (1) minute overload current rating of 150% and a two (2) second overload current rating of 250% for constant torque drives. The VFD shall have a one (1) minute overload current rating of 110% for variable torque drives.

6. The VFD shall be capable of operating of operating any NEMA design B squirrel cage induction motor, regardless of manufacturer, with a horsepower and current rating within the capacity of the VFD.

7. The VFD shall have an integral EMI/RFI filter as standard.

8. The VFD shall limit harmonic distortion reflected onto the utility system to a voltage and current level as defined by IEEE 519 for general systems applications, by utilizing the standard 3% nominal impedance integral AC three-phase line reactor integrally mounted in the VFD enclosure and additional filtering as shown on the one line diagram.

9. The external VFD filters shall be Trans Coil HG7 Harmonic Filter (TCI Part number HG75AW00STC) with contactor to provide a maximum 7% harmonic distortion at full load, MTE Series D or equal. Harmonic filter to be mounted within the MCC. Optionally, the filters may be mounted above the MCC to save space but must be housed in a NEMA 1 enclosure.

10. Any harmonic calculations shall be done based on the kVA capacity, X/R ratio and the impedance of the utility transformer feeding the installation, as noted on the drawings, and the total system load. The calculations shall be made with the point of common coupling being the point where the utility feeds multiple customers.

11. Total harmonic distortion shall be calculated under worst-case conditions in accordance with the procedure outlined in IEEE standard 519-1992. Copies of these calculations are to be made available upon request. The contractor shall provide any needed information to the VFD supplier three (3) weeks prior to requiring harmonic calculations.

12. The system containing the VFD shall comply with the 5% level of total harmonic distortion of line voltage and the line current limits as defined in IEEE 519-1992.

13. The VFD shall be able to start into a spinning motor (flying start). The VFD shall be able to determine the motor speed in any direction and resume operation without tripping. If the motor is spinning in the reverse direction, the VFD shall start into the motor in the reverse direction, bring the motor to a controlled stop, and then accelerate the motor to the preset speed.

14. Standard operating conditions shall be:

    a. Incoming Power: Three-phase, 380 – 500Vac (+10% to -15%) and 50/60 Hz (+/-5 Hz) power to a fixed potential DC bus level.

    b. Frequency stability of +/-0.05% for 24 hours with voltage regulation of +/-1% of maximum rated output voltage.

c. Speed regulation of +/- 0.5% of base speed.

d. Load inertia dependent carryover (ride-through) during utility loss.

e. Insensitive to input line rotation.

f. Humidity: 0 to 95% (non-condensing and non-corrosive).

g. Altitude: 0 to 3,300 feet (1000 meters) above sea level.

h. Ambient Temperature: -10 to 50 °C (CT), -10 to 40 °C (VT).

i. Storage Temperature: -40 to 60 °C.

15. Control Functions

a. Frequently accessed VFD programmable parameters shall be adjustable from a digital operator keypad located on the front of the VFD. The VFD shall have a 3-line alphanumeric programmable display with status indicators. Keypads must use plain English words for parameters, status, and diagnostic messages. Keypads that are difficult to read or understand are not acceptable, and particularly those that use alphanumeric code and tables. Keypads shall be adjustable for contrast with large characters easily visible in normal ambient light.

b. The keypad shall include a Local/Remote pushbutton selection. Both start/ stop source and speed reference shall be independently programmable for Keypad, Remote I/O, or Field Bus.

c. The keypad shall have copy / paste capability.

d. Upon initial power up of the VFD, the keypad shall display a start-up guide that will sequence all the necessary parameter adjustments for general start up.

e. Standard advanced programming and trouble-shooting functions shall be available by using a personal computer's RS-232 port and Windows™ based software. In addition, the software shall permit control and monitoring via the VFD RS232 port. The manufacturer shall supply a diskette with the required software. An easily understood instruction manual and software help screens shall also be provided. The computer software shall be used for modifying the drive setup and reviewing diagnostic and trend information as outlined in this section. Provide one copy of the advanced programming software.

f. The operator shall be able to scroll through the keypad menu to choose between the following:

1) Monitor

2) Operate

3) Parameter setup

4) Actual parameter values

5) Active faults

6) Fault history

7) LCD contrast adjustment

8) Information to indicate the standard software and optional features software loaded.

g. The following setups and adjustments, at a minimum, are to be available:

1) Start command from keypad, remote or communications port

2) Speed command from keypad, remote or communications port

3) Motor direction selection

4) Maximum and minimum speed limits

5) Acceleration and deceleration times, two settable ranges

6) Critical (skip) frequency avoidance

7) Torque limit

8) Multiple attempt restart function

9) Multiple preset speeds adjustment

10) Catch a spinning motor start or normal start selection

11) Programmable analog output

12) DC brake current magnitude and time

13) PID process controller

16. The VFD shall have the following system interfaces:

a. Inputs – A minimum of six (6) programmable digital inputs, two (2) analog inputs and serial communications interface shall be provided with the following available as a minimum:

b. Remote manual/auto

c. Remote start/stop

d. Remote forward/reverse

e. Remote preset speeds

f. Remote external trip

g. Remote fault reset

h. Process control speed reference interface, 4-20mA DC

i. Potentiometer and 1-10VDC speed reference interface

j. RS-232 programming and operation interface port

k. Serial communications port

B. Outputs – A minimum of two (2) discrete programmable digital outputs, one (1) programmable open collector output, and one (1) programmable analog output shall be provided, with the following available at minimum.

a. Programmable relay outputs with one (1) set of Form C contacts for each, selectable with the following available at minimum:

b. Fault

c. Run

d. Ready

e. Reversed

f. Jogging

g. At speed

h. Torque Limit Supervision

i. Motor rotation direction opposite of commanded

j. Over-temperature

2. Programmable open collector output with available 24VDC power supply and selectable with the following available at minimum:

a. Fault

b. Run

c. Ready

d. Reversed

e. Jogging

f. At speed

g. Torque Limit Supervision

h. Motor rotation direction opposite of commanded

i. Over-temperature

3. Programmable analog output signal, selectable with the following available at minimum:

a. Motor current

b. Output frequency

c. Frequency reference

d. Motor speed

e. Motor torque

f. Motor power

g. Motor voltage

h. DC-bus voltage

i. AI1 (Analog Input 1)

j. AI2 (Analog Input 2)

k. PT100 temperature

l. FB digital input 4 (Field Bus Input)

4. Monitoring and Displays

a. The VFD display shall be a LCD type capable of displaying three (3) lines of text and the following thirteen (13) status indicators:

1) Run

2) Forward

3) Reverse

4) Stop

5) Ready

6) Alarm

7) Fault

8) Input/Output (I/O) terminal

9) Keypad

10) Bus/Communication

11) Local (LED)

12) Remote (LED)

13) Fault (LED)

5. The VFD keypad shall be capable of displaying the following monitoring functions at a minimum:

   a. Output frequency

   b. Frequency reference

   c. Motor speed

   d. Motor current

   e. Motor torque

   f. Motor power

   g. Motor voltage

   h. DC-bus voltage

   i. Unit temperature

   j. Calculated motor temperature

   k. Voltage level of analog input

   l. Current level of analog input

   m. Digital inputs status

   n. Digital and relay outputs status

   o. Analog Input

6. Protective Functions

   a. The VFD shall include the following protective features at minimum:

1) Over-current

2) Over-voltage

3) Inverter fault

4) Under-voltage

5) Input phase loss

6) Output phase loss

7) Under-temperature

8) Over-temperature

9) Motor stalled

10) Motor over-temperature

11) Motor under-load

12) Logic voltage failure

13) Microprocessor failure

b. The VFD shall provide ground fault protection during power-up, starting, and running. VFD with no ground fault protection during running are not acceptable.

7. Diagnostic Features

a. Fault History

1) Record and log faults

2) Indicate the most recent first, and store up to 30 faults

8. Optional features to be included in the VFD:

a. Thermal Magnetic (TM) breaker to provide a disconnect means. Operating handle shall protrude through the door. The disconnect shall not be mounted on the door. The handle position shall indicate ON, OFF, and TRIPPED condition. The handle shall have provisions for padlocking in the OFF position with at least three (3) padlocks. Interlocks shall prevent unauthorized opening or closing of the VFD door with the disconnect handle in the ON position. Door handle interlock can be defeated by qualified maintenance personnel.

b. 120-VAC control to allow VFD to interface with remote dry contacts.

c. Copy/Paste keypad

1) The operator interface shall consist of a LCD keypad located on the front of the VFD. Features shall include:

d. Nine (9) pushbuttons for selection, display, and modification of the VFD characteristics as follows:

e. Scroll left

f. Scroll right

g. Scroll up/increase

h. Scroll down/decrease

i. Enter

j. Reset

k. Start

l. Stop

m. Local/Remote

1) The keypad LCD panel shall provide a choice of 4-line 16 character/line, backlit alphanumeric LCD display.

2) The operator shall be able to scroll through the keypad menu to choose between the following screens:

n. Parameters

o. Keypad control

p. Active faults

q. Fault history

r. System menu

s. Expander boards

t. Monitor

u. Operate menu

v. Communication card for interface with Modbus RTU control system.

w. Provide an input EMI filter to minimize conducted electrical noise to meet the requirements of IEC 61800-3.

9. Enclosure

    a. The VFD enclosure shall be NEMA 1 within the MCC. The VFD shall have complete front accessibility with easily removable assemblies.

10. Spare Parts

    a. The main logic board, keypad and power supply board shall be supplied as spares, one for each different part number supplied.

11. The VFD manufacturer shall maintain, as part of a national network, engineering service facilities within 100 miles of project to provide start-up service, emergency service calls, repair work, service contracts, maintenance and training of customer personnel.

PART 3 – EXECUTION

3.01 EXAMINATION

3.02 FACTORY TESTING

A. The following standard factory tests shall be performed on the equipment provided under this section. All tests shall be in accordance with the latest version of UL and NEMA standards.

1. All printed circuit boards shall be functionally tested via automatic test equipment prior to unit installation.

2. After all tests have been performed, each VFD shall undergo a burn-in test. The drive shall be burned in at 100% inductive or motor load without an unscheduled shutdown.

3. After the burn-in cycle is complete, each VFD shall be put through a motor load test before inspection and shipping.

B. The manufacturer shall provide three (3) certified copies of factory test reports.

3.03 INSTALLATION

3.04 FIELD QUALITY CONTROL

A. Provide the services of a qualified manufacturer's employed Field Service Engineer to assist the Contractor in installation and start-up of the equipment specified under this section. Field Service personnel shall be factory trained with periodic updates and have experience with the same model of VFD on the job site. Sales representatives will not be acceptable to perform this work. The manufacturer's service representative shall provide technical direction and assistance to the Contractor in general assembly of the equipment, installation as specified in manufacturer's installation instructions, wiring, application dependent adjustments, and verification of proper VFD operation.

B. The Contractor under the technical direction of the manufacturer's service representative shall perform the following minimum work.

1. Inspection and final adjustments.

2. Operational and functional checks of VFD and spare parts.

3. The contractor shall certify that he has read the drive manufacturer's installation instructions and has installed the VFD in accordance with those instructions.

C. The Contractor shall provide three (3) copies of the manufacturer's field start-up report before final payment is made.

3.05 MAINTENANCE / WARRANTY SERVICE

A. Warranty to commence 24 months from the date of start-up, not to exceed 36 months from the date of shipment, and include all parts, labor, and travel time.

3.06 FIELD TESTING

A. The VFD manufacturer shall perform harmonic measurements at the point where the utility feeds multiple customers (PCC) to verify compliance with IEEE519-1992. A report of the voltage THD and current TDD shall be sent to the engineer. The contractor shall provide labor, material, and protection as needed to access the test points. The readings shall be taken with all drives and all other loads at full load, or as close as field conditions allow.

3.07 TRAINING

A. The Contractor shall provide a training session for up to 12 owner's representatives for 0.5 normal workday with a maximum of 3 trips at a job site location determined by the owner. Training and instruction time shall be in addition to that required for start-up service.

B. The manufacturer's qualified representative shall conduct the training.

C. The training program shall consist of the following:

1. Instructions on the proper operation of the equipment.

2. Instructions on the proper maintenance of the equipment.

D. Testing and startup shall not be combined with training. Testing and start-up time shall not be used for manufacturer's warranty repairs.

END OF SECTION

SECTION 16950

ELECTRICAL TESTING

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall engage the services of the equipment manufacturer' as required for performing inspections and tests as herein specified.

B. The Contractor/manufacturer shall hire a certified third party to provide all material, equipment, labor, and technical supervision to perform such tests and inspections.

C. It is the purpose of these tests to assure that all tested electrical equipment, Contractor-supplied, is operational and within industry and manufacturer's tolerances and is installed in accordance with design specifications. The tests and inspections shall determine suitability for energizing equipment.

D. Test systems and equipment furnished under Division 16 and repair or replace all defective work and equipment at no additional cost to the Owner. Refer to the individual equipment sections for additional specific testing requirements.

E. Make adjustments to the systems furnished under Division 16 and instruct the Owner's personnel in the proper operation of the systems.

F. In addition to the specific testing requirements listed in the individual sections, perform the additional testing, inspections and adjust settings as specified herein.

G. Testing shall be scheduled and coordinated with the Owner at least 2 weeks in advance.

H. Provide qualified test personnel, instruments and test equipment.

I. Provide a test report verifying compliance with the testing requirements included under Division 16.

J. Before proceeding with the energization of equipment, notify the Owner to schedule the start-up of the equipment.

K. Field testing and commissioning shall be performed in accordance with the latest revisions of NETA Standard ATS "Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems" unless otherwise modified by these sections.

L. A typed test report for each component tested shall be submitted to the Engineer for the project record files as indicated.

M. Testing shall be scheduled and coordinated with the Owner at least 2 weeks in advance.

1.02 SUBMITTALS

A. Submittals shall be submitted to the Engineer for review and acceptance prior to construction in accordance with Special Provisions Section 21- Submittals.

B. Test Report:

1. The test report shall include the following:

a. Summary of project

b. Listing of equipment tested

c. Test results

d. Recommendations

2. Furnish copies of the complete report to the owner/engineer's representative as directed in the contract documents.

C. The report shall include a Table of Content and a data sheet for each component tested. The Table of Contents shall identify each component by a unique number. The Number shall appear on the technical data sheet for identification. Submit cable test results, grounding test results, circuit breaker, motor circuit protector, and protective device settings, fuse type and rating for each piece of equipment. Test report shall be submitted in a three-ring binder. Three copies shall be furnished.

D. The report shall include a Table of Contents, a technical data sheet for each component (i.e. cable, circuit breaker, transformer, relay, etc.) tested. The Table of Content shall include the name of each component, location, the major piece of equipment the component is located within, and a sheet number on which the technical information is presented. Each data sheet shall include a unique sheet number, the name of the component under test, the major piece of equipment in which the component is located and the weather conditions at the time of the test including the temperature and relative humidity at the time of the test. The firm doing the testing shall include, in the report, their opinion whether or not the equipment being tested complies with the specification and recommended measures to correct the deficiency. Any discrepancies shall be noted in the concluding summary of the report. Test report forms shall be in compliance with NETA standards. Three complete copies shall be provided. Reports shall be signed by the person in responsible charge of the field testing, an officer of the firm performing the tests and an officer of the Electrical Contracting Firm.

E. The reports shall be submitted to the Engineer for review, comment and record purposes. Each report shall include a Table of Content, a technical data sheet, for each component (i.e. cable, circuit breaker, transformer, relay, etc.) tested. The Table of Content shall include the name of each component, the major piece equipment the component is located within, and a sheet number on which the technical information is presented. Each data sheet shall include a unique sheet number, the name of the component under test, the major piece of equipment in which the component is located, the weather conditions at the time of the test (i.e. temperature, humidity, sunny, rain, etc.) the tester's observation and findings, discrepancies, any remedial work performed or act to resolve problems, technical parameters obtained during the tests, as left settings of all devices, and a statement indicating the equipment is ready to be energized. The report shall contain a statement

indicating the equipment was tested in accordance with the procedures outlined in the latest edition of The International Testing Association Acceptance Testing Specifications.

1.03 APPLICABLE CODES, STANDARDS, AND REFERENCES

A. All inspections and tests shall be in accordance with the following codes and standards except as provided otherwise herein:

1. National Electrical Manufacturer's Association - NEMA
2. American Society for Testing and Materials - ASTM
3. Institute of Electrical and Electronic Engineers - IEEE
4. InterNational Electrical Testing Association - NETA Acceptance Testing Specifications (ATS) – Latest Revision
5. InterNational Electrical Testing Association - NETA Maintenance Testing Specifications (MTS) – Latest Revision
6. American National Standards Institute - ANSI C2: National Electrical Safety Code
7. State and local codes and ordinances
8. Insulated Cable Engineers Association - ICEA
9. Association of Edison Illuminating Companies - AEIC
10. Occupational Safety and Health Administration - OSHA
11. National Fire Protection Association - NFPA
    a. ANSI/NFPA 70: National Electrical Code
    b. ANSI/NFPA 70B: Electrical Equipment Maintenance
    c. NFPA 70E: Electrical Safety Requirements for Employee Workplaces
    d. ANSI/NFPA 78: Lightning Protection Code
    e. ANSI/NFPA 101: Life Safety Code

B. All inspections and tests shall utilize the following references:

1. Project design Specifications.
2. Project design Contract Drawings.
3. Project short-circuit, coordination and arc flash study
4. Manufacturer's instruction manuals applicable to each particular apparatus

5. Project list of equipment to be inspected and tested

1.04 QUALITY ASSURANCE

A. Qualifications of Testing Firm:

1. The testing firm shall be a corporately- and financially-independent testing organization which can function as an unbiased testing authority, professionally independent of the manufacturers, suppliers, and installers of equipment or systems evaluated by the testing firm.

2. The testing firm shall be regularly engaged in the testing of electrical equipment devices, installations, and systems.

3. The testing firm shall meet OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907, or be a Full Member company of the InterNational Electrical Testing Association.

4. The lead, on-site, technical person shall be currently certified by the InterNational Electrical Testing Association (NETA) or National Institute for Certification in Engineering Technologies (NICET) in electrical power distribution system testing.

5. The testing firm shall utilize engineers and technicians who are regularly employed by the firm for testing services. Resumes of key staff proposed for the project shall be submitted to the Engineer for review.

6. The testing firm shall submit proof of the above qualifications with bid documents, when requested.

7. The terms used here within, such as test agency, test Contractor, testing laboratory, or Contractor's test company shall be construed to mean the testing firm.

1.05 DIVISION OF RESPONSIBILITY

A. The Contractor shall perform routine insulation-resistance, continuity, and rotation tests for all distribution and utilization equipment prior to and in addition to tests performed by the testing firm specified herein.

B. The Contractor shall supply a suitable and stable source of electrical power to each test site. The testing firm shall specify the specific power requirements.

C. The Contractor shall notify the testing firm when equipment becomes available for acceptance tests. Work shall be coordinated to expedite project scheduling.

D. The project electrical engineer shall supply a short-circuit analysis and coordination study, a protective device setting sheet, a complete set of electrical Contract Drawings, specifications, and any pertinent change orders to the testing firm prior to commencement of testing.

E. The testing firm shall notify the Owner/Engineer's representative prior to commencement of any testing.

F. Any system, material, or workmanship which is found defective on the basis of acceptance tests shall be reported to the owner/engineer's representative.

G. The testing firm shall maintain a written record of all tests and, upon completion of project, shall assemble and certify a final test report.

H. Safety and Precautions:

1. Safety practices shall include, but are not limited to, the following requirements:

a. Occupational Safety and Health Act (OSHA)

b. Accident Prevention Manual for Industrial Operations, National Safety Council (NSC)

c. Applicable state and local safety operating procedures

d. Owner's safety practices (Lockout/Tagout)

e. National Fire Protection Association - NFPA 70E

f. National Fire Protection Association – NFPA 79

g. American National Standards for Personnel Protection

2. All tests shall be performed with apparatus de-energized. Exceptions must be thoroughly reviewed to identify safety hazards and devise adequate safeguards.

3. The testing firm shall have a designated safety representative on the project to supervise the testing operations with respect to safety.

1.06 TEST EQUIPMENT REQUIREMENTS

A. Suitability of Test Equipment:

1. All test equipment shall be in good mechanical and electrical condition.

2. Selection of metering equipment should be based on a knowledge of the waveform of the variable being measured. Digital multimeters may be average or RMS sensing and may include or exclude the dc component. When the variable contains harmonics or dc offset and, in general, any deviation from a pure sine wave, average sensing and average measuring RMS scaled meters may be misleading. Use of RMS measuring meters is recommended.

3. Field test metering used to check power system meter calibration must have an accuracy higher than that of the instrument being checked.

4. Accuracy of metering in test equipment shall be appropriate for the test being performed.

5. Wave shape and frequency of test equipment output waveforms shall be appropriate for the test and tested equipment.

B. Test Instrument Standards:

1. All equipment used for testing and calibration procedures shall exhibit the following characteristics:

a. Maintained in good visual and mechanical condition

b. Maintained in safe operating condition

2. Test equipment should have operating accuracy equal to, or better than, the following limits:

a. Portable multimeters should be true RMS measuring.

b. Multimeters should have the following accuracy limits, or better:

1) AC voltage ranges: .75% +/-3 last single digits @ 60 Hz

2) AC current ranges: .90% +/-3 last single digits @ 60 Hz, including adapters, transducers

3) DC voltage ranges: .25% +/-1 last single digit

4) DC current ranges: .75% +/-1 last single digit

5) Resistance ranges: .50% +/-1 last single digit

6) Frequency range: .10% +/-1 last single digit @ 60 Hz

c. Clamp-on ammeters: ac current +/-3% of range +/-1 last single digit @ 60 Hz

d. Dissipation/power factor field equipment

1) i. +/-0.1% power factor for power factor values up to 2.0%

2) ii. 5% of the reading for power factor values above 2.0%

e. Low-range dc resistance equipment: 1.0% of reading, +/-2 last single digits

f. Transformer turns-ratio test equipment: 0.5% or better @ 60 Hz

g. Ground electrode test equipment: +/-2% of range

h. Insulation test sets: 0-1000V dc +/-20% of reading at mid-scale

i. Electrical load survey equipment

1) i. +/-5% total error, including sensors

2) 1% resolution

3) Current transformers +/-2% of range @ 60 Hz

4) Voltage transformers +/-0.5% of range @ 60 Hz

j. Liquid dielectric strength test equipment: +/-2% of scale

k. Infrared scanning equipment: sensitivity of 2O degrees C

l. Phase shifting equipment: +/-1.0 degree C over entire range

m. High-current test equipment: +/-2% of range

n. DC high potential test equipment: +/-2% of full scale

o. AC high potential test equipment (60 Hz): +/-2% of full scale

C. Test Instrument Calibration:

1. The testing firm shall have a calibration program which assures that all applicable test instruments are maintained within rated accuracy.

2. The accuracy shall be directly traceable to the National Institute of Standards and Technology.

3. Instruments shall be calibrated in accordance with the following frequency schedule:

a. Field instruments: 6 months maximum

b. Laboratory instruments: 12 months

c. Leased specialty equipment: 12 months (Where accuracy is guaranteed by lessor)

d. Dated calibration labels shall be visible on all test equipment.

e. Records, which show date and results of instruments calibrated or tested, must be kept up-to-date and available upon request.

f. Up-to-date instrument calibration instructions and procedures shall be maintained for each test instrument.

G. Calibrating standard shall be of higher accuracy than that of the instrument tested.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 PREPARATION

A. Testing shall be scheduled and coordinated with the Owner at least 2 weeks in advance

3.02 ACCEPTANCE TESTING

A. Tests all electrical equipment, both Contractor- and Owner-supplied, such that it is operational and within industry and manufacturer's tolerances and is installed in accordance with design specifications prior to energizing equipment.

B. Test systems and equipment furnished under Division 16 and repair or replace all defective work and equipment at no additional cost to the Owner. Refer to the individual equipment sections for additional specific testing requirements.

C. Adjust the systems furnished under Division 16 and instruct the Owner's personnel in the proper operation of the systems.

D. Provided mechanical inspection of equipment and operational testing of control circuits to confirm proper operation of equipment.

E. Check and record the full load current draw of each motor. Check ampere rating of thermal overloads for motors and submit a typed record to the Engineer, if using ambient compensated thermal overloads, submit the ambient temperature used at the time of the test. Include MCC cubicle location and driven load designation, motor service factor, horsepower, and Code letter. If incorrect thermal overloads are installed replace with the correct size overload.

F. Check power and control power fuse ratings for correct size and type. Replace fuses if they are found to be of the incorrect size/ratings.

G. Check settings of the motor circuit protectors. Adjust settings to lowest setting that will allow the motor to be started when under load conditions.

H. Check motor nameplates for correct phase and voltage.

I. Check rotation of motors prior to testing the driven load. Disconnect the driven equipment if damage could occur due to wrong rotation. If the rotation of the motor shaft is not correct, for the driven equipment, change the motor connections at the motor terminal box.

J. Check interlocking, control and instrument wiring for each system and/or part of a system to prove that the system will function properly as indicated by control schematic and wiring diagrams.

K. Verify all terminations at transformers, equipment, panels and enclosures are connected to the proper terminals by producing a 1, 2, 3 rotation on a phase sequenced motor when connected to "A," "B" and "C" phases.

L. Verify all circuit breaker ratings are as required by the Contract Documents or as amended during shop drawing review. Advise the Engineer of discrepancies and make changes as directed by the Engineer.

M. Verify grounding of instrumentation equipment and line surge protection equipment.

END OF SECTION

Forms

(to be used following award of bid)

1) **Contract Form**
2) **Performance Bond**
3) **Payment Bond**

PROJECTTITLE
BID #
PWP#

THIS CONTRACT made and entered into on this ___ day of MONTH, 20____, by and between the City of Sparks, Nevada, a municipal corporation, existing under and by virtue of the laws of the State of Nevada, hereinafter called "City", and **CONTRACTOR,** a qualified Contractor in the class of work required, hereinafter called "Contractor".

W I T N E S E T H

WHEREAS, the City has awarded a contract to Contractor for providing material and/or performing the work hereinafter mentioned in accordance with the proposal of said Contractor;

WHEREAS, the Contractor will provide the material and/or perform the work for the compensation stated in said proposal, an amount which has been arrived at between the parties;

WHEREAS, each party is willing to and does assume joint liability for the contents of this Contract, and each party accordingly agrees that it shall not be construed against any party as a drafting party;

NOW, THEREFORE, IT IS AGREED as follows:

1. **Scope of Work:**
   The scope of work for this contract is generally defined as **TITLE**. The City's Contract Documents and Contractor's Entire Proposal are on file with the City of Sparks. All terms, conditions and requirements contained within these Documents, including any and all bid documents, addenda and specifications issued by the City, are hereby incorporated by reference into this Contract.

   The Contractor shall perform within the time stipulated, the Contract as herein defined and shall provide and furnish any and all of the labor, materials, methods or processes, equipment implements, tools, machinery and equipment, and all utility, transportation and other services required to construct, install and put in complete order for use in a good and workmanlike manner all of the work covered by the Contract in connection with strict accordance with the plans and specifications therein, which were approved by said City and are on file with the City, including any and all addenda issued by the City, and with the other contract documents hereinafter enumerated.

2. **Payment for Project Services**
   As full consideration for the Services to be performed by Contractor, City agrees to pay Contractor as set forth in accordance with the bid and not to exceed fee of **COST** for the project.

   A monthly progress payment in the amount of ninety-five percent (95%) of the value of the work completed may be made every thirty (30) days upon application by the Contractor and certification by the Project Manager that such work has been completed.

Partial payments will be made once each month as the work satisfactorily progresses and after acceptance by the authorized City representative. The progress estimates shall be based upon materials in place, or on the job site and invoiced, and labor expended thereon. From the total of the amount ascertained will be deducted an amount equivalent to five percent (5%) of the whole, which five percent (5%) will be retained by the City until after completion of the entire Contract in an acceptable manner. Any time after fifty percent (50%) of the value of the work has been completed, the City will make any of the remaining partial payments in full.

No such estimates or payments shall be required to be made, when, in the judgment of the City Project Manager, the work is not proceeding in accordance with the provision of the Contract, or when in his judgment the total value of the work done since last estimate amounts to less than Five Hundred Dollars ($500.00).

The cost of materials conforming to the plans and specifications (materials being those which are required to be contained and incorporated in a finished contract bid item) delivered to the project and not at the time incorporated in the work, may also be included in the estimate for payment. No such estimate or payment shall be construed to be an acceptance of any defective work or improper material. The Contractor shall be responsible for, and shall not remove from the project any material that has been included in the estimate for payment.

Final payment shall be made upon the Project Manager certifying that the Contractor has satisfactorily completed the work in conformity with the Contract Documents.

3. Time for Completion:

The Contractor shall deliver the material and/or services called for in the specifications/proposal and within the delivery time specified and in accordance with the terms of the contract. Work shall be completed within _____ days from the Notice to Proceed issued by the City of Sparks Purchasing Division. The Contractor shall not alter or vary any terms or conditions contained or incorporated herein, including but not limited to, the quantity, price, delivery date or date designated as After Receipt of Order (ARO) or date for commencement or completion of services as mutually agreed upon, unless such alteration or variation is consented to in writing by a duly authorized representative of the City.

The City reserves the right to cancel resultant Contract upon ten days written notice in the event the type and quality of the product or work performance is unsatisfactory or in default, subject to Contractor's right to cure as outlined in termination clause.

This is a non-exclusive Contract and the City reserves the right to acquire the material and/or services at its discretion, from other sources during the term of this Contract.

4. No Unlawful Discrimination:

In connection with the performance of work under this Agreement, Contractor agrees not to discriminate against any employee or applicant because of race, creed, color, national origin, disability, sex, sexual orientation or age. Such agreement shall include, but not be limited to, the following: recruitment or recruitment advertising, rates or pay or other forms of compensation, and selection. Any violation of these provisions by Contractor shall constitute a material breach of contract.

In all cases where persons are employed in the construction of public works, preference must be given when the qualifications of the applicants are equal:

A) First: To honorably discharged soldiers, sailors and marines of the United States who are citizens of the State of Nevada.
B) Second: To other citizens of the State of Nevada

If the provisions of this section are not complied with by the contractor engaged on the public work, the contract is void, and any failure or refusal to comply with any of the provisions of this section renders any such contract void and subject to the exceptions contained in this section, no money may be paid out of the State Treasury or out of the treasury of any political subdivision of the State to any person employed on any work mentioned in this section unless there has been compliance with the provisions of this section. Any contractor engaged on a public work or any other person who violates any of the provisions of this section is guilty of a misdemeanor. The penalties provided for in this section do not apply where violations thereof are due to misrepresentations made by the employee or employees.

5. No Illegal Harassment:
Violation of the City's harassment policy, which is incorporated by reference and available from the Human Resource Division, by the Contractor, its officers, employees, agents, vendors, consultants, subcontractors and anyone from whom it is legally liable, while performing or failing to perform Contractor's duties under this Contract shall be considered a material breach of contract.

6. Lawful Performance:
Vendor shall abide by all Federal, State and Local Laws, Ordinances, Regulations, and Statutes as may be related to the performance of duties under this agreement. In addition, all applicable permits and licenses required shall be obtained by the vendor, at vendor's sole expense.

7. Preferences (This Section ☐ IS ☐ IS NOT Applicable to this contract):
To the extent Contractor has sought and qualified for a bidding preference and this project has a value of over $250,000 pursuant to Nevada Revised Statutes Chapter 338, Contractor acknowledges and agrees that the following requirements will be adhered to, documented and attained for the duration of the Project:

1. At least 50 percent of the workers employed on the Project (including subcontractors) hold a valid driver's license or identification card issued by the Nevada Department of Motor Vehicles;

2. All vehicles used primarily for the public work will be (a) registered and (where applicable) partially apportioned to Nevada; or (b) registered in Nevada; and

3. The Contractor shall maintain and make available for inspection within Nevada all payroll records related to the Project.

Contractor recognizes and accepts that failure to comply with any requirements herein shall be a material breach of the contract and entitle the City of Sparks to liquidated damages in the amount set by statute. In addition, the Contractor recognizes and accepts that failure to comply with any

requirements herein may lose its certification for a preference in bidding and/or its ability to bid on any contracts for public works pursuant to NRS Chapter 338.

To the extent Contractor has sought and qualified for a bidding preference and this project has a value of over $250,000 pursuant to Nevada Revised Statutes Chapter 338, each contract between the contractor, applicant or design-build team and a subcontractor must provide for the apportionment of liquidated damages assessed pursuant to this section if a person other than the Contractor was responsible for the breach of a contract for a public work caused by a failure to comply with a requirement of Items 1-5 within this section. The apportionment of liquidated damages must be in proportion to the responsibility of each party for the breach.

8. Prevailing Wages:

The Contractor and subcontractors shall be bound by and comply with all federal, state and local laws with regard to minimum wages, overtime work, hiring and discrimination, including Chapter 338 of the NRS, which is entitled, "Public Works Projects."

The Contractor shall ensure that all employees on the work site are paid in accordance with the CURRENT PREVAILING WAGE RATES AS APPROVED BY THE STATE LABOR COMMISSIONER, whenever the actual value of the Contract totals Two Hundred Fifty Thousand Dollars ($250,000) or more, or when required by the Supplementary Conditions. If a Change Order causes a Contract to exceed Two Hundred Fifty Thousand Dollars ($250,000), the State Labor Commissioner may audit the entire Contract period.

Questions involving the Prevailing Wage Rates for the City of Sparks should be referred to the Labor Commissioner, State of Nevada, at (775) 687-4850.

When federal money is associated with the project making the Contract subject to both state and federal wage rates, the Contractor shall not pay less than the higher rate when the two rates differ for similar kinds of labor.

The Remainder of this Section (Section 8) ☐ IS ☐ IS NOT Applicable to this contract):

A. Posting of Minimum Wage Rates - In accordance with NRS, Chapter 338, Section 338.020, the Contractor shall post the hourly and daily rate of wages to be paid to each of the classes of mechanics and workers on the site of Work of this Contract in a place generally visible to the workers.

B. Pursuant to NRS 338.060 and 338.070, the Contractor hereby agrees to forfeit, as a penalty to the City of Sparks, not less than Twenty Dollars ($20) nor more than Fifty Dollars ($50) for each calendar day or portion thereof that each worker employed on the Contract is paid less than the designated rate for any work done under the Contract, by the Contractor or any subcontractor under him, or is not reported to the City of Sparks as required by NRS 338.070.

C. The contractor and each subcontractor shall keep or cause to be kept an accurate record showing, for each worker employed by the contractor or subcontractor:

(1) The name of the worker;
(2) The occupation of the worker;
(3) If the worker has a driver's license or identification card, an indication of the state or other jurisdiction that issued the license or card; and
(4) The actual per diem, wages and benefits paid to the worker.

In addition, the contractor and each subcontractor shall keep or cause to be kept an accurate record showing, for each worker employed by the contractor or subcontractor who has a driver's license or identification card:
(1) The name of the worker;
(2) The driver's license number or identification card number of the worker; and
(3) The state or other jurisdiction that issued the license or card.

D. The records in Section C above must be open at all reasonable hours to the inspection of the City of Sparks, and its officers and agents. A copy of the each record for each calendar Month for the General Contractor and all Sub-Contractors must be submitted to the City of Sparks no later than 15 days after the end of each month for the previous months' wages.

9. Acceptance by the City:
It is expressly understood and agreed that all materials provided and/or work done by the Contractor shall be subject to inspection and acceptance by the City at its discretion, and that any progress inspections and approval by the City of any item or work shall not forfeit the right of the City to require the correction of faulty workmanship or material at any time during the course of the work, although previously approved by oversight. Nothing herein contained shall relieve the Contractor of the responsibility for proper construction and maintenance of the work, materials and equipment required under the terms of this Contract until all work has been completed and accepted by the City.

10. Waiver:
No waiver of any term, provision or condition of this Contract, whether by conduct or otherwise, in any one or more instances, shall be deemed to be nor shall it be construed as a further or continuing waiver of any such term, provision or condition of this Contract. No waiver shall be effective unless it is in writing and signed by the party making it.

11. Notices:
All notices required to be given in writing by this Contract shall be deemed to be received (i) upon delivery if personally delivered, or (ii) when receipt is signed for if mailed by certified or registered mail, postage prepaid, or by express delivery service or courier, when addressed as follows (or sent to such other address as a Party may specify in a notice to the others):

PURCHASING MANAGER	CONTRACTOR:
CITY OF SPARKS	_____
431 PRATER WAY	_____
PO BOX 857	_____
SPARKS, NV 89432-0857	_____

12. Arbitration:

Any and all disputes, controversies or claims arising under or in connection with this Contract, including without limitation, fraud in the inducement of this Contract, or the general validity or enforceability of this Contract, shall be governed by the laws of the State of Nevada without giving effect to conflicts of law principles, may be submitted to binding arbitration before one arbitrator, and shall be conducted in accordance with the Commercial Arbitration Rules of the American Arbitration Association in a private manner in Washoe County, Nevada. This award shall be final and judgment may be entered upon it in any court having jurisdiction thereof. In reaching this final award, the arbitrator shall have no authority to change or modify any provision of this Contract. All other expenses of arbitration shall be borne equally by the parties. All fees, including legal fees, shall be borne by the party who incurred them. All costs of enforcement shall be borne by the losing party. Each party shall have the right to discovery in accordance with the Nevada Rules of Civil Procedure.

13. Jurisdiction and Venue:

In the event the arbitration award is challenged, any action or proceeding seeking to do so must be brought in the courts of the State of Nevada, County of Washoe, or if the party can acquire subject-matter jurisdiction, in the United States District Court for the District of Nevada in the City of Reno. Each of the parties consents to the personal jurisdiction of such courts (and of the appropriate appellate courts) in any such action or proceeding and waives any objection to venue laid therein. Process in any action or proceeding referred to in the preceding sentence may be served on either party by sending it certified mail to the respective addresses designated for notice.

14. Indemnification:

To the fullest extent permitted by law, upon award, Contractor shall hold harmless, indemnify, defend and protect City, its affiliates, officers, agents, employees, volunteers, successors and assigns ("Indemnified Parties"), and each of them from and against any and all claims, demands, causes of action, damages, costs, expenses, actual attorney's fees, losses or liabilities, in law or in equity, of every kind and nature whatsoever ("Claims") arising out of or related to any act or omission of Contractor, its employees, agents, representatives, or Subcontractors in any way related to the performance of work under this Agreement by Contractor, or to work performed by others under the direction or supervision of Contractor, including but not limited to:

1. Personal injury, including but not limited to bodily injury, emotional injury, sickness or disease, or death to persons;
2. Damage to property of anyone, including loss of use thereof;
3. Penalties from violation of any law or regulation caused by Contractor's action or inaction;
4. Failure of Contractor to comply with the Insurance requirements established under this Agreement;
5. Any violation by Contractor of any law or regulation in any way related to the occupational safety and health of employees.

In determining the nature of the claim against City, the incident underlying the claim shall determine the nature of the claim, notwithstanding the form of the allegations against City.

If City's personnel are involved in defending such actions, Contractor shall reimburse City for the time

and costs spent by such personnel at the rate charged City for such services by private professionals.

In cases of professional service agreements, requiring professional liability coverage:
If the insurer by which a Consultant is insured against professional liability does not so defend the City and applicable agents and/or staff, and the Consultant is adjudicated to be liable by a trier of fact, the City shall be entitled to reasonable attorney's fees and costs to be paid to the City by the Consultant in an amount which is proportionate to the liability of the of the Consultant.

Nothing in this contract shall be interpreted to waive nor does the City, by entering into this contract, waive any of the provisions found in Chapter 41 of the Nevada Revised Statutes.

15. Licenses and Permits:

The Contractor shall procure at his own expense all necessary licenses and permits and shall adhere to all the laws, regulations and ordinances applicable to the performance of this Contract.

All Contractors, Sub-Contractors and Suppliers doing business within the City of Sparks are required to obtain a current business license from the City of Sparks prior to commencement of this contract. Per Sparks Municipal Code Section 5.08.020A: "It is unlawful for any person to transact business in the City without first having obtained a license from the City to do so and without complying with all applicable provisions of this title and paying the fee therefore."

16. Insurance:

BIDDERS' ATTENTION IS DIRECTED TO THE INSURANCE REQUIREMENTS BELOW. IT IS HIGHLY RECOMMENDED THAT BIDDERS CONFER WITH THEIR RESPECTIVE INSURANCE CARRIERS OR BROKERS TO DETERMINE IN ADVANCE OF BID SUBMISSION THE AVAILABILITY OF INSURANCE CERTIFICATES AND ENDORSEMENTS AS PRESCRIBED AND PROVIDED HEREIN. IF THE APPARENT LOW BIDDER FAILS TO COMPLY STRICTLY WITH THE INSURANCE REQUIREMENTS, THAT BIDDER MAY BE DISQUALIFIED FROM AWARD OF THE CONTRACT.

Should work be required on City premises or within the public right-of-way, upon award of the contract, the bidder shall provide proof of insurance for the types of coverage, limits of insurance and other terms specified herein, prior to initiation of any services under City, Bid, Proposal or Contract. Coverage shall be from a company authorized to transact business in the State of Nevada and the City of Sparks and shall meet the following minimum specifications:

Contractor shall at its own expense carry and maintain at all times the following insurance coverage and limits of insurance no less than the following or the amount customarily carried by Contractor or any of its subcontractors, whichever is greater. Contractor shall also cause each subcontractor employed by Contractor to purchase and maintain insurance of the type specified herein. All insurers must have AM Best rating not less than A-VII, and be acceptable to the City. Contractor shall furnish copies of certificates of insurance evidencing coverage for itself and for each subcontractor. Failure to maintain the required insurance may result in termination of this contract at City's option. If Contractor fails to maintain the insurance as set forth herein, City shall have the right, but not the obligation, to purchase said insurance

at Contractor's expense.

Contractor shall provide proof of insurance for the lines of coverage, limits of insurance and other terms specified below prior to initiation of any services. Coverage shall be from a company authorized to transact business in the State of Nevada and the City of Sparks. Contractor and any of its subcontractors shall carry and maintain coverage and limits no less than the following or the amount customarily carried by Contractor or any of its subcontractors, whichever is greater.

Applicable to this Contract	Insurance Type	Minimum Limit	Insurance Certificate	Additional Insured	Waiver of Subrogation
Yes	General Liability/Umbrella (Excess) Liability	$2,000,000	✔	✔	✔
Yes	Automobile Liability	$1,000,000	✔	✔	
Yes	Workers' Compensation	Statutory	✔	N/A	✔
Yes	Employer's Liability	$1,000,000	✔	N/A	
No	Professional Liability	$1,000,000	✔	N/A	N/A
No	Pollution Legal Liability	$1,000,000	✔	N/A	N/A

Commercial General Liability

Contractor shall carry and maintain Commercial General Liability (CGL) and, if necessary to meet required limits of insurance, commercial umbrella/excess liability insurance with a total limit of not less than the limits specified herein.

For contracts that are for the construction or improvement of public facilities, the Contractor shall obtain and maintain products and completed operations liability coverage through the statute of repose after completion of the project.

There shall be no endorsement or modification of the CGL limiting the scope of coverage for liability arising from pollution, explosion, collapse, underground property damage, employment-related practices, or damage to the named insured's work unless Subcontractor carries and maintains separate policies providing such coverage and provides Contractor evidence of insurance confirming the coverage.

Minimum Limits of Insurance

$2,000,000 Each Occurrence Limit for bodily injury and property damage
$2,000,000 General Aggregate Limit
$2,000,000 Products and Completed Operations Aggregate Limit
$10,000 Medical Expense Limit

If Commercial General Liability Insurance or other form with a general aggregate limit is used, it shall be

revised to apply separately to this PROJECT or LOCATION.

Coverage Form
Coverage shall be at least as broad as the unmodified Insurance Services Office (ISO) Commercial General Liability (CGL) "Occurrence" form CG 00 01 04/13 or substitute form providing equivalent coverage and shall cover liability arising from premises, operations, independent contractors, products-completed operations, personal and advertising injury, and liability assumed under an insured contract (including the tort liability of another assumed in a business contract).

Additional Insured
City, its officers, agents, employees, and volunteers are to be included as insureds using the applicable ISO additional insured endorsement(s) or substitute forms providing equivalent coverage, in respects to damages and defense arising from: activities performed by or on behalf of Contractor, including the insured's general supervision of Contractor; products and completed operations of Contractor; premises owned, occupied, or used by Contractor. The coverage shall contain no special limitations on the scope of protection afforded to City, its officers, employees, or volunteers. Additional insured status for City shall apply until the expiration of time within which a claimant can bring suit per applicable state law.

Any failure by the Contractor to comply with reporting provisions of the policies shall not affect its obligations to the additional insureds.

Primary and Non-Contributory
Contractor's insurance coverage shall apply as primary insurance with respect to any other insurance or self-insurance programs afforded to City, its officers, agents, employees, and volunteers. There shall be no endorsement or modification of the CGL to make it excess over other available insurance; alternatively, if the CGL states that it is excess or pro rata, the policy shall be endorsed to be primary with respect to the additional insured. Any insurance or self-insurance maintained by City, its officers, employees, or volunteers shall be excess of Contractor's insurance and shall not contribute with it in any way.

Separation of Insureds
Contractor's insurance shall apply separately to each insured against whom a claim is made or suit is brought, except with respect to the limits of the insurer's liability.

Waiver of Subrogation
Contractor waives all rights against City and its agents, officers, directors and employees for recovery of damages to the extent these damages are covered by the commercial general liability or commercial umbrella liability insurance maintained pursuant to this agreement. Insurer shall endorse CGL policy as required to waive subrogation against the City with respect to any loss paid under the policy.

Endorsements
A policy form or endorsement is required confirming coverage for all required additional insureds. The endorsement for CGL shall be at least as broad as the unmodified ISO additional insured endorsement CG 20 10 11/85 or substitute forms providing additional insured coverage for products and completed operations.

A waiver of subrogation in favor of City shall be endorsed to the policy using an unmodified Waiver of Transfer of Rights of Recovery of Others to Us ISO CG 24 04 05 09, or a substitute form providing equivalent coverage.

If any underground work will be performed, Contractor shall maintain electronic data liability insurance applicable to the Project and insuring against liability arising out of the loss of, loss of use of, damage to, corruption of, inability to access, or inability to manipulate electronic data. This coverage shall be maintained with a limit of liability of not less than $1,000,000 and provide coverage at least as broad as electronic data liability coverage form CG 04 37 (or substitute form providing equivalent coverage.

Business Automobile Liability

Minimum Limits of Insurance
$1,000,000 Combined Single Limit per accident for bodily injury and property damage or the limit customarily carried by Contractor, whichever is greater. No aggregate limit may apply. Coverage may be combined with Excess/Umbrella Liability coverage to meet the required limit.

Coverage Form
Coverage shall be at least as broad as the unmodified Insurance Services Office (ISO) Business Automobile Coverage form CA 00 01 10/13, CA 00 25 10/13, CA 00 20 10/13 or substitute form providing equivalent coverage. Such insurance shall cover liability arising out of any auto (including owned, hired, and non-owned autos).

Pollution liability coverage at least as broad as that provided under the ISO pollution liability—broadened coverage for covered autos endorsement (CA 99 48) shall be provided, and the Motor Carrier Act endorsement (MCS 90) shall be attached for all contracts involving transportation of "hazardous material" as this term is defined by applicable law, including, but not limited to, waste, asbestos, fungi, bacteria and mold.

Additional Insured
City, its officers, agents, employees, and volunteers are to be included as insureds with respect to damages and defense arising from the ownership, maintenance or use of automobiles owned, leased, hired, or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to City, its officers, employees, or volunteers. Additional insured status for City shall apply until the expiration of time within which a claimant can bring suit per applicable state law.

Endorsements
A policy endorsement is required listing all required additional insureds. The endorsement for Business Automobile Liability shall be at least as broad as the unmodified ISO CA 20 48 10/13 or a substitute form confirming City's insured status for Liability Coverage under the Who Is An Insured Provision contained in Section II of the coverage form ISO CA 00 01 10/13.

Workers' Compensation and Employer's Liability
Contractor shall carry and maintain workers' compensation and employer's liability insurance as required

by NRS 616B.627 or provide proof that compliance with the provisions of Nevada Revised Statutes Chapters 616A-D and all other related chapters is not required. It is understood and agreed that there shall be no coverage provided for Contractor or any Subcontractor of the Contractor by the City. Contractor agrees, as a precondition to the performance of any work under this Agreement and as a precondition to any obligation of the City to make any payment under this Agreement to provide City with a certificate issued by an insurer in accordance with NRS 616B.627 and with a certificate of an insurer showing coverage pursuant to NRS 617.210.

It is further understood and agreed by and between City and Contractor that Contractor shall procure, pay for and maintain the above mentioned coverage at Contractor's sole cost and expense.

Should Contractor be self-funded for workers' compensation and employer's liability insurance, Contractor shall so notify City in writing prior to the signing of this Contract. City reserves the right to approve said retentions, and may request additional documentation, financial or otherwise, for review prior to the signing of this Contract.

Nevada law allows the following to reject workers' compensation coverage if they do not use employees or subcontractors in the performance of work under the contract:

- Sole proprietors (NRS 616B.627 and NRS 617.210)
- Unpaid officers of quasi-public, private or nonprofit corporations (NRS 616B.624 and NRS 617.207)
- Unpaid managers of limited liability companies (NRS 616B.624 and NRS 617.207)
- An officer or manager of a corporation or limited liability company who owns the corporation or company (NRS 616B.624 and NRS617.207)

If a contractor has rejected workers' compensation coverage under applicable Nevada law, the contractor must indicate the basis for the rejection of coverage and complete, sign and have notarized an Affidavit of Rejection of Coverage. The Affidavit must be completed, signed and notarized prior to performance of any work.

Minimum Limits of Insurance

Workers' Compensation:	Statutory Limits
Employer's Liability:	**$1,000,000** Bodily Injury by Accident – Each Accident
	$1,000,000 Bodily Injury by Disease – Each Employee
	$1,000,000 Bodily Injury by Disease – Policy Limit

Coverage Form

Coverage shall be at least as broad as the unmodified National Council on Compensation Insurance (NCCI) Workers Compensation and Employer's Liability coverage form WC 00 00 07/11 or substitute form providing equivalent coverage.

OTHER INSURANCE COVERAGES (IF APPLICABLE)

Professional Liability Insurance (if Applicable) $1,000,000 per occurrence limits of liability or whatever limit is customarily carried by the Contractor, whichever is greater, for design, design-build

or any type of professional services with a minimum of three (3) years reporting of claims following completion of the project.

Contractors Pollution Liability Insurance (If Applicable)- $1,000,000 per occurrence and $2,000,000 aggregate or whatever amount is acceptable to the City for any exposure to "hazardous materials" as this term is defined in applicable law, including but not limited to waste, asbestos, fungi, bacterial or mold.

Lower tier sub-subcontractors, Truckers, Suppliers: Evidence confirming lower tier subcontractors, truckers and suppliers are maintaining valid insurance prior to beginning work on the project to meet the requirements set forth herein on Subcontractor, including but not limited to all additional insured requirements of Subcontractor.

ALL COVERAGES
Coverage shall not be suspended, voided, canceled, or non-renewed by either CONTRACTOR or by the insurer, reduced in coverage or in limits except after thirty (30) days' prior written notice has been given to CITY except for ten (10) days' notice for nonpayment of premium.

OTHER INSURANCE PROVISIONS
Should City and Contractor agree that higher coverage limits are needed warranting a project policy, project coverage shall be purchased and the premium for limits exceeding the above amount may be borne by City. City retains the option to purchase project insurance through Contractor's insurer or its own source.

Any failure to comply with reporting provisions of the policies shall not affect coverage provided to City, its officers, agents, employees, or volunteers.

ACCEPTABILITY OF INSURERS
Insurance is to be placed with insurers with a Best's rating of no less than A-VII and acceptable to the City. City, with the approval of the Risk Manager, may accept coverage with carriers having lower Best's ratings upon review of financial information concerning Contractor and insurance carrier. City reserves the right to require that Contractor's insurer be a licensed and admitted insurer in the State of Nevada, or on the Insurance Commissioner's approved but not admitted list.

VERIFICATION OF COVERAGE
Contractor shall furnish City with certificates of insurance and with original endorsements affecting coverage required by this contract. The certificates and endorsements for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf.

Prior to the start of any Work, Contractor must provide the following documents to City of Sparks, Attention: Purchasing Division, P.O. Box 857, Sparks, NV 89432-0857:

A. Certificate of Insurance. Contractor must provide a Certificate of Insurance form to the City of Sparks to evidence the insurance policies and coverage required of Contractor.

B. Additional Insured Endorsements. An original Additional Insured Endorsement, signed by an authorized insurance company representative, must be submitted to the City of Sparks, by attachment to the Certificate of Insurance, to evidence the endorsement of the City of Sparks as additional insured.

C. Policy Cancellation Endorsement. Except for ten (10) days' notice for non-payment of premium, each insurance policy shall be endorsed to specify that without thirty (30) days prior written notice to the City of Sparks, the policy shall not be suspended, voided, cancelled or non-renewed, and shall provide that notices required by this paragraph shall be sent by certified mailed to the address specified above. A copy of this signed endorsement must be attached to the Certificate of Insurance.

D. Bonds (as Applicable). Bonds as required and/or defined in the original bid documents.

All certificates and endorsements are to be addressed to the City of Sparks, Purchasing Division and be received and approved by City before work commences. The City reserves the right to require complete certified copies of all required insurance policies at any time.

SUBCONTRACTORS

Contractor shall include all Subcontractors as insureds under its policies or shall furnish separate certificates and endorsements for each Subcontractor. All coverages for Subcontractors shall be subject to all of the requirements stated herein.

MISCELLANEOUS CONDITIONS

1. Contractor shall be responsible for and remedy all damage or loss to any property, including property of City, caused in whole or in part by Contractor, any Subcontractor, or anyone employed, directed, or supervised by Contractor.
2. Nothing herein contained shall be construed as limiting in any way the extent to which Contractor may be held responsible for payment of damages to persons or property resulting from its operations or the operations of any Subcontractors under it.
3. In addition to any other remedies City may have if Contractor fails to provide or maintain any insurance policies or policy endorsements to the extent and within the time herein required, City may, at its sole option:
    a. Purchase such insurance to cover any risk for which City may be liable through the operations of Contractor under this Agreement and deduct or retain the amount of the premiums for such insurance from any sums due under the Agreement;
    b. Order Contractor to stop work under this Agreement and/or withhold any payments which become due Contractor here under until Contractor demonstrates compliance with the requirements hereof; or,
    c. Terminate the Agreement.

17. Liquidated Damages:

If the Product is not delivered/Project is not completed within the time stipulated in the bid, the Contractor shall pay to the City of Sparks as fixed, agreed and liquidated damages for delay and not as a penalty (it

being impossible to determine the actual damages occasioned by the delay) $_____ for each _____ day of delay until delivery is completed; the Contractor shall be liable to the City of Sparks for the amount herein. This amount may be deducted from money due or to become due to the Contractor as compensation under this proposal in the event the Contractor fails to meet delivery schedules or product specifications.

18. Material Breach of Contract:
In the event Contractor fails to deliver the product and services as contracted for herein, to the satisfaction of the City of Sparks or otherwise fails to perform any provisions of this Contract, the City, after providing five (5) days written notice and Contractor's failure to cure such breach within the time specified in the notice, may without waiving any other remedy, make good the deficiencies and deduct the actual cost of providing alternative products and/or services from payment due the Contractor. Non-performance after the first notice of non-performance shall be considered a material breach of contract.

19. Force Majeure:
Neither party to the Contract shall be held responsible for delay or default caused by fire, riot, acts of God, and/or war which is beyond that party's reasonable control. City may terminate the Contract upon written notice after determining such delay or default will reasonably prevent successful performance of the Contract.

20. Termination:
The City may terminate the Contract for material breach of contract upon ten (10) days written notice and recover all damages, deducting any amount still due the Contractor from damages owed to the City, or seek other remedy including action against all bonds. The Contractor may terminate the Contract for material breach of contract upon thirty (30) days written notice to the City.

21. Assignment:
All of the terms, conditions and provisions of this Contract, and any amendments thereto, shall inure to the benefit of and be binding upon the parties hereto, and their respective successors and assigns. The Contractor shall not assign this Contract without the written consent of the City which will not be unreasonably withheld.

22. Entire Contract:
This Contract constitutes the entire agreement of the parties and shall supersede all prior offers, negotiations, agreements and contracts whether written or oral. Any modifications to the terms and conditions of this Contract must be in writing and signed by both parties.

23. Severability:
If any part of this Contract is found to be void it will not affect the validity of the remaining terms of this Contract which will remain in full force and effect.

24. Headings:
Paragraph titles or captions contained in this Contract are inserted only as a matter of convenience and for reference only, and in no way define, limit, extend, or describe the scope of this Contract or the intent of any provision herein.

25. Singular Includes the Plural; Gender; Title Reference:

Whenever the singular number is used in this Contract and when required by the context, the same shall include the plural, and the use of any gender, be it masculine, feminine or neuter, shall include all of the genders, and the word "person" or "entity" shall include corporation, firm, partnership, or any other combination or association.

The use of the title "Bidder", "Vendor", "Contractor" or "Consultant" within this contract or associated bid documents shall be deemed interchangeable and shall refer to the person or entity with whom the City of Sparks is contracting for the service or product referenced within this contract.

26. Execution:

The parties agree to execute such additional documents and to take such additional actions as are reasonably necessary or desirable to carry out the purposes hereof. They also agree, acknowledge and represent that all corporate authorizations have been obtained for the execution of this Contract and for the compliance with each and every term hereof. Each undersigned officer, representative or employee represents that he or she has the authority to execute this Contract on behalf of the party for whom he or she is signing.

IN WITNESS WHEREOF, the City of Sparks has caused this Contract to be executed by its officers thereunto duly authorized and the Consultant has subscribed same, all on the day and year first above written.

_____	CITY OF SPARKS, NEVADA
(Vendor)	A Municipal Corporation
By: _____	By:_____
	Geno R. Martini, Mayor
_____	
(Title)	
APPROVED AS TO FORM	ATTEST:
_____	_____
City Attorney	Teresa Gardner, City Clerk

CITY OF SPARKS, NEVADA - BOND OF FAITHFUL PERFORMANCE

Bid #: _____
Bond #: _____
Surety Rating: _____
NV License #: _____
Appt. Agent Countersigning - List below with address

KNOW ALL MEN BY THESE PRESENTS: That WHEREAS, the City of Sparks in the State of Nevada has awarded to (**CONTRACTOR NAME)** hereinafter designated as the "Principal" a contract for Bid # **BID NUMBER**, PWP # **PWP NUMBER**, for the **PROJECT TITLE** and

WHEREAS, said Principal is required under the terms of said contract to furnish a bond for the faithful and proper performance of the Contract and the Bonding Company has an "A" or better rating with Moody's or A.M. Best and T-Listed with the U.S. Treasury Department;

NOW, THEREFORE, we the Principal and _____ as Surety, are held and firmly bound unto the City of Sparks in the State of Nevada, in the penal sum of (**WRITTEN COST)** dollars ($_____), lawful money of the United States, being not less than one hundred percent (100%) of the estimated contract cost of the work, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that if the above bound Principal, his or its heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and faithfully perform the covenants, conditions and agreements in the said contract and any alterations made as therein provided on his or their part to be kept and performed at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall indemnify and save harmless the City of Sparks in the State of Nevada, its officers and agents as therein stipulated, then this obligation shall become null and void; otherwise, it shall be and remain in full force and virtue.

As a condition precedent to the satisfactory completion of the said contract, the above obligation shall hold good for a period of one (1) year after the completion and acceptance of the said work, during which time, if the above bounden principal, his or its heirs, executors, administrators, successors or assigns shall fail to make full, complete and satisfactory repair and replacements or totally protect the said City of Sparks in the State of Nevada from loss or damage made evident during said period of one (1) year from the date of acceptance of said works, and resulting from or caused by defective materials or faulty workmanship in the prosecution of the work done, the obligation in the said sum of (**WRITTEN COST)** dollars ($_____) shall remain in full force and virtue; otherwise the above obligation shall be void.

And the said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in anyway effect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration, or addition to the terms of the contract, to the work or to the specifications.

IN WITNESS WHEREOF, the above bound parties have executed this instrument under their seals this _____ day of _____, 20___, the name and corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

_____
_____
_____
Principal

By _____
_____
_____
_____
Surety
By _____

CITY OF SPARKS, NEVADA – Payment Bond – Labor & Materials

Bid #: _____
Bond #: _____
Surety Rating: _____
NV License #: _____
Appt. Agent Countersigning - List below with address

KNOW ALL MEN BY THESE PRESENTS: That WHEREAS, the City of Sparks in the State of Nevada, has awarded to **CONTRACTOR**, hereinafter designated as the "Principal" a Contract for Bid # **BID NUMBER**, PWP # **PWP NUMBER**, for the **PROJECT TITLE** and

WHEREAS, said Principal is required under the terms of said contract to furnish a Bond for the faithful and proper performance of the Contract and the Bonding Company has an "A" or better rating with Moody's or A.M. Best and T-Listed with the U.S. Treasury Department;

NOW, THEREFORE, we, the Principal, and _____ as Surety, are held and firmly bound unto the City of Sparks in the State of Nevada, in the penal sum of **WRITTEN AMOUNT** dollars ($_____), lawful money of the United States, being not less than one hundred percent (100%) of the estimated contract cost of the work for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally firmly by these presents.

NOW, THEREFORE, THE CONDITION OF THIS OBLICATION IS SUCH that if the above bounden principal, his or its heirs, executors, administrators, successors, or assigns, shall fail to pay for any materials, provisions, provender or other supplies, implements, or machinery used in, upon, for, or about the performance of the work contracted to be done or for any work or labor thereon of any kind, or for amounts due under the Unemployment Compensation Law with respect to such work or labor as required by the provisions of NRS 612, and provided that the claimant shall have complied with the provisions of said law, the Surety hereon will pay for the same within thirty (30) calendar days an amount not exceeding the sum specified in this bond, then the above obligation shall be null and void; otherwise to remain in full force and account. In case suit is brought upon this bond, the said Surety agrees to pay a reasonable attorney's fees to be fixed by the Court.

The Bond shall insure to the benefit of any and all persons, companies and corporations entitled to file claims under NRS 339 as to give a right of action to them or their assigns in any suit brought upon this Bond.

IN WITNESS WHEREOF, the above bound parties have executed this instrument under their seals this _____ day of _____, 20___, 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.

_____
_____
_____
Principal

By _____

_____
_____
_____
Surety

By _____