CONTRACT DOCUMENTS
AND
SPECIFICATIONS
FOR
HAILEY PUMP STATION VARIABLE FREQUENCY DRIVE IMPROVEMENTS
FOR THE CITY OF MESQUITE, TEXAS
PUBLIC WORKS DEPARTMENT - ENGINEERING DIVISION
CITY CONTRACT NO. E2017-003

MESQUITE
TEXAS
Real. Texas. Service.

Prepared by:

FREEMAN-MILLICAN, INC. REG. ENG. FIRM F-2827

March 2017

BIDDING SET

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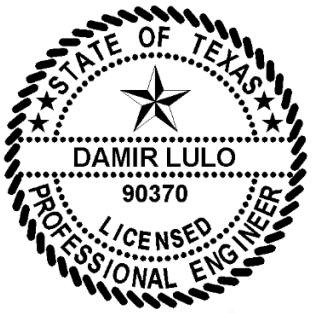

03/29/2017

March 2017

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Tentative Schedule

FOR

HAILEY PUMP STATION VARIABLE FREQUENCY DRIVE IMPROVEMENTS

City Contract No. E2017-003

Submit Public Advertisement to Purchasing	Wednesday, March 22, 2017
1st Public Advertisement	Thursday March 30, 2017
2nd Public Advertisement	Thursday, April 6, 2017
Pre-Bid Conference	Tuesday, April 11, 2017 @ 10:00 am
Open Bids	Thursday, April 20, 2017 at 2:00 pm
Agenda Item & Council Briefing Completed	May 5, 2017
*Council Awards Contract	May 15, 2017
1st Notice to Proceed – Authorization to Acquire Equipment	June 1, 2017
2nd Notice to Proceed – Authorization to Start of Construction	September 15, 2017

(Tentative Notice to proceed dates assumes rapid execution of contract documents by the Contractor with proper insurance and bonds)

Substantial Completion (100-working day contract) December 24, 2017

***City Council award date assumes no bidding irregularities or other issues with the low bidder requiring extensive checking of qualifications, etc.**

ADVERTISEMENT FOR BIDS

Bid No. E2017-003

Sealed competitive bids or proposals as set forth and required in the plans and specifications (either of which shall hereinafter be referred to as the "Bid") addressed to the Mayor and City Council of the City of Mesquite, Texas will be received at the office of Ryan Williams, Manager of Purchasing at the Municipal Center, 1515 N. Galloway Ave., Mesquite, Texas 75149 until ***2:00 p.m. on, Tuesday, April 20, 2017***, for the following: ***Hailey Pump Station Variable Frequency Drive Improvements***

As set forth in the plans and specifications. the project is to install two (2) 400 HP Variable Frequency Drives to control two existing 400 HP vertical turbine pumps at Hailey Pump Station together with a partial upgrade of the existing SCADA system to allow for an inclusion of local and remote variable frequency drive control.

A pre-bid conference will be held at 10:00 a.m. on Tuesday, April 11, 2017, at the City of Mesquite Art Center located at 1527 N. Galloway Avenue, Mesquite, Texas 75149 in the Rehearsal Hall.

Instruction to Bidders: proposal forms, plans and specifications (the "Bid Documents") may be obtained from the Engineering Division office, Municipal Center, 1515 N. Galloway, Mesquite, Texas 75149 upon a non-refundable payment of fifty dollars ($50.00).

The Bid shall be submitted on the form provided in the Bid Documents. Vendors should check the Mesquite Purchasing Department website, http://www.cityofmesquite.com/674/Bid-Openings-Specifications-Conferences, and BidSync, http://www.cityofmesquite.com/678/BidSync-Bid-Openings, to view documents relating to this RFP. Questions shall be submitted through BidSync and response will be posted through BidSync.

Bidder must submit, with their Bid, a Cashier's check, Certified check or a Bid Bond from an approved surety company, in the amount of five percent (5%) of their Bid as a guarantee that the Bidder will enter into a contract and guarantee forms, if required, within 10 days after notice of award of contract.

The successful bidder must furnish Performance Bond and Payment Bond, each in the amount of 100 percent of the contract price, from an approved Surety company holding a permit from the State of Texas to act as surety, and acceptable according to the latest list of companies holding Certificates of Authority from the Secretary of the Treasury of the United States, or another Surety acceptable to the City.

Further information concerning the procurement may be obtained **by email only** from the City of Mesquite Engineering Division – *Corey Nesbit, P.E. CFM, cnesbit@cityofmesquite.com, City Engineer.*

The right is reserved by the City of Mesquite to reject any and all bids.

CITY OF MESQUITE, TEXAS

_____

Sonja Land
City Secretary
CITY CONTRACT: E2017-003
Publish: March 30, 2017
Publish: April 6, 2017

INSTRUCTIONS TO BIDDERS

1. If you have questions regarding the preparation of your bid, you may contact Ryan Williams, Manager of Purchasing, City of Mesquite, telephone 972-216-6201. For technical questions **send an email** to ***Corey Nesbit, P.E. CFM, email address cnesbit@cityofmesquite.com, City Engineer*** and ***Damir Lulo, P.E. damir@fmi-dallas.com, Freeman-Millican, Inc.***

2. Mailed bids must be submitted in sufficient time to be received and time-stamped at the location in the advertisement on or before the published date and time shown on the Advertisement for Bids. The City of Mesquite is not responsible for mail delivered from the post office. Bids received after the published date and time will not be considered and will be returned unopened.

3. The Bidder/Contractor shall at all times observe and comply with all Federal, State and local laws, ordinances and regulations which in any manner affect the Contract or the work, and shall indemnify and save harmless the City against any claim arising from the violation of any such laws, ordinances and regulations whether by the Bidder/Contractor or his employees.

4. Prices shall be filled in and extended on the bid sheets. In case of discrepancy between unit price and the extension, the unit price will govern. Contractors may utilize the Microsoft Excel spreadsheet bid form available on the City's Purchasing Division web site. No other electronic forms will be accepted. A hard copy printout is required with the bid.

5. Bidder shall complete all information requested and blanks provided shall be filled in beside or under each bid item. Failure to completely describe the item being bid may result in rejection of the bid.

6. Prices quoted in the bid shall prevail for the entire term of the contract.

7. The Contract, Performance Bond and Payment Bond forms are included for Bidders information so that Bidders may be familiar with their contents and requirements. ***Bidder shall not fill in or execute these forms at time of bid submittal.***

8. The City of Mesquite reserves the right to reject any and all bids, waive formalities and to make award of bid as may be deemed to the best advantage of the City. No bid may be withdrawn within thirty (30) days after date of opening. The City may, at its sole discretion, release any Bidder and return the bid security prior to that date.

9. The City of Mesquite reserves the right to evaluate variations from these specifications. If exceptions are made, bidder shall state wherein the bid item fails to meet these specifications. Failure to completely describe the item being bid may result in rejection of your bid.

10. Any ambiguity in the bid as a result of omission, error, lack of clarity or non-compliance by the Bidder with specifications, instructions and all conditions shall be construed in favor of the City.

11. Quantities are estimated. It is specifically understood and agreed that these quantities are approximate and any increase or decrease in quantities may result in contract adjustments per General Provision 104.2.

12. Disadvantaged business/HUB vendors listed with the Office of Small Business Assistance of the General Services Commission are requested to provide a copy of their current certificate with the bid.

13. Bidders shall complete the non-collusion statement included in the bid.

14. All BIDDERS must submit **with the bid**, either a Bid Bond provided herein, Cashier's Check or Certified Check in the amount of 5% of the total bid per General Provision Section 102.5.

15. Bidders shall fill out the following forms, as noted in the bid and attach them to their bid and mail or deliver them prior to the bid closing date and time to the City of Mesquite Purchasing Division, 1515 N. Galloway, Mesquite, Texas 75149:

    a. Bid Form (Proposal)
    b. Disadvantaged Business Enterprises (DBE) Information
    c. Non-Collusion Statement
    d. Conflict of Interest Questionnaire
    e. Bid Bond

16. The **apparent low bidder** shall complete and deliver to the Engineering Division and City's Consulting Engineer **within 48-hours after the bid opening**, the following **Bidder's Qualification Information** documents:

    - ❑ Qualification Statement of Bidder. If additional space is needed, please use attachments.
    - ❑ Reference Statement of Bidder's Surety.
    - ❑ Bidder's Release of Qualification Information.
    - ❑ Bidder's List of Proposed Sub-contractors.
    - ❑ Financial Statement Reviewed or Audited by an Independent Certified Public Accountant (CPA) in accordance with Generally Accepted Accounting Principles (GAAP), prepared in the last 12-months for the bidder's company.
    - ❑ IRS W9 Form

All six (6) documents shall be delivered to the Engineering Division and City's Consulting Engineer as a single, complete package. No one form or statement will be accepted individually.

If a project is a "joint venture", all partners in the joint venture shall complete the qualification forms.

END OF SECTION

STANDARDS OF CONDUCT

The City of Mesquite conducts business with the public, business partners, vendors and contractors under a set of rules to ensure that all City officials and employees discharge their duties in a manner designed to promote public trust and confidence in our city. This code of ethics, titled Standards of Conduct, is taken from the Mesquite City Code, Chapter 2, Article IV, Sec 2-123.

The City wants you to be aware of the rules that its employees are required to follow while performing their services to you. A violation of state or federal statutes may occur if these rules are broken. It is hoped that by outlining these rules for you, your experience in dealing with the City of Mesquite will be both rewarding and satisfactory.

Acceptance of Gifts or Gratuities

Accepting gifts or gratuities by employees in consideration for the performance of their duties, or as an appreciation for their performance, is strictly prohibited.

- Please do not offer employees any gift, loans or any other thing of value.
- Employees may not receive any fee or compensation for their services from any sources other than the City, so please don't offer.
- Please do not offer to buy meals for employees.
- Employees may accept coffee, tea, soft drinks, snacks, etc. when attending meetings in your office.
- Letters to supervisors for exceptional service by employees are always welcome.

Conflicts of Interest

Employees are prohibited from engaging in any outside activities that conflict with, or have the appearance of conflicting with, the duties assigned to them in the employment of the City.

- Please do not ask employees for any special favor or consideration that is not available to every other citizen.
- Please do not ask an employee to disclose any information that is not available to every other citizen through normal public information channels.
- Please do not offer to compensate the employee by offering to hire, or do business with any business entity of the employee or family member
- Do not ask employees to represent you or your company or make any recommendations on your behalf other than those that are a part of their official duties with the City.
- Please do not ask employees to endorse the products or services of your company.
- Please do not ask employees to hand out or post advertising materials.

Solicitation by City Employees

Employees may not solicit gifts, loans, or any other items of value from people doing City business that will be used by them personally.

- If you are asked to pay a fee for services that you believe is improper or illegal, please contact the City's ethic's officer at **972-329-8723**. (Payments should only be made to designated cashiers or clerks.)
- Employees are prohibited from taking retaliatory action against you for failing to comply with any request unless the request is within the scope of the employee's official duties for the City.

Use of City Equipment, Facilities and Resources

Use of City equipment, facilities and resources is authorized only for City purposes and for those activities permitted by City ordinance and policy.

- Please do not ask employees to use City equipment to run errands or perform tasks for your benefit.
- Employees may not perform tasks, nor conduct any business not related to their official duties while on City time.

Your Rights and Expectations

When dealing with employees of the City of Mesquite you have the right to honest, fair and impartial treatment. You may expect prompt, courteous and professional service from our employees who are expected to understand and practice good customer service skills. Employees are tasked to uphold the public trust through the ethical performance of their duties. We understand that the enforcement of regulatory guidelines and codes may sometimes be a cause for concern; however, you may rest assured that we are responsible to all of the citizens of Mesquite and our goal is to serve them to the best of our ability.

Should you have any concerns or questions concerning this information or the conduct of any of our employees please contact the City's ethics officer at 972-329-8723. All calls to the City's ethics officer are confidential and your name (or any other identifying information) will not be disclosed.

Cliff Keheley
City Manager

PROPOSAL

To: The Honorable Mayor and City Council Members
Purchasing Office - Municipal Center
City of Mesquite
1515 N. Galloway Avenue
Mesquite, Texas, 75149

Pursuant to the Advertisement for Bid, Proposal, Contract, Bond(s), General Provisions, Special Provision(s), and Requirements and the Plans and Technical Specifications, the undersigned Bidder hereby proposes to do all the work and furnish all necessary superintendence, labor, machinery, equipment, tools and materials, and to complete all the work upon which he bids, as provided by the Specifications, and binds himself, on acceptance of the proposal, to execute a contract and bonds, according to the City of Mesquite forms, for performing and completing the said work within the required time, and furnish all guarantees, for the following prices, and the undersigned certifies that the bid prices contained in this proposal have been carefully checked and are submitted as correct and final, to wit:

HAILEY PUMP STATION VARIABLE FREQUENCY DRIVE IMPROVEMENTS

CITY CONTRACT NO. E2017-003

HAILEY PUMP STATION VARIABLE FREQUENCY DRIVE IMPROVEMENTS

CITY CONTRACT NO. E2017-003

Bid Form

1. The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with CITY in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

2. Bidder accepts all of the terms and conditions of the Advertisement for Bids and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. The Bid will remain subject to acceptance for thirty (30) days after the Bid opening date, or for such longer period of time that Bidder may agree to in writing upon request of CITY.

3. In submitting this Bid, Bidder represents, as set forth in the Agreement, that:

   A. Bidder has examined and carefully studied the Bidding Documents and the other related data identified in the Bidding Documents.

   B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local and site conditions that may affect cost, progress, and performance of the Work.

   C. Bidder is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress and performance of the Work.

   D. Bidder has carefully studied all reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site.

   E. Bidder has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.

   F. Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the prices bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.

   G. Bidder is aware of the general nature of work to be performed by CITY and others at the Site that relates to the Work as indicated in the Bidding Documents.

   H. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.

I. Bidder has given CITY written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by CITY is acceptable to Bidder.

J. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

4. Bidder further represents that this Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any individual or entity to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over CITY.

5. Bidder will complete the Work in accordance with the Contract Documents for the following prices:

HAILEY PUMP STATION
VARIABLE FREQUENCY DRIVE IMPROVEMENTS
City Contract No. E2017-003
MESQUITE, TEXAS

BASE BID

ITEM NO	BID QTY	UNITS	ITEM DESCRIPTION	UNIT PRICE	AMOUNT
1	2	EACH	Install 18 pulse, standalone, 400HP, clean power Variable Frequency Drive (VFD) with circuit breaker in NEMA 1 enclosure, model CPX9000 by Eaton inside existing electrical room, complete in place, the sum of:	$	$
2	1	LS	Allowance for modification of the existing SCADA program(s) to allow VFD control of the pumps, modifications of the HMI screen at City's dispatch center and remote VFD control, by Prime Controls, Inc. complete in place, the sum of:	$12,000	$12,000
3	1	LS	Installation of a complete 3-ton mini-split A/C system as shown on the plans, complete in place, the sum of:	$	$
4	1	LS	Upgrade of the existing grounded conductor as shown on the plans, complete in place, the sum of:	$	$
5	1	LS	Mobilization allowance for move-in, bond and insurance and submittal preparation, **not to exceed five (5) percent** of the Contract base bid amount:	$	$

TOTAL BASE BID (Items 1 to 4) **$ _____**

1. Materials incorporated into the Project: $ _____

2. All other charges: $ _____

Request for pricing:

RP1	100	LF	Pull out 3~700MCM power conductors in existing 4" conduit and reinstall with new larger ground conductor as shown on the plans, complete in place, the sum of:	$	$

NOTES:

1. Materials and all other charges incorporated into the Hailey Pump Station Electrical Improvements Project must equal base bid amount.

2. **Request for pricing - RP1** - will be applicable only if the existing ground conductor cannot be used for pulling in the new larger ground conductor. The pricing shall be proportionally increased or decreased based on the final length of pull and number of conduits.

3. **Bidders must prepare the Base Bid**. Bidding the Alternative 1 is optional.

4. Contact Colby Cobb with Prime Controls Inc. at cj.cobb@prime-controls.com for scope and quote for Proposal Item P2.

HAILEY PUMP STATION
VARIABLE FREQUENCY DRIVE IMPROVEMENTS
City Contract No. E2017-003
MESQUITE, TEXAS

ALTERNATIVE NO. 1

ITEM NO	BID QTY	UNITS	ITEM DESCRIPTION	UNIT PRICE	AMOUNT
A1.1	2	EACH	Install 18 pulse, standalone 400 HP Clean Power Variable Frequency Drive (VFD) with circuit breaker in NEMA 1 enclosure by Danfoss, inside existing electrical room, complete in place the sum of , as shown on the plans, complete in place the sum of:	$	$

Pre-bid Inspection
The undersigned declares that he has personally inspected the site where the work is to be performed and that he has informed himself of all:

(1) surface and subsurface conditions, constraints, and facilities which may in any way affect the work, in terms of cost, time, and/or constructability;
(2) quantities, types, and nature(s) of materials to be incorporated into the work;
(3) types and specialties of equipment, tools, labor, and superintendence required to perform the work;
(4) other matters which in any way will affect the work and/or the performance of the work;
(5) project plans, specifications and other project documents.

Commencement and Execution
The undersigned bidder agrees to commence the work on or before the date so stated in the written notice to proceed and to diligently perform all of the work and to substantially complete the work in **100 calendar days from the 2nd Notice to Proceed – Authorization to Start of Construction.** Time shall commence on the first day of move-in, but in no case later than the date so stated in the written notice to proceed.

The Time of Construction as given above shall include all work related to this project. Included in the above Time and Construction shall be the necessary utility work involved with the franchise utility companies (i.e. Natural Gas, Telecommunications, Cable Television, Electrical Power, etc.).

The right is reserved by the City as is advantageous to the City, to reject any and all bids, award a contract based upon submitted bids, or to re-bid the contract and to waive any and all formalities. Bidder understands and agrees that the unit prices provided above shall be used for all additions and deletions from the accepted option.

Bidder submits as guarantee that he will execute and issue the required contracts, bonds, insurance, and other required agreements and documents, as set forth under the contract, and general and special provisions of agreement, cashier's check or bid bond payable in full without conditions and upon demand to the City of Mesquite in the amount of:

_____($_____),

representing 5% of the Bidder's total base bid price.

Bidder understands and agrees that, should he fail to execute and issue the contract, bonds, insurance, other agreements, and other documents as set forth under the general and special provisions of agreement for that certain contract known as the **(HAILEY PUMP STATION VARIABLE FREQUENCY DRIVE IMPROVEMENTS and CITY CONTRACT No. E2017-003)** the City will cash or demand payment under the bid bond for payment of agreed upon liquidated damages. Bidder understands and agrees that, for bidding purpose only, liquidated damages shall be 5% of the Bidder's bid proposal, and that upon execution of the Contract, liquidated damages shall be as stated in the General Provisions.

Addenda

Contractor acknowledges receipt and incorporation into the bid of addendums as listed below:

Addendum No. 1 – Acknowledgement of Receipt: _____ ***(initial)***
Addendum No. 2 – Acknowledgement of Receipt: _____ ***(initial)***
Addendum No. 3 – Acknowledgement of Receipt: _____ ***(initial)***
Addendum No. 4 – Acknowledgement of Receipt: _____ ***(initial)***

Proposal Approval:

_____
Company Name

_____ _____
Signature: Printed Name:

_____ _____
Title: Company Address

_____ _____
Telephone City State Zip Code

(If Bidder is a Corporation Seal Proposal with Corporate Seal)

SEAL

DISADVANTAGED BUSINESS ENTERPRISE (DBE) INFORMATION

Disadvantaged Business Enterprises (DBEs) are encouraged to participate in City of Mesquite's bid. The Purchasing Office will provide additional clarification on specifications, assistance with Bid Proposal Forms and further explanation of bidding procedures to those DBEs who request it.

Representatives from DBE companies should identify themselves as such and submit a copy of the Certification.

The City of Mesquite recognizes the certifications of both the State of Texas General Services Commission HUB Program and the North Central Texas Regional Certification Agency. All companies seeking information concerning DBE certification are urged to contact

State of Texas HUB Program General Services Commission PO Box 13047 Austin, TX 78711-3047 512-463-5872	OR	North Central Texas ***Regional Certification Agency*** 624 Six Flags Drive, Suite 216 Arlington, TX 76011 817-640-0606

If your company is already certified, attach a copy of your certification to this form and return with your bid.

_____

FIRM NAME SUBMITTING THE BID

_____ _____

REPRESENTATIVE TITLE OF AUTHORIZED REPRESENTATIVE

_____ _____

ADDRESS CITY, STATE, ZIP

_____ _____

TELEPHONE NUMBER FACSIMILE NUMBER

Indicate all that apply:

□ Minority-Owned Business Enterprise

□ Women-Owned Business Enterprise

□ Disadvantaged Business Enterprise

Non-Exclusion Affidavit - System for Award Management (SAM)

Federal, state, and local government agencies, not-profits, and other organizations that use federal money to fund all or part of any program or project are required to follow specific requirements regarding the use of such federal funds. One of these requirements is that no contract, subcontract, grant, financial assistance, or other forms of assistance provided using federal funds may be awarded to individuals or entities that have been suspended, debarred, or otherwise excluded from participation in federally funded programs.

The U.S. federal government maintains a Web site known as the "System for Award Management" (SAM) at www.sam.gov. One of the purposes of the SAM Web site is to provide a comprehensive list of all individuals, firms, and other entities that have been suspended, debarred, or otherwise excluded from participation in federally funded contracts, subcontracts, grants, etc. SAM provides a simple means of helping government, non-profit agencies, and other organizations ensure that they do not award federally-funded grants, contracts, subcontracts, or other financial or non-financial benefits to any individual, firm, or other entity that has been excluded by any agency from participation in such federally funded activities.

I, _____ ***(Contractor Representative)***, hereby certify that neither I nor _____ ***(Name of the company or organization I represent)*** nor any subcontractors that I or said company may employ to work on any federally funded activity have been suspended, debarred, or otherwise excluded by any federal agency from participation in any federally funded activity. I further acknowledge my understanding that, before entering into a contract with me or with the company or organization I represent, City of Mesquite staff will perform a search on www.sam.gov to verify whether I, the organization I represent, or any subcontractors I may employ to work on any federally funded activity, have been excluded from participation in any federally funded activity.

_____ _____

Signature of Contractor Representative Date

Notary

Sworn to and subscribed before me this _____ day of _____, 20__

_____

Notary Public in and for _____ County, _____ (Insert State Name)

NON-COLLUSION STATEMENT

The undersigned affirms that they are duly authorized to execute this contract, that this company, corporation, firm, partnership or individual has not prepared this bid in collusion with any other bidder and that the contents of this bid as to prices, terms or conditions of said bid have not been communicated by the undersigned nor by any employee or agent to any other person engaged in this type of business prior to the official opening of this bid.

Name of Company _____

Address _____

_____

Phone

_____

Email _____

Fax _____

Bidder (Signature) _____

Bidder (Print Name) _____

Position with Company

_____

Signature of
Company Official
Authorizing This Bid _____

Company Official
(Printed Name) _____

Official Position _____

SUBSCRIBED AND SWORN TO BEFORE ME, this **_____ day of _____, 201_**.

_____
(Notary Public in and for the State of Texas)

_____
(Printed Name of Notary)

My commission expires _____

CONTRACTING WITH THE CITY OF MESQUITE

Updated: March 7, 2017

Conflict of Interest Questionnaire
And Disclosure of Interested Parties (Form 1295)

YOU WILL BE REQUIRED TO COMPLY WITH THE FOLLOWING:

Chapter 176 of the Texas Local Government Code is an ethics law that was initially enacted by the Texas Legislature with HB 914 in 2005 that requires disclosure of employment and business relationships local government officers may have with contractors, consultants and vendors who conduct business with local government entities. The law applies to any written contract for the sale or purchase of real property, goods or services. Further information regarding Texas Conflict of Interest laws and the ***Conflict of Interest Questionnaire*** (Form CIQ) can be found at the Texas Ethics Commission web site at the following web address:

https://www.ethics.state.tx.us/filinginfo/conflict_forms.htm
PLEASE COMPLETE THE ATTACHED FORM CIQ AND SUBMIT WITH YOUR RESPONSE.

Section 2252.908 of the Texas Government Code was enacted in 2015, by the Texas Legislature pursuant to HB 1295, which provides that a governmental entity may not enter into certain contracts with a business entity on or after January 1, 2016, unless the business entity submits a disclosure of interested parties (Form 1295) to the governmental entity at the time the business entity submits the signed contract to the governmental entity. Further information regarding the disclosure of interested parties law and Form 1295 can be found at the Texas Ethics Commission web site at the following web address:

https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm
PLEASE DO NOT COMPLETE FORM 1295 UNTIL YOU HAVE BEEN NOTIFIED OF CONTRACT AWARD AND REQUESTED TO ELECTRONICALLY FILE FORM 1295 WITH THE TEXAS ETHICS COMMISSION.

CONFLICT OF INTEREST QUESTIONNAIRE

For vendor doing business with local governmental entity

FORM CIQ

This questionnaire reflects changes made to the law by H.B. 23, 84th Leg., Regular Session.

This questionnaire is being filed in accordance with Chapter 176, Local Government Code, by a vendor who has a business relationship as defined by Section 176.001(1-a) with a local governmental entity and the vendor meets requirements under Section 176.006(a).

By law this questionnaire must be filed with the records administrator of the local governmental entity not later than the 7th business day after the date the vendor becomes aware of facts that require the statement to be filed. *See* Section 176.006(a-1), Local Government Code.

A vendor commits an offense if the vendor knowingly violates Section 176.006, Local Government Code. An offense under this section is a misdemeanor.

OFFICE USE ONLY

Date Received

1 **Name of vendor who has a business relationship with local governmental entity.**

2 ☐ **Check this box if you are filing an update to a previously filed questionnaire.** (The law requires that you file an updated completed questionnaire with the appropriate filing authority not later than the 7th business day after the date on which you became aware that the originally filed questionnaire was incomplete or inaccurate.)

3 **Name of local government officer about whom the information is being disclosed.**

_____
Name of Officer

4 **Describe each employment or other business relationship with the local government officer, or a family member of the officer, as described by Section 176.003(a)(2)(A). Also describe any family relationship with the local government officer. Complete subparts A and B for each employment or business relationship described. Attach additional pages to this Form CIQ as necessary.**

A. Is the local government officer or a family member of the officer receiving or likely to receive taxable income, other than investment income, from the vendor?

☐ Yes ☐ No

B. Is the vendor receiving or likely to receive taxable income, other than investment income, from or at the direction of the local government officer or a family member of the officer AND the taxable income is not received from the local governmental entity?

☐ Yes ☐ No

5 **Describe each employment or business relationship that the vendor named in Section 1 maintains with a corporation or other business entity with respect to which the local government officer serves as an officer or director, or holds an ownership interest of one percent or more.**

6 ☐ Check this box if the vendor has given the local government officer or a family member of the officer one or more gifts as described in Section 176.003(a)(2)(B), excluding gifts described in Section 176.003(a-1).

7

_____ _____
Signature of vendor doing business with the governmental entity Date

CONFLICT OF INTEREST QUESTIONNAIRE
For vendor doing business with local governmental entity

A complete copy of Chapter 176 of the Local Government Code may be found at http://www.statutes.legis.state.tx.us/Docs/LG/htm/LG.176.htm. For easy reference, below are some of the sections cited on this form.

Local Government Code § 176.001(1-a): "Business relationship" means a connection between two or more parties based on commercial activity of one of the parties. The term does not include a connection based on:

(A) a transaction that is subject to rate or fee regulation by a federal, state, or local governmental entity or an agency of a federal, state, or local governmental entity;

(B) a transaction conducted at a price and subject to terms available to the public; or

(C) a purchase or lease of goods or services from a person that is chartered by a state or federal agency and that is subject to regular examination by, and reporting to, that agency.

Local Government Code § 176.003(a)(2)(A) and (B):

(a) A local government officer shall file a conflicts disclosure statement with respect to a vendor if:

***

(2) the vendor:

(A) has an employment or other business relationship with the local government officer or a family member of the officer that results in the officer or family member receiving taxable income, other than investment income, that exceeds $2,500 during the 12-month period preceding the date that the officer becomes aware that

(i) a contract between the local governmental entity and vendor has been executed; or

(ii) the local governmental entity is considering entering into a contract with the vendor;

(B) has given to the local government officer or a family member of the officer one or more gifts that have an aggregate value of more than $100 in the 12-month period preceding the date the officer becomes aware that:

(i) a contract between the local governmental entity and vendor has been executed; or

(ii) the local governmental entity is considering entering into a contract with the vendor.

Local Government Code § 176.006(a) and (a-1)

(a) A vendor shall file a completed conflict of interest questionnaire if the vendor has a business relationship with a local governmental entity and:

(1) has an employment or other business relationship with a local government officer of that local governmental entity, or a family member of the officer, described by Section 176.003(a)(2)(A);

(2) has given a local government officer of that local governmental entity, or a family member of the officer, one or more gifts with the aggregate value specified by Section 176.003(a)(2)(B), excluding any gift described by Section 176.003(a-1); or

(3) has a family relationship with a local government officer of that local governmental entity.

(a-1) The completed conflict of interest questionnaire must be filed with the appropriate records administrator not later than the seventh business day after the later of:

(1) the date that the vendor:

(A) begins discussions or negotiations to enter into a contract with the local governmental entity; or

(B) submits to the local governmental entity an application, response to a request for proposals or bids, correspondence, or another writing related to a potential contract with the local governmental entity; or

(2) the date the vendor becomes aware:

(A) of an employment or other business relationship with a local government officer, or a family member of the officer, described by Subsection (a);

(B) that the vendor has given one or more gifts described by Subsection (a); or

(C) of a family relationship with a local government officer.

CERTIFICATE OF INTERESTED PARTIES

FORM 1295

Complete Nos. 1 - 4 and 6 if there are interested parties.
Complete Nos. 1, 2, 3, 5, and 6 if there are no interested parties.

OFFICE USE ONLY

1 **Name of business entity filing form, and the city, state and country of the business entity's place of business.**

2 **Name of governmental entity or state agency that is a party to the contract for which the form is being filed.**

3 **Provide the identification number used by the governmental entity or state agency to track or identify the contract, and provide a description of the goods or services to be provided under the contract.**

4 Name of Interested Party	City, State, Country (place of business)	Nature of Interest (check applicable)	
		Controlling	Intermediary

5 **Check only if there is NO Interested Party.** ☐

6 **AFFIDAVIT**

I swear, or affirm, under penalty of perjury, that the above disclosure is true and correct.

_____
Signature of authorized agent of contracting business entity

AFFIX NOTARY STAMP / SEAL ABOVE

Sworn to and subscribed before me, by the said _____, this the _____ day of _____, 20 _____, to certify which, witness my hand and seal of office.

_____ _____ _____
Signature of officer administering oath | Printed name of officer administering oath | Title of officer administering oath

ADD ADDITIONAL PAGES AS NECESSARY

BID BOND

Bond No.: _____
(by Surety)

STATE OF TEXAS §
§ **KNOW ALL MEN BY THESE PRESENTS:**
COUNTY OF DALLAS §

THAT_____, of the City of _____, _____County, State of Texas (hereinafter referred to as "Principal"), and _____, authorized under the laws of the State of Texas to act as Surety on bonds for principals (hereinafter referred to as "Surety") are held and firmly bound unto the City of Mesquite (hereinafter referred to as "City") in the penal sum of $_____ (an amount equal to 5% of the approximate total amount of the bid or if the bid is based upon alternates and/or addenda, at least 5% of the greatest amount bid by the bidder or Principal herein as evidenced in the Bid Proposal) for the payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally, by these presents;

WHEREAS the Principal has submitted on or about this date, a bid proposal offering to perform the following: **HAILEY PUMP STATION VARIABLE FREQUENCY DRIVE IMPROVEMENTS, City Contract No. E2017-003** in accordance with the specifications and terms and conditions related thereto, to which reference is hereby made;

NOW, THEREFORE, the condition of this obligation is such that if the said Principal's offer as stated in the bid proposal is accepted by the City, and the said Principal executes and returns to the City the number of original counterparts of the contract required by the City, on the forms provided by the City, for the materials, equipment and/or services described herein and also executes and returns the same number of Performance, Payment and Maintenance Bonds, if required, on the forms provided by the City, within the time provided in the specifications, then this obligation is null and void, otherwise, it is to remain in full force and effect;

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument on this _____ day of _____, 2017.

PRINCIPAL:	**SURETY:**
_____	_____
Signature	Signature
_____	_____
Typed or Printed Name	Typed or Printed Name
Title:_____	Title:_____
Company:_____	Company:_____
Address:_____	Address:_____
_____	_____

SURETY'S DALLAS COUNTY REGISTERED AGENT FOR SERVICE (REQUIRED):

_____
Type or Printed Name

_____
Street Address (P.O. Box is not acceptable)

_____
City, State, and Zip Code

_____
Dallas County Telephone No.

APPROVED AS TO FORM:

CITY OF MESQUITE

_____
City Attorney or Designee

ATTEST:

_____
City Secretary

BIDDER'S QUALIFICATION INFORMATION

1. The **apparent low bidder** shall complete and deliver to the Engineering Division and City's Consulting Engineer **within 48-hours after the bid opening**, the following **Bidder's Qualification Information** documents:

   - ❑ Qualification Statement of Bidder. If additional space is needed, please use attachments.
   - ❑ Reference Statement of Bidder's Surety.
   - ❑ Bidder's Release of Qualification Information.
   - ❑ Bidder's List of Proposed Sub-contractors.
   - ❑ Non-Exclusion Affidavit - System for Award Management (SAM)
   - ❑ Financial Statement Reviewed or Audited by an Independent Certified Public Accountant (CPA) in accordance with Generally Accepted Accounting Principles (GAAP), prepared in the last 12-months for the bidder's company.
   - ❑ IRS W9 Form – a pdf version of this form can be downloaded from IRS web site.

All six (6) documents shall be delivered to the Engineering Division and City's Consulting Engineer as a single, complete package. No one form or statement will be accepted individually.

2. If the 48-hours deadline falls on a weekend or holiday, Bidder shall deliver the six (6) documents to the Engineering Division and City's Consulting Engineer the next workday after the 48-hours.

3. If a project is a "joint venture", all partners in the joint venture shall complete the pre-qualification forms.

4. The low bidder shall be required to submit evidence that they have a practical knowledge and experience of the particular work bid upon and that they have the financial resources to complete the proposed work.

5. In determining the contractor's qualifications, the following factors will be considered: Work previously completed by the contractor; adequate plant and equipment to do the work properly and expeditiously; financial resources to meet all obligations incidental to the work; technical expertise and safety record.

QUALIFICATION STATEMENT OF BIDDER

Engineering Division
City of Mesquite
1515 N. Galloway Avenue
Mesquite, Texas 75149

Bidder: _____

Circle One: Sole Proprietor Partnership Corporation Joint Venture

Name: _____ Partner: _____

Address: _____ Address: _____

City: _____ City: _____

Phone: _____ Phone: _____

Principal Place of Business: Principal Place of Business:

_____ _____
County & State County & State

If the Bidder is a corporation, fill out the following:

State and County of Incorporation: _____

Location of Principal Office: _____

Contact Person(s) at Office: _____ Phone: _____

List Officers of the Corporation and person(s) authorized to execute Contracts on Behalf of the Corporation:

Name: _____ Title: _____

Name: _____ Title: _____

Name: _____ Title: _____

Name: _____ Title: _____

How many years has your organization been in business as a General Contractor? _____

Greatest number of contracts in excess of $100,000 under construction at one time in company's history: _____

Greatest number of contracts in excess of $500,000 under construction at one time in company's history: _____

Total approximate value of incomplete work outstanding: $ _____

List major projects of the type of work qualifying for or similar work completed in the last three years, give the following information for each project:

Project: _____

Owner/Engineer: _____

Contact Person: _____ Phone: _____

Date of Completion: _____ Contract Price: _____

Project: _____

Owner/Engineer: _____

Contact Person: _____ Phone: _____

Date of Completion: _____ Contract Price: _____

Project: _____

Owner/Engineer: _____

Contact Person: _____ Phone: _____

Date of Completion: _____ Contract Price: _____

Project: _____

Owner/Engineer: _____

Contact Person: _____ Phone: _____

Date of Completion: _____ Contract Price: _____

Project: _____

Owner/Engineer: _____

Contact Person: _____ Phone: _____

Date of Completion: _____ Contract Price: _____

Project: _____

Owner/Engineer: _____

Contact Person: _____ Phone: _____

Date of Completion: _____ Contract Price: _____

Project: _____

Owner/Engineer: _____

Contact Person: _____ Phone: _____

Date of Completion: _____ Contract Price: _____

Project: _____

Owner/Engineer: _____

Contact Person: _____ Phone: _____

Date of Completion: _____ Contract Price: _____

Project: _____

Owner/Engineer: _____

Contact Person: _____ Phone: _____

Date of Completion: _____ Contract Price: _____

(If Necessary - List Additional Projects by Using Attachments)

List **incomplete** projects, including the following information for each incomplete project listed:

Project: _____

Owner/Engineer: _____

Contact Person: _____ Phone: _____

Value of Incomplete Work: _____

Project: _____

Owner/Engineer: _____

Contact Person: _____ Phone: _____

Value of Incomplete Work: _____

Project: _____

Owner/Engineer: _____

Contact Person: _____ Phone: _____

Value of Incomplete Work: _____

Project: _____

Owner/Engineer: _____

Contact Person: _____ Phone: _____

Value of Incomplete Work: _____

Project: _____

Owner/Engineer: _____

Contact Person: _____ Phone: _____

Value of Incomplete Work: _____

(If Necessary - List Additional Projects by Using Attachments)

If company is under new management, please list names of staff and qualification and/or experience of said persons. (Please use attachments).

Have you or any present partner(s) or officer(s) failed to complete a contract? _____
If so, name of owner and/or surety:

Contact Person: _____ Phone: _____

List any unsatisfied demands upon you as to your accounts payable, please use attachments.

Bank Reference:

Bank: _____ City: _____

Address: _____ Phone: _____

Contact Officer: _____

Other Credit References:

Name: _____ Name: _____

Address: _____ Address: _____

City: _____ City: _____

Phone: _____ Phone: _____

Municipal Reference:

City: _____

Contact Person: _____ Title: _____

Address: _____Phone: _____

REFERENCE STATEMENT OF BIDDER'S SURETY

Bidder: _____

Address: _____

1. For this Bidder, how many contracts **that are now complete** has this surety furnished contract bonds? _____

2. For this Bidder, how many **incomplete contracts** has this surety furnished contract bonds? _____

3. What is the maximum bonding capacity of this Bidder? $ _____

4. Does the current financial information on this Bidder indicate solvency and a financial ability to complete this contract? _____

5. Does the information available to this surety indicate that the contractor pays accounts when due? _____ If not, give details: _____

6. Is it the surety's opinion that the bidder has sufficient experience and financial resources to satisfactorily perform the contract? _____

7. Provided this bidder does not assume other commitments or that this surety does not acquire further information that in your opinion will materially affect the bidder's capacity to perform this contract, will you furnish the bonds as specified: _____

REMARKS:

_____

_____

_____

Surety: _____

Signed: _____

Title: _____

Address: _____ (Local office in Dallas County)

_____
City State Zip

Phone: _____

BIDDER'S RELEASE OF QUALIFICATION INFORMATION

Pursuant to advertisement for bids and in conformance with Instructions to Bidders for types of work outlined in Bidder's Statement of Qualifications, the undersigned is submitting information as required with the understanding that the purpose is for the City's confidential use, only to assist in determining the qualifications of Bidder's organization to perform the type and magnitude of work designated, and further, Bidder guarantees the truth and accuracy of all statements made, and will accept the City's determination of qualifications without prejudice. The surety herein named, any other bonding company(s), bank(s), subcontractor(s), supplier(s), or any other person(s), firm(s) or corporation(s) with whom Bidder has done business, or who have extended any credit to Bidder is (are) hereby authorized to furnish the City with any information the City may request concerning performance on previous work and Bidder's credit standing with any of them; and Bidder hereby releases any and all such parties from any legal responsibility whatsoever on account of having furnished such information to the City:

Signed: _____ Title: _____

Printed Name: _____ Email: _____

Bidder: _____ Date: _____

LOCATION OF LOCAL UNDERWRITING OFFICE OF PROPOSED SURETY (MUST BE IN DALLAS COUNTY)

Name: _____ Phone: _____

Printed Name: _____ Email: _____

Address: _____ City: _____ State: _____

BIDDER'S LIST OF PROPOSED SUB-CONTRACTORS

1. Sub-Contractor / Material Supplier:

Company Name: _____

Type of Work to Be Performed: _____

Contact Person: _____ Title: _____

Email: _____ Phone: _____

---

2. Sub-Contractor / Material Supplier:

Company Name: _____

Type of Work to Be Performed: _____

Contact Person: _____ Title: _____

Email: _____ Phone: _____

---

3. Sub-Contractor / Material Supplier:

Company Name: _____

Type of Work to Be Performed: _____

Contact Person: _____ Title: _____

Email: _____ Phone: _____

---

4. Sub-Contractor / Material Supplier:

Company Name: _____

Type of Work to Be Performed: _____

Contact Person: _____ Title: _____

Email: _____ Phone: _____

---

5. Sub-Contractor / Material Supplier:

Company Name: _____

Type of Work to Be Performed: _____

Contact Person: _____ Title: _____

Email: _____ Phone: _____

---

6. Sub-Contractor / Material Supplier:

Company Name: _____

Type of Work to Be Performed: _____

Contact Person: _____ Title: _____

Email: _____ Phone: _____

7. Sub-Contractor / Material Supplier:

Company Name: _____

Type of Work to Be Performed: _____

Contact Person: _____ Title: _____

Email: _____ Phone: _____

8. Sub-Contractor / Material Supplier:

Company Name: _____

Type of Work to Be Performed: _____

Contact Person: _____ Title: _____

Email: _____ Phone: _____

9. Sub-Contractor / Material Supplier:

Company Name: _____

Type of Work to Be Performed: _____

Contact Person: _____ Title: _____

Email: _____ Phone: _____

10. Sub-Contractor / Material Supplier:

Company Name: _____

Type of Work to Be Performed: _____

Contact Person: _____ Title: _____

Email: _____ Phone: _____

CONTRACT AND BOND FORMS

NOTICE TO BIDDERS

The following blank spaces in the contract and bonds **are not to be filled in** by the Bidder at the time of submitting his proposal.

The contract and bond forms are submitted at this time to familiarize the Bidder with the form of contract and bonds that the successful Bidder will be required to execute.

CONTRACT CHECKLIST

City contracts must be checked to ensure they are ready for review and signature.

CHECK	CONTRACT ITEM:
	Are all blanks filled in, except for the signatures of the Mayor (or City Manager), City Secretary and City Attorney?
	The date the Contract is "made and entered into" should be the meeting date the bid was awarded by City Council (for contracts over $50,000), or the date of City Manager approval (for contracts under $50,000). Is the date of the contract correct?
	units x unit price = amount
	individual amounts = total base bid
	total bid = amount awarded by Council
	Company name is consistent throughout all contractual documents
	If the contractor is a corporation, the President or Vice-President of the corporation should sign the Contract. The Secretary of the corporation must then attest the signature and seal the Contract unless the contract form used provides for an acknowledgment by a notary.
	Contract total matches the awarded amount by Council
	Signed by authorized person for the company
	Printed name matches signed name
	The name of the person signing the Contract on behalf of the contractor and the City must be typed on the appropriate lines as well as their respective titles.
	If the Contract is revised by the striking-out or inserting of new language, both parties should initial the change.
	PERFORMANCE AND PAYMENT BONDS
	Performance Bond = 100% of Contract Amount (City Form) Includes a 2-year warranty period after City Acceptance for materials and workmanship.
	Check that the company name is identical to name listed in contract
	Check for same contract date (reference in top paragraphs)
	The name of the surety on the bond must appear the same on each page of the bond.
	Check for issuance date (date of contract or after)
	Check for same signature & title throughout bond.
	Check for typed name and title of the person signing bond and for legible signature.
	Check for agent in Dallas County.
	The items listed as work to be done must exactly match the improvements listed on the Contract.
	The surety's seal (which is the seal of the bond company) must appear under the surety's signature (not a notary's seal). All corporate sureties have seals. The seal may be a legible facsimile seal, unless the instrument states otherwise.
	Payment Bond = 100% of contract amount (City form)
	Check that the company name is identical to name listed in contract
	Check for same contract date (reference in top paragraphs)
	The name of the surety on the bond must appear the same on each page of the bond.
	Check for issuance date (date of contract or after)
	Check for same signature & title throughout bond
	Check for typed name and title of the person signing bond and for legible signature.
	Check for agent in Dallas County
	The items listed as work to be done must exactly match the improvements listed on the Contract.

CHECK	CONTRACT ITEM:
	The surety's seal (which is the seal of the bond company) must appear under the surety's signature (not a notary's seal). All corporate sureties have seals. The seal may be a legible facsimile seal, unless the instrument states otherwise.
	INSURANCE-GENERAL
	Certificate of Insurance (ACORD form)
	Certificate of Insurance Supplemental Form
	Check that the company name is identical to name listed in contract
	Check the expiration date on policy to ensure it is current.
	Check for City of Mesquite listed as additional insured under General and Auto Liability Policies.
	Check for a waiver of subrogation in favor of the City of Mesquite under General and workers Compensation/Employers Liability.
	Workers Compensation $100,000 per occurrence
	INSURANCE-CONSTRUCTION
	Commercial Liability $500,000 per person/$1,000,000 per occurrence
	Contractual Liability property damage $500,000 per occurrence with general aggregate of $1,000,000
	Automobile combined single limit $500,000
	OTHER
	Filled out Certificate of Interested Parties - Form 1295
	Fill out and Submit Conflict of Interest Questionnaire (CIQ)
	IRS W9 Form Submitted for Setting Up Vendor Account and Processing Payment

Checked by: _____

Date:_____

Reset Form

INSURANCE CERTIFICATE ADMINISTRATORS	**Supplement to ACORD® 25 (Construction)**	DATE:	

Insured:	Certificate Holder(s):

Yes	No		
Commercial General Liability:			
		C-1	Provide, in the space below, the appropriate form number(s) of the Additional Insured endorsement(s): Ongoing Operations Completed Operations Attach a copy of the endorsement(s).
		C-2	Does the Other Insurance clause or an endorsement to the policy state that the CGL policy is primary for the Additional Insured if "agreed in writing in a contract or agreement that this insurance would be primary" or does it contain similar wording? If so, provide a copy of such similar wording clearly highlighting or referencing the applicable language.
		C-3	Does the Other Insurance clause or an endorsement to the policy state that the CGL policy is non-contributory for the Additional Insured if "agreed in writing in a contract or agreement that this insurance...would not seek contribution from any other insurance available to the additional insured " or does it contain similar wording? If so, provide a copy of such similar wording clearly highlighting or referencing the applicable language.
		C-4a	Does the definition of "insured contract" contain the words or phrase "caused in whole or in part by" or "sole negligence"? If YES, attach the policy definition clearly highlighting or referencing the applicable language.
		C-4b	Does the contractual liability provision contain a reference to "residential construction"? If YES, attach a copy clearly highlighting or referencing the applicable language.
		C-5	Is coverage under the policy limited to work performed within certain described operations and/or classification codes? If YES, attach the operations and/or classification codes.
		C-6	Is there a pollution exclusion in the "policy form"?
		C-6a	If C-6 is NO, has a pollution exclusion been added by endorsement?
		C-6b	If C-6 is YES, has a pollution endorsement been added?
Are the following specifically excluded?			
		C-7	Independent Contractors?
		C-8	Explosion? (X)?
		C-9	Collapse? (C)?
		C-10	Underground? (U)?
		C-11	Punitive Damages (other than Terrorism)?
		C-12	Third Party Over Actions?
		C-13	Residential Construction Operations? If YES, attach a copy of the exclusion.
		C-14	Prior Work? If YES, attach a copy of the exclusion.
Workers Compensation:			
Yes	No		
		C-1	Does Part 3 provide coverage for "All States"(other than monopolistic states) or list specific states? If specific states are listed, provide a list of the states.
		C-2	Is the Alternate Employer endorsement attached to the policy?
Excess/Umbrella Liabilities:			
The Excess/Umbrella policy is excess over which of the following primary policies?			
		C-1	Commercial General Liability Insurance
		C-2	Automobile Liability Insurance
		C-3	Employers Liability Insurance
		C-4	Pollution Liability Insurance (If provided by separate policy)
Yes	No		
		C-5	Does the policy include language addressing reduced or exhausted primary limits over which the policy is excess, frequently referred to as drop-down? If YES, provide a copy of such wording clearly highlighting or referencing the applicable language.
Notice of Cancellation:			
		C-1	Do all policies certified on the attached ACORD® 25 provide at least a 30 day notice to the certificate holder for cancellation (other than non-payment of premium)?

It is agreed that the coverages, endorsements and conditions shown on these pages are in effect and apply, as indicated, to the coverages certified on the attached ACORD® certificate of insurance. This form neither affirmatively nor negatively amends, extends nor alters the coverage afforded by the policy summarized hereon and is qualified by reference to the policy itself. This form does not constitute a contract between the issuing insurer(s), authorized representatives or producer, and the certificate holder.	**Signature:**

A25 01C (03-13)

CONTRACT

STATE OF TEXAS §
§ KNOW ALL MEN BY THESE PRESENTS:
COUNTY OF DALLAS §

THIS CONTRACT is made and entered into on _____, 20___ by and between the CITY OF MESQUITE, TEXAS, a municipal corporation, of the County of Dallas and State of Texas, acting through Cliff Keheley, City Manager, hereinafter termed the CITY, and_____, a _____, of the City of Contractor City, County of Contractor County and State of Texas, hereinafter termed the CONTRACTOR.

WITNESSETH: That for and in consideration of the mutual covenants hereinafter set forth, the CITY and CONTRACTOR agree as follows:

I. DESCRIPTION OF WORK

The CONTRACTOR shall perform all of the work as specified in the contract documents such work generally described as:

HAILEY PUMP STATION VARIABLE FREQUENCY DRIVE IMPROVEMENTS
City Contract No. E2017-003

Plans and Specifications prepared by:

FREEMAN-MILLICAN, Inc. Texas Registered Firm F-2827

All work shall be performed at the CONTRACTOR'S own proper cost and expense to furnish all the materials, supplies, machinery, equipment, tools, superintendence, labor, insurance, bonds and other accessories and services necessary to complete the work, in accordance with the Contract documents.

II. CONTRACT DOCUMENTS

The Contract documents shall consist of the following:

1. this Contract;
2. all addenda issued prior to award of Contract;
3. the bid specifications including the advertisement for bid, instruction to bidders, bidder's bid form, plans, and drawings (if any);
4. the City of Mesquite General Design Standards;
5. the Standard Specifications for Public Works Construction (North Central Texas Fourth Edition October 2004), Division 100, as amended and supplemented by the City of Mesquite by Addendum (hereinafter referred to as the "General Provisions");
6. a Performance Bond in the sum of ONE HUNDRED PERCENT (100%) of the total Contract price, which Bond shall be in a form acceptable to the City, shall guarantee the work in accordance with the plans and specifications for a period of two (2) years after acceptance by the City, and shall provide for repair or replacement of all defects due to

faulty material and/or workmanship that appear within a period of two (2) years from the date of acceptance by the City;

7. a Payment Bond in the sum of ONE HUNDRED PERCENT (100%) of the total Contract price; and
8. the Contractor's bid/proposal and any other documents identified as pertaining to this Contract, all of which have been identified by the CITY and the CONTRACTOR.

These Contract documents constitute the entire agreement between the CITY and CONTRACTOR, and all are as fully a part of this Contract as if attached to or repeated herein. The Contract documents are complementary and what is called for by one shall be as binding as if called for by all. In the event of an inconsistency in any of the provisions of the Contract documents, the inconsistency shall be resolved by giving precedence to the Contract documents in the order in which they are listed above. The Contract may be altered, amended or modified only as provided in the general or special provisions.

III. TIME OF COMMENCEMENT, COMPLETION AND LIQUIDATED DAMAGES

The work to be performed under this Contract shall be commenced by the CONTRACTOR upon final execution of this Contract and notice from the CITY to proceed. All work to be performed under this Contract shall be substantially completed in **100 calendar days from the 2nd Notice to Proceed – Authorization to Start of Construction**, subject to extensions of time provided in accordance with the Contract documents. Time is of the essence in this Contract and it is understood by the CONTRACTOR and CITY that actual damages caused by the failure of the CONTRACTOR to complete the work within the stated time are impractical or extremely difficult to fix or ascertain, and that per diem deduction from the Contract price shall be retained by the CITY as payment by the CONTRACTOR of liquidated damages, and not as penalty for such failure. Such liquidated damages to be assessed and retained are set forth in the General Provisions.

IV. CONTRACT PRICE

The CITY shall pay the CONTRACTOR for the performance of the work, subject to additions and deductions by change order or as otherwise provided in the provisions of this Contract, in current funds the Contract sum, which has been bid as a separated contract in compliance with the Texas Tax Code, as follows:

Material charges incorporated into the project: $_____

Labor, equipment and other materials charges: + $_____

Total sum: _____($_____)

V. CONTRACT ADMINISTRATION

This Contract shall be administered on behalf of the CITY by _____ (referred to herein as "City Representative") and the CONTRACTOR shall fully comply with any and all instructions from said City Representative. With execution and delivery of the Contract, the CONTRACTOR shall furnish and file with the CITY in the amounts herein required, performance and payment bonds in accordance with the provisions of V.T.C.A. Government Code, Chapter 2253 if this is a public work contract in excess of fifty thousand dollars ($50,000.00).

VI. DISCLOSURE OF CONFLICTS OF INTEREST AND COMPLIANCE WITH OTHER APPLICABLE LAWS

The CONTRACTOR shall at all times observe and comply with all Federal, State and local laws, ordinances and regulations including all amendments and revisions thereto, which in any manner affect the CONTRACTOR or the services and/or items to be provided, specifically and not limited to any ethics laws. In particular, the CONTRACTOR is put on notice that the CITY will require the CONTRACTOR to comply with Chapter 176 of the Texas Local Government Code by completing the attached Conflict of Interest questionnaire (FORM CIQ) and returning the completed FORM CIQ to the CITY. Additionally, CONTRACTOR must comply with Section 2252.908 of the Texas Government Code, which was enacted in 2015 by the Texas Legislature pursuant to HB 1295, providing that a governmental entity may not enter into certain contracts with a business entity on or after January 1, 2016, unless the business entity submits a disclosure of interested parties (FORM1295) to the governmental entity at the time the business entity submits the signed contract to the governmental entity. Further information regarding the disclosure of interested parties law and instructions on filing FORM1295 can be found at the Texas Ethics Commission web site at the following web address:

https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm

VII. INSURANCE

The CONTRACTOR agrees to provide and to maintain the types and amounts of insurance set forth in the General Provisions attached hereto, and to include the CITY as an additional insured in all policies providing coverage for the term of this Contract.

VIII. CHOICE OF LAW, VENUE AND CONTRACT INTEPRETATION

The Parties agree that the laws of the State of Texas shall apply to this Contract, and that it is performable in Dallas County, Texas. Exclusive venue shall lie in Dallas County, Texas. Although this Contract is drafted by the CITY, should any part be in dispute, the parties agree this Contract shall not be construed more favorably for either Party.

IX. SEVERABILITY

If any part of this Contract shall be stricken for any reason whatsoever or found to be invalid or unenforceable, that part will be severed and the remainder of this Contract will continue in full force and effect.

X. SURVIVAL

Any liabilities or obligations of a Party for acts or omissions prior to the cancellation or termination of this Contract, and any other provisions of this Contract which, by their terms, are contemplated to survive (or to be performed after) termination of this Contract, shall survive cancellation or termination thereof.

XI. AUTHORITY TO SIGN

The undersigned officers and/or agents of the parties hereto are the properly authorized officials and have the necessary authority to execute this Contract on behalf of the parties hereto.

IN WITNESS WHEREOF, the CITY and CONTRACTOR have executed this Contract in the year and day first written above.

CITY OF MESQUITE
(CITY)

By: _____
Cliff Keheley
City Manager

ATTEST:

By: _____
Sonja Land, City Secretary

APPROVED AS TO FORM:

By: _____
City Attorney or Designee

_____
(CONTRACTOR)

BY: _____
(signature)

TYPED NAME: _____

TITLE: _____

ATTEST:

_____

General Decision Number: TX170291 01/27/2017 TX291

Superseded General Decision Number: TX20160291

State: Texas

Construction Type: Building

County: Dallas County in Texas.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.20 for calendar year 2017 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.20 (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2017. The EO minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/06/2017
1	01/27/2017

ASBE0021-011 05/01/2013

	Rates	Fringes
ASBESTOS WORKER/HEAT & FROST INSULATOR (Duct, Pipe and Mechanical System Insulation)	$ 21.52	7.15

BOIL0074-003 01/01/2014

	Rates	Fringes
BOILERMAKER	$ 23.14	21.55

CARP1421-002 04/01/2016

	Rates	Fringes
MILLWRIGHT	$ 26.60	8.65

* ELEV0021-006 01/01/2017

	Rates	Fringes
ELEVATOR MECHANIC	$ 38.77	31.585+a+b

FOOTNOTES:
A. 6% under 5 years based on regular hourly rate for all hours worked. 8% over 5 years based on regular hourly rate

for all hours worked.

B. New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the Friday after Thanksgiving Day, Christmas Day, and Veterans Day.

ENGI0178-005 06/01/2014

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
(1) Tower Crane	$ 29.00	10.60
(2) Cranes with Pile Driving or Caisson Attachment and Hydraulic Crane 60 tons and above	$ 28.75	10.60
(3) Hydraulic cranes 59 Tons and under	$ 27.50	10.60

IRON0263-005 06/01/2015

	Rates	Fringes
IRONWORKER (ORNAMENTAL AND STRUCTURAL)	$ 23.00	6.55

PLUM0100-005 07/01/2016

	Rates	Fringes
HVAC MECHANIC (HVAC Unit Installation Only)	$ 27.11	10.02
PIPEFITTER (Excludes HVAC Pipe Installation)	$ 27.11	10.02

SUTX2014-017 07/21/2014

	Rates	Fringes
BRICKLAYER	$ 19.50	4.27
CARPENTER, Excludes Drywall Hanging, Form Work, and Metal Stud Installation	$ 17.13	2.97
CAULKER	$ 14.71	0.00
CEMENT MASON/CONCRETE FINISHER	$ 13.40	0.00
DRYWALL HANGER AND METAL STUD INSTALLER	$ 15.45	0.00
ELECTRICIAN (Alarm Installation Only)	$ 21.52	4.16
ELECTRICIAN (Communication Technician Only)	$ 16.40	2.87
ELECTRICIAN (Low Voltage Wiring Only)	$ 20.03	3.04

ELECTRICIAN, Excludes Low Voltage Wiring and Installation of Alarms/Sound and Communication Systems	$ 21.51	3.69
FORM WORKER	$ 12.32	0.00
GLAZIER	$ 16.15	2.13
HIGHWAY/PARKING LOT STRIPING: Operator (Striping Machine)	$ 10.04	2.31
INSTALLER - SIDING (METAL/ALUMINUM/VINYL)	$ 14.26	0.00
INSTALLER - SIGN	$ 15.61	0.00
INSULATOR - BATT	$ 13.00	0.00
IRONWORKER, REINFORCING	$ 12.24	0.00
LABORER: Common or General	$ 11.57	0.00
LABORER: Mason Tender - Brick	$ 11.00	1.70
LABORER: Mason Tender - Cement/Concrete	$ 10.64	0.00
LABORER: Pipelayer	$ 13.00	0.35
LABORER: Plaster Tender	$ 14.50	0.00
LABORER: Roof Tearoff	$ 11.28	0.00
LABORER: Landscape and Irrigation	$ 12.00	0.23
LATHER	$ 16.00	0.00
OPERATOR: Backhoe/Excavator/Trackhoe	$ 13.06	0.00
OPERATOR: Bobcat/Skid Steer/Skid Loader	$ 13.93	0.00
OPERATOR: Bulldozer	$ 18.29	1.31
OPERATOR: Drill	$ 13.00	0.50
OPERATOR: Forklift	$ 13.38	0.81
OPERATOR: Grader/Blade	$ 13.05	0.00
OPERATOR: Loader	$ 14.02	1.82
OPERATOR: Mechanic	$ 17.52	3.33
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 18.44	0.00

OPERATOR: Roller	$ 15.04	0.00
PAINTER (Brush, Roller and Spray, Excluding Drywalling/Taping)	$ 13.60	2.24
PAINTER: Drywall Finishing/Taping Only	$ 14.28	3.04
PLASTERER	$ 15.37	0.00
PLUMBER (HVAC Pipe Installation Only)	$ 23.87	6.66
PLUMBER, Excludes HVAC Pipe Installation	$ 22.70	5.65
ROOFER	$ 17.19	0.00
SHEET METAL WORKER (HVAC Duct Installation Only)	$ 21.10	5.50
SHEET METAL WORKER, Excludes HVAC Duct Installation	$ 24.88	7.23
SPRINKLER FITTER (Fire Sprinklers)	$ 21.25	15.55
TILE FINISHER	$ 11.22	0.00
TILE SETTER	$ 14.25	0.00
TRUCK DRIVER: 1/Single Axle Truck	$ 16.40	0.81
TRUCK DRIVER: Dump Truck	$ 12.39	1.18
TRUCK DRIVER: Flatbed Truck	$ 19.65	8.57
TRUCK DRIVER: Semi-Trailer Truck	$ 12.50	0.00
TRUCK DRIVER: Water Truck	$ 12.00	4.11

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other

health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

* an existing published wage determination
* a survey underlying a wage determination
* a Wage and Hour Division letter setting forth a position on a wage determination matter
* a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor

200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

PERFORMANCE BOND

STATE OF TEXAS §
§ **KNOW ALL MEN BY THESE PRESENTS:**
COUNTY OF DALLAS §

THAT _____, of the City of _____, _____ County, State of Texas (hereinafter referred to as "Principal"), and _____ (hereinafter referred to as "Surety"), authorized under the laws of the State of Texas to act as Surety on bonds for principals are held and firmly bound unto the **City of Mesquite** (hereinafter referred to as "City") in the penal sum of **$**_____ (not less than 100% of the approximate total amount of the Contract as evidenced in the Proposal) for the payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally, by these presents:

WHEREAS the Principal has entered into a certain written contract with the City, dated the _____day of _____, 2017, for the **HAILEY PUMP STATION VARIABLE FREQUENCY DRIVE IMPROVEMENTS, City Contract No. E2017-003** to which said Contract is hereby referred to and made a part hereof and as fully and to the same extent as if copied at length herein;

NOW, THEREFORE, the condition of this obligation is such that if the said Principal fully and faithfully executes the work and performance of the Contract in accordance with the Plans, Specifications and Contract Documents, including any extensions thereof, and according to the true intent and meaning of said Contract and the Plans and Specifications hereto annexed, then this obligation shall be void; otherwise, to remain in full force and effect.

PROVIDED, HOWEVER, that this Bond is executed pursuant to the provisions of V.T.C.A. Government Code Chapter 2253, Public Work Performance and Payment bonds, as amended, and Article 53.201 of the Property Code, and all liabilities on this Bond shall be determined in accordance with the provisions of said articles to the same extent as if they were fully copied at length herein.

Surety, for value received, stipulates and agrees that the Bond shall automatically be increased by the amount of any change order or supplemental agreement which increases the contract price with or without notice to the Surety and that no change, extension of time, alteration or addition to the terms of the Contract, or to the work performed thereunder, or the Plans, Specifications or Drawings accompanying the same shall in any way affect its obligation 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 or to the work to be performed thereunder.

Surety must be approved by the Texas State Board of Insurance under Article 7.19-1 of the Insurance Code and authorized under the laws of Texas to act a surety on bonds for principals.

Surety agrees that the bond provides for the repairs and/or replacement of all defects due to faulty materials and workmanship that appear within a period of **two (2) years** from the date of completion and acceptance of the improvement by the City.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument on this the ____day of _____, 2017.

PRINCIPAL:

Signature:

_____

Printed Name:

_____

Title: _____

Company: _____

Street Address:

_____

(P.O. Box is not acceptable)

_____

City, State, Zip Code

Phone Number: _____
Dallas Telephone Number

SURETY:

Signature:

_____

Printed Name:

_____

Title: _____

Company: _____

Street Address:

_____

(P.O. Box is not acceptable)

_____

City, State, Zip Code

SURETY'S DALLAS COUNTY REGISTERED AGENT FOR SERVICE (REQUIRED):

Printed Name: _____

Title: _____

Company: _____

Street Address: _____
(P.O. Box is not acceptable)

_____
City, State, Zip Code

Phone Number: _____
Dallas County Telephone Number
(Attach dated Power of Attorney for Surety)

ATTEST:

_____
City Secretary

APPROVED AS TO FORM:

_____
City Attorney or Designee

PAYMENT BOND

STATE OF TEXAS §
§ **KNOW ALL MEN BY THESE PRESENTS:**
COUNTY OF DALLAS §

THAT _____, of the City of _____, _____ County, State of Texas, (hereinafter referred to as Principal), and _____ (hereinafter referred to as "Surety"), authorized under the laws of the State of Texas to act as Surety on bonds for principals are held and firmly bound unto the City of Mesquite (hereinafter referred to as "City") in the penal sum of **$**_____ (an amount not less than 100% of the approximate total amount of the Contract) for the payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally, by these presents:

WHEREAS the Principal has entered into a certain written contract with the City, dated the _____day of _____, 2017, for the **HAILEY PUMP STATION VARIABLE FREQUENCY DRIVE IMPROVEMENTS, City Contract No. E2017-003** to which said Contract is hereby referred to and made a part hereof and as fully and to the same extent as if copied at length herein;

NOW, THEREFORE, the condition of this obligation is such that the bond guarantees the full and proper protection of all claimants supplying labor and material in the prosecution of the work provided for in said Contract and for the use of each claimant, and that conversely should the Principal faithfully perform said Contract and in all respects duly and faithfully observe and perform all and singular the covenants, conditions and agreements in and by said Contract agreed to by the Principal, and according to the true intent and meaning of said Contract, and the claims and specifications hereto annexed, then this obligation shall be void; otherwise, to remain in full force and effect.

PROVIDED, HOWEVER, that this Bond is executed pursuant to the provisions of V.T.C.A. Government Code Chapter 2253, Public Work Performance and Payment bonds, as amended, and Article 53.201 of the Property Code, and all liabilities on this Bond shall be determined in accordance with the provisions of said articles to the same extent as if they were fully copied at length herein.

Surety, for value received, stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract, or to the work performed thereunder, or the Plans, Specifications or Drawings accompanying same shall in any way affect its obligation 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 or to the work to be performed thereunder.

Surety must be approved by the Texas State Board of Insurance under Article 7.19-1 of the Insurance Code and authorized under the laws of Texas to act a surety on bonds for principals.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument on this the ___ day of _____, 2017.

PRINCIPAL:

Signature:

_____

Printed Name:

_____

Title: _____

Company: _____

Street Address:

_____

(P.O. Box is not acceptable)

_____

City, State, Zip Code

SURETY:

Signature:

_____

Printed Name:

_____

Title: _____

Company: _____

Street Address:

_____

(P.O. Box is not acceptable)

_____

City, State, Zip Code

Phone Number: _____

Dallas Telephone Number

SURETY'S DALLAS COUNTY REGISTERED AGENT FOR SERVICE (REQUIRED):

Printed Name: _____

Title: _____

Company: _____

Street Address: _____

(P.O. Box is not acceptable)

_____

City, State, Zip Code

Phone Number: _____

Dallas County Telephone Number

(Attach dated Power of Attorney for Surety)

ATTEST:

_____

City Secretary

APPROVED AS TO FORM:

_____

City Attorney or Designee

CONTRACTOR'S AFFIDAVIT OF FINAL PAYMENT AND RELEASE

(This form will be prepared by the City and executed by the Contractor after project completion)

STATE OF TEXAS §
§ KNOW ALL MEN BY THESE PRESENTS:
COUNTY OF DALLAS §

BEFORE ME, the undersigned authority, on this day personally appeared _____ ("Affiant") ***(insert name of authorized company officer)***, who, after being by me duly sworn, deposes and says that he is _____ ***(insert title)*** of _____ ***(insert formal company name)***, a _____ ***(insert company business organization such as corporation, partnership, etc..)*** of _____ **County** ***(insert county and state of company incorporation)***, State of Texas (the "Contractor"), which said Contractor was awarded the contract dated the _____ day of _____**, 2017** ***(insert date of contract)*** for the construction of **HAILEY PUMP STATION VARIABLE FREQUENCY DRIVE IMPROVEMENTS, City Contract No. E2017-003** (the "Work"), for a total consideration **of _____??/100 Dollars ($?,???,???.??)** ***(Insert sum of total work in place as calculated on final estimate)*** to be paid to the said Contractor (the "Contract"), and that Affiant has full power of authority to make this affidavit.

That City of Mesquite, Texas, (the "City") has approved the final estimate on said Work, and that the said Contractor has fully satisfied and paid any and all claims that may be covered by Chapter 53 of the Texas Property Code, and Chapter 2253 of the Texas Government Code, or any other applicable statutes or charter provisions, and that all just bills for labor and materials have been paid and discharged by said Contractor insofar as they pertain to the Work in question.

That in addition to any funds which may have been previously paid by the City, the Contractor hereby accepts the amount of _____ **??/100 Dollars ($???,???.??)** as **FULL AND FINAL PAYMENT** ***(remaining payment plus retainage, minus liquidated damages or other penalties both written out and in numeric)*** under the aforementioned Contract, and hereby waives and releases any right Affiant and/or the Contractor may have to pursue claims of any nature against the City arising out of or in any manner connected with the performance of the Work and/or the Contract, including but not limited to claims of third parties that supplied material and/or labor for the Work for or through the Contractor ("Subcontractors"), as well as claims for delay, additional compensation, or for recovery of liquidated damages which may have been withheld by the City. The Contractor shall defend, hold harmless, and indemnify the Owner from any such claims of such Subcontractors. The Contractor further releases the City from any claim or liability arising from any act or neglect of the City related to or connected with the Contract. This affidavit is given pursuant to the final payment provisions of the Contract, and shall not be deemed to alter or modify the terms and provisions of said Contract.

By:

_____ _____
(Affiant) (Contractor's Signature) (Title)

_____
(Printed Name)

SUBSCRIBED AND SWORN TO BEFORE ME, this **_____ day of _____, 201_**.

_____
(Notary Public in and for the State of Texas)

_____
(Printed Name of Notary)

My commission expires _____

SECTION GP

CONTRACT GENERAL PROVISIONS

For this Contract the City of Mesquite has adopted the *North Central Texas Council of Governments Public Works Construction Standards, Fourth Edition (October 2004), Division 100 General Provisions* with modifications by addendum. The modifications to the above referenced Division 100 General Provisions are contained in the below City of Mesquite Addendum.

CITY OF MESQUITE

ADDENDUM

TO

NORTH CENTRAL TEXAS

STANDARD SPECIFICATIONS

FOR

PUBLIC WORKS CONSTRUCTION

This addendum to the ***North Central Texas Standard Specifications for Public Works Construction, Division 100 General Provisions, Fourth Edition, dated October 2004*** sets forth exceptions or requirements of the City of Mesquite and thereby takes precedence over any conditions or requirements of the ***North Central Texas Standard Specifications for Public Works Construction, Division 100 General Provisions*** with which it is in conflict.

The comments are itemized by the ***North Central Texas Standard Specifications for Public Works Construction, Division 100 General Provisions*** section reference number followed by specific comments.

101.1 DEFINITIONS

Add the following definitions:

Advertisement: All of the legal publications pertaining to the work contemplated or under contract.

Apparent Low Bidder: The bidder determined to have the numerically lowest bid as a result of the tabulation of bids by the Owner.

Award: The City Council's acceptance of the Contractor's bid for a proposed contract that authorizes the Owner to enter into a contract.

Bid Bond: The approved form of proposal guarantee furnished by the Contractor and his surety as security for compliance with all conditions of such proposal guarantee as set forth in the General Provisions.

Bidder: Any person, persons, partnership, company, firm, association or corporation or combination thereof, acting directly or through a duly authorized representative submitting a proposal for the work contemplated.

Calendar Day: A calendar day is defined as any day of the week or year, no days being excepted.

City: The City of Mesquite, Texas, a municipal corporation, acting by and through (a) its governing body, (b) its Mayor or (c) its City Manager, each of whom is required by Charter to perform specific duties. Responsibility for final enforcement of contracts involving the City of Mesquite is by Charter vested in the City Manager.

Claim: Compensation for any alleged damage by reason of the acts or omissions of the Owner.

Consulting Engineer: The person, firm or entity hired as an independent consultant by the Owner to design the Project and represent the Owner in the administration of the Contract in whatever capacity the Owner designates; the Owner may, at sole option, designate the Consulting Engineer to be the Engineer for purposes of administration of the Contact. The Consulting Engineer shall be understood to be the Consulting Engineer of the Owner, and nothing contained in the Contract Documents shall be construed to make the Consulting Engineer an employee of the Owner, nor shall they be construed to create any contractual or agency relationship between the Consulting Engineer and the Contractor. The term includes the officers, employees, associates, agents or sub-consultants of the Consulting Engineer, if any.

Contractor's Qualification Information: qualification forms completed by a Bidder reflecting a Bidder's financial data and experience.

Effective Start Date: The date indicated in the Notice to Proceed as the date of commencement of Work which is the date from which the start of Contract Time is measured.

Field Order: A written order issued by the Owner's Representative which orders minor changes or clarifications in the Work which do not involve a change in the Contract Time or Contract Price.

General Conditions: The special clauses of the contract setting forth conditions or requirements supplementing the standard or general specifications and taking precedence over any conditions or requirements.

General Design Standards: The General Design Standards developed, adopted and published by the City of Mesquite - Engineering Division.

Owner: The City of Mesquite, Texas.

Owner's Inspector: The Public Works Construction Inspector of the City of Mesquite or the person designated by the Owner's Representative to inspect the work for the City, more than one inspector may be assigned to a project.

Owner's Representative: The City Engineer of the City of Mesquite or the person designated by the City Engineer to represent the City, or such other person as authorized by the City in the contract documents.

Product: The term "product" includes materials, systems, and equipment.

Proposal: The written statement or statements duly filed with the Purchasing Agent, whether in the form of a sealed bid, proposal, quotation or other form, of the person, persons, partnership, company, firm, association or corporation proposing to do the work contemplated.

Proposal Guarantee: The security designated in the advertisement and proposal, to be furnished by each bidder as a guarantee of good faith to enter into a contract with the Owner and comply with all conditions provided for such Proposal Guarantee in the General Provisions (reference Section 102.5).

Provide: The term "provide" means to furnish and install.

Request for Information (RFI): A written request from the Contractor to the Owner's Representative for plan or specification interpretation or clarification.

Shop Drawings or Submittals: All drawings, diagrams, illustrations schedules, and other data which are specifically prepared by or for the Contractor to illustrate some portion of the Work and all illustrations, brochures, standard schedules, performance charts, instructions, manufacturer's data, diagrams, and other information submitted by the Contractor to the Owner's Representative for approval (reference Section 105.3).

Standard Details: Standard details developed, adopted and published by the City of Mesquite Engineering Division or the standard details developed by other agencies or engineers that are included in the project plans or specifications.

Substantially Complete: In the opinion of the Engineer, that the Work has been made suitable for use or occupancy or is serving its full intended purpose, but may require minor

miscellaneous work or adjustment as evidenced by issuance of a Certification of Substantial Completion by the Owner's Representative.

Working Hours: Work shall be done only during the regular and commonly accepted and described working hours between 7:00 a.m. and 6:00 p.m. No work shall be done nights, Sundays or regular holidays unless written permission is given by the Owner's Representative.

Official City Holidays are:
New Year's Day Holiday
Martin Luther King Jr. Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day
Thanksgiving Friday
Christmas Eve Holiday
Christmas Day Holiday

Written Notice: Written notice shall be deemed to have been duly served if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered mail to the last business address known to him who gives the notice.

102.1 PROPOSAL FORM
Add: Proposal Forms may be obtained as provided in the advertisement for bids.

Add to the end of the Section the Following Subsections:

102.1.1 Contract Price. The total Contract Price shall cover all Work required by the Contract Documents. All costs in connection with the proper and successful completion of the Work, including furnishing all materials, equipment, supplies, and appurtenances; providing all construction plant, equipment, and tools; and performing all necessary labor and supervision to fully complete the Work, shall be included in the unit and lump sum prices bid. All Work not specifically set forth as a pay item in the Bid Form shall be considered a subsidiary obligation of Contractor and all costs in connection therewith shall be included in the prices bid.

102.1.2 Pay Items. Items not listed in the bid proposal shall be considered subsidiary to the construction and no additional compensation will be given for them.

102.3. EXAMINATION OF PLANS, SPECIFICATIONS AND SITE OF THE WORK
Add to End of Section the Following Subsections:

102.3.1. Addenda. Bidders desiring further information, or interpretation of the plans and specifications, must make request for such information in writing to the Owner's Representative five (5) working days prior to the date of the bid opening. Answers to such requests will be given in writing to all bidders by Addendum and such Addendum shall be made a part of the Contract Documents. No other explanation or interpretation will be considered official or binding. Should a bidder find discrepancies in the plans, specifications or quantities, or should he be in doubt as to their meaning, he shall at once notify the Owner's Representative in order that a written Addendum may be sent to all bidders. Any Addenda issued prior to twenty-four (24) hours before the opening of bids will be delivered by facsimile or email to all plan holders on record with the City of Mesquite. The proposal as submitted by the Bidder will be so constructed as to include any Addendum issued by the Owner's Representative prior to twenty-four (24) hours before the opening of bids.

The Bidder must acknowledge in the proposal bid forms that all addendums have been received.

102.3.2. Pre-Bid Inspection. Bidder shall inspect the site prior to bidding and prior to move in. Bidder's inspection shall include but not be limited to observation and verification of existing grades, topographic conditions, surface and subsurface soil conditions and surface and subsurface water drainage conditions, observation and verification of any existing utility, appurtenance, or structure as it may relate to the contract. This shall include but not be limited to:

- ❑ Water and sewer appurtenances.
- ❑ Storm sewer structures and appurtenances.
- ❑ Concrete structures and appurtenances.
- ❑ Petroleum pipeline systems and appurtenances.
- ❑ Natural Gas pipeline systems and appurtenances.
- ❑ Telecommunications systems and appurtenances.
- ❑ Electrical systems and appurtenances.
- ❑ Television cable systems and appurtenances.
- ❑ Irrigation systems and appurtenances.

102.3.3. Geotechnical Data. Soil Borings, soil profiles, ground water elevations, and underground utilities shown on the plans have been obtained for use in preparation of the plans. The Owner makes no representation or warranty to the accuracy of this geotechnical data.

102.3.4. Quantity Verification. Bidders shall verify all quantities included in the bid proposal prior to submitting bid. Should any major quantity discrepancy between stated bid quantities and Bidder's estimate be found, Bidder shall notify the Owner's Representative in writing, prior to submitting bid, and

obtain a clarification and/or correction to the stated bid quantity. By submitting a bid, Bidder represents that estimates were performed and no major quantity discrepancies were found.

102.3.5. Subsidiary Cost: It is the intent of the Contract Documents, Technical Specifications, Supplemental Specifications, and plans to describe the construction and subsidiary activities and materials necessary to furnish and install a complete in place project, ready for its intended use, accepted by the Owner's Representative. Those materials and work necessary to furnish and install a complete in place project, conforming to the plans and specifications, that are not specifically identified in the bid proposal, technical specifications, or the supplemental technical specifications as pay items shall be considered as subsidiary to the contract as a whole, and as such shall not be submitted for individual payment by the Contractor. The cost of those subsidiary items shall be reflected in the prices stated in the bid proposal. It shall be the responsibility of the Contractor to review the bid proposal, plans, technical specifications, and supplemental technical specifications and site conditions to determine those materials and work which are not specifically identified but which shall be necessary to furnish and install a complete project in place.

102.4. PREPARATION OF PROPOSAL
Change: in the second sentence "both in words and numerals" to "in numerals"

Add after the first sentence: The bidder shall submit Bid Proposals on Bid Forms in the contract document or from computer generated forms supplied by the Owner. Modifications, revisions and creations of a new computer generated form not furnished by the Owner shall be considered an irregular proposal and may disqualify the bidder. Unit prices shown on the Bid Proposals shall state the prices for which he proposes to do the work contemplated or furnish the material required.

102.5 PROPOSAL GUARANTY
Add to the end of the section: An acceptable Surety per the terms of GP Section 103.3 SURETY BONDS shall execute the bidder's surety bond, together with the bidder, as Principal. In addition, the Bidder and its agents shall have no financial interest in the Surety.

102.7. WITHDRAWING PROPOSALS
Change: In the last sentence, change "90 days" to "120 days".

Add: After the 120-day period, if agreed to in writing between Contractor and Owner, the bid will stay in effect, without change, for a period agreed to between the Contractor and Owner.

102.8 OPENING PROPOSALS
Delete the last sentence of this section.

102.9. CONSIDERATION OF PROPOSAL
Add: When required by the bid documents, within 48-hours of the bid opening, the apparent low bidder must submit to the Owner, the Bidder's Qualification Information on the forms provided in the bid documents providing evidence that the bidder is capable of properly executing the work.

102.10. IRREGULAR PROPOSALS
Add: After the words "irregular if" add ", in the sole opinion of the Owner,"

102.12. DISQUALIFICATION OF BIDDERS
Add:
(9) The bidder being party to any litigation against the Owner;
(10) The bidder being in arrears on any existing contract or other financial obligation or debt.
(11) Lack of experience, competency, ability, capacity of the bidder to perform the contract or provide the service required as revealed by the Bidder's Qualification Information.
(12) Lack of a current financial report as required in the Bidder's Qualification Information submission requirements.

(13) The quality, availability and adaptability of the supplies, materials, equipment or contractual services, to the particular use required.
(14) The number and scope of conditions attached to the bid proposal.
(15) Whether the bidder can perform the contract or provide the service promptly, or within the time required, without delay or interference.
(16) The character, responsibility, integrity, reputation, experience and safety record of the bidder.
(17) The previous and existing compliance by the bidder with laws relating to the contract or service.
(18) Any previous or existing noncompliance by the bidder to perform the contract or provide the service.
(19) The ability of the bidder to provide future maintenance, repair parts, and service for the subject contract.
(20) Rejection of bid when a bid is submitted in which there is a material failure to comply with the specification requirements
(21) Evidence that contractor, subcontractor have been suspended, debarred, or otherwise excluded from participation in federally funded programs.

103.2. AWARD OF CONTRACT
Change: In the first sentence, change “90 days” to “120 days”.

Add: The right is reserved, as the interest of the Owner may require, to reject any and all bids and waive any informality of bids received.

103.3.1.1. Performance Bond.
Change: In the last sentence, change “period of one year” to “period of **two years**”.

103.3.1.4. Bond Amounts Based on Contract Amounts
Delete entire section.

103.3.3. Sureties.
Delete second to last sentence and Replace with: The surety shall designate an agent in Dallas County, Texas who is acceptable to the Owner to whom any requisite notices may be delivered and on whom service of process may be had in matters arising out of such suretyship. Legal venue for enforcement of the bonds shall lie exclusively in Dallas County, Texas.

103.4 INSURANCE

Delete entire subsection 103.4.1. Contractor's Insurance, including subsections and Replace with:

103.4.1 Contractor's Insurance. The Contractor and his subcontractor(s) shall not commence work on any contract in the City of Mesquite until he has obtained, for himself and all subcontractors, all the insurance required under this paragraph, and such insurance has been approved by the Owner.

The Contractor and his subcontractor(s) agrees to provide and to maintain the following types and amounts of insurance, which may be satisfied by any combination of primary, excess or umbrella liability insurance, for the term of this Contract:

Amounts and Types of Insurance:

	Type	Amount	
1	Workers Compensation/Employer's Liability	Statutory	
2	Employer's Liability	$100,000 Limit Ea. Acc/Disease/Aggregate	City shall be an Additional Insured with Waiver of Subrogation
3	Commercial (Public) Liability, including, but not limited to: A. Premises/Operations B. Independent Contractors C. Personal Injury D. Products/Completed Operations E. Contractual Liability (insuring above indemnity provisions) F. Explosion or Cave-in	$1,000,000 per Occurrence and Aggregate Limits	All insurance policies shall be written on a primary basis and be non-contributory with any other coverages carried by the City. City is to be an Additional Insured with Waiver of Subrogation.
4	Automobile Policy	Combined Single Limit - $500,000.00	City shall be an Additional Insured

The required limits may be satisfied by any combination of Primary, Excess or Umbrella liability coverage. The preceding amounts notwithstanding, Owner reserves the right to decrease or increase the minimum required insurance either as provided in the contract documents or after thirty (30) days notice is sent to the Contractor's address as shown on Contractor's Proposal. The Contractor may pass through to the Owner all costs for obtaining the increase in the insurance coverage.

The Contractor understands that it is its sole responsibility to provide Certificates of each policy before any work is started and that failure to timely comply with the stated policy endorsements and special conditions hereinafter specified shall be a cause for termination of this Contract. Prior to the effective date of cancellation of any coverage, the Contractor must deliver to the Owner a replacement Certificate or proof of reinstatement. In addition to the Certificates, all Policies shall be subject to examination and approval by the City Attorney's office for their adequacy as to form, content, form of protection and the providing company.

Insurance required by this Contract for the Owner as additional insured shall be primary insurance and not contributing with any other insurance available to the Owner, under any third party liability policy.

Delete entire subsection 103.4.2. Owner's Protective Liability Insurance and Replace with:

103.4.2 Worker's Compensation Insurance. The Owner shall require worker's compensation insurance coverage as defined in Section 401.011(44) of the Texas Labor Code from any contractor before entering into a building or construction contract to prove in writing that the Contractor and all subcontractors shall provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements set forth in Section 406.096 of the Texas Labor Code, for all persons providing services on the project, for the duration of the project.

103.4.5.1 Endorsements.
Delete 103.4.5.1(1) and Replace with:
(1) With the exception of Workers' Compensation and Professional Liability coverage, the Certificate of Insurance must state that "The City of Mesquite-Texas, its trustees, officers, agents and employees are Additional Insureds as their interests appear relating to the contractually stipulated service, project or product";

103.4.5.2(2) Insurance Requirements.
Add: rated at least "A-(VIII)" in A.M. Best's Key Rating Guide; and

103.6 NOTICE TO PROCEED AND COMMENCEMENT OF WORK
Add: Prior to the start of work, the Owner may arrange a Pre-Construction Conference with the Contractor and appropriate Owner staff. The Pre-Construction Conference shall be scheduled no later than 10 days after the Contract is fully executed. The Notice to Proceed (NTP) shall state the date upon which the Contract time (the Effective Start date) shall start. The Effective Start date will be within 10 days after the Pre-Construction Conference for the Project is held unless requested otherwise in writing by the Owner's Representative.

Add The Following Section:
103.8. COST BREAKDOWN (SCHEDULE OF VALUES FOR LUMP SUM BIDS OR BID ITEMS)
The Contractor shall prepare and submit for approval to the Owner's Representative at the preconstruction meeting a breakdown of lump sum items, identified by the Owner, for the various parts and classes of work to be performed under the Contract.

105.1.1 Priority of Contract Documents.
Delete entire subsection and Replace with:
The bid documents, contract, bonds, bid form, general provisions, special provisions, technical specifications, general specifications, plans, details, appendixes and all supplementary information and referenced standards cited are essential parts of the contract requirements. A requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work.

In case of discrepancy or conflict:
- written out or calculated dimensions shall govern over scaled dimensions;
- large-scale details shall govern over general or smaller scale details;
- project specific details shall govern over general or standard details;
- Special Provisions shall govern over General Provisions;
- project specific technical specifications shall govern over standard specifications;
- City of Mesquite General Design Standards shall govern over ***North Central Texas Standard Specifications for Public Works Construction, Fourth Edition, dated October 2004***;
- City of Mesquite General Design Standards shall govern over Texas Department of Transportation (TXDOT) Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges, 2004 Edition.

105.1.3. Contract Drawings and Specifications.
Add at the end of the first paragraph: "The only plans authorized for use are stamped:

105.2.2. Special Warranty.
Change: In the first sentence, change “one year” to “two years”.

105.3. SHOP DRAWINGS, PRODUCT DATA AND SAMPLES
Delete: The last sentence in the last paragraph.

105.4. CONSTRUCTION STAKES
Delete: Entire first paragraph of section.
Add: The Contractor is responsible for furnishing at Contractor’s expense all construction staking necessary to establish line and grade. The Consulting Engineer will provide one-time location of survey control points for the Contractor’s surveyor. Prior to construction the Contractor shall field verify elevations and locations of tie-in points for existing utilities. If discrepancies are discovered between field conditions and plan elevations the Contractor shall notify the owner immediately of the discrepancies. All construction staking is subject to checking and verification by the Owner’s Representative. The hiring of a Registered Land Surveyor shall comply with Article 2254.004 of the Texas Governmental Code (Professional Services Procurement Act.

105.6. SUPERVISION BY CONTRACTOR
Add: The Contractor shall at all times have on the site of the work a superintendent or general foreman on site if any work is being done or any materials are being delivered to the project location. The Contractor superintendent and general foreman shall be fluent in speaking, reading and writing English.

105.7.1 Authority of the Engineer
Add: The Owner’s Representative has the authority to stop the work whenever such stoppage may be necessary to insure the proper execution of the Contract.

105.7.2. Owner’s Representative’s Final Determination
Add: Should the Contractor object to any order by any subordinate Owner’s Representative, the Contractor may, within six days make written appeal to the Owner’s Representative for his decision.

105.9 INSPECTION
Add: The Owner’s Inspector shall not have the power to waive the obligations of this Contract for the furnishing by the Contractor of good material, and of his performing good work as herein described, and in full accordance with the plans and specifications. No failure or omission of the Owner’s Inspector to condemn any defective work or material shall release the Contractor from the obligation to at once remove and properly replace the same at any time prior to Owner’s final acceptance upon the discovery of said defective work or material.

105.9.1. Removal of Defective and Unauthorized Work.
Add: If the Owner’s Representative prefers to accept Work which is defective and/or not in accordance with the requirements of the Contract Documents, the Owner’s Representative may accept Work instead of requiring its removal and correction, prior to recommendation of final payment. Work found to be defective and accepted by the Owner shall be, at the discretion of the Owner’s Representative and without recourse by the Contractor, subject to partial or non-payment. Contractor shall bear all direct, indirect, and consequential costs attributable to the Owner’s evaluation of any determination to accept such defective work (such costs to be approved by the Owner’s Representative as to reasonableness, and to include, but not be limited to, fees and charges of engineers, inspectors,

architects, attorneys, laboratories and other professionals). If any such acceptance occurs prior to the Owner's Representative's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and the Owner shall be entitled to an appropriate decrease in the Contract Price. If the acceptance occurs after such recommendation, an appropriate amount will be paid by the Contractor to the Owner.

105.9.3. Inspection Overtime
Delete the second sentence in the second paragraph and Replace with the following: "The Inspector's normal working hours are 7:30 a.m. to 11:30 a.m. and 12:30 p.m. to 4:30 p.m., Monday through Friday with the exclusion of Official City Holidays. **The Contractor will reimburse the Owner for all Inspection overtime outside the Inspector's normal working hours.** To arrange for inspection outside Inspector's normal working hours a verbal request for overtime inspection must be communicated to the Owner's Inspector two working days in advance. Work on Sundays and Holidays is prohibited except in the case of emergency and authorized, in writing, by the Owner's Representative. Work between the hours of 6:00 P.M. and 7:00 A.M. must be approved by the Owner's Representative. Overtime inspection shall be charged portal to portal. There is a two-hour minimum charge for inspection on weekends or Official City Holidays. The Contractor will be charged a 2-hour minimum overtime charge if the Contractor schedules inspection on weekends or Official City Holidays but then cancels work without notice to the Public Works Construction Inspector before the inspector shows up to the project.

Delete: The last two paragraphs.

Add: Inspection overtime will be reimbursed to the Owner by the Contractor at the rate of time-and-one-half plus workman's compensation, F.I.C.A. and other normal City benefits and pertaining rates. The Contractor will be billed monthly by the City for overtime charges. The City will not give final payment or give final acceptance of a project until inspector overtime charges are paid.

106.4. OFF-SITE STORAGE
Delete entire section and Replace with:
The costs incurred in storage of materials or equipment away from the project site will not be made by the Owner. All costs incurred shall be the full responsibility of the Contractor and included in the Contractor's bid.

106.5 SAMPLES AND TESTS OF MATERIALS
Delete the first paragraph and Replace with:

Where, called for in the specifications or in the opinion of the Owner tests and retests of materials or completed work are necessary, such tests will be made **at the expense of the Contractor** unless otherwise specified.

Add at the end of the last paragraph:
The Contractor shall designate and pay a recognized testing laboratory to perform all testing, if any, for this project. Such designation is subject to the approval of the Owner's Representative. The hiring of the testing laboratory shall comply with Article 2254.004 of the Texas Governmental Code (Professional Services Procurement Act).

The Testing Laboratory must furnish the inspector with one field copy of the test results. A typed paper copy must be mailed to the Owner's Representative identified at the Pre-Construction Conference. The Owner's Representative may approve the submission of final test reports to the Owner by electronic means.

Collection of potable water samples for bacterial sampling will be accomplished by the Contractor. The Contractor must prepare the sample point and assist the City Public Works Construction Inspector in collecting the sample. All work and materials used for the sampling point and taking the samples must

conform to the latest version of the American Water Works Association. Delivery of the potable water sample to the testing laboratory and testing of the potable water sample will be at the Owner's expense.

107.2 INDEMNIFICATION
Add the following subsections:

107.2.1 Contractor's Responsibility. Contractor further agrees that it shall at all times exercise reasonable precautions on behalf of, and be solely responsible for, the safety of its officers, agents, employees, subcontractors, licensees, invitees, and other persons, as well as their property, while in the vicinity where the improvements are being made. It is expressly understood and agreed that City shall not be liable or responsible for the negligence of the Contractor, including but not limited to its officers, agents, employees, subcontractors, licensees, invitees, and other persons.

107.2.2 Premise Defects. Further, City assumes no responsibility or liability for harm, injury, or any damaging events which are directly or indirectly attributable to premise defects, real or alleged, in improvements constructed by Contractor which may now exist or which may hereafter arise upon the premises, responsibility for any and all such defects being expressly assumed by Contractor. Contractor understands and agrees that this indemnity provision shall apply to any and all claims, suits, demands, and/or actions based upon or arising from any such premise defects or conditions, including but not limited to any such claim asserted by or on behalf of Contractor, including but not limited to its officers, agents, employees, subcontractors, licensees, invitees, and other persons.

107.2.3 Notice of Claim. It is further agreed with respect to the above indemnity that City and Contractor will provide the other prompt and timely notice of any event covered which in any way, directly or indirectly, consequently or otherwise, affects or might affect the Contractor or City, and City shall have the right to compromise and defend the same to the extent of its own interests.

107.3 OWNER'S OFFICERS EMPLOYEES OR AGENTS
Add the following subsection:

107.3.3 Specific Ethics Provisions
Contractor shall at all times observe and comply with all Federal, State and local laws, ordinances and regulations relating to ethics provisions, including all amendments and revisions thereto, which in any manner affect Contractor or the services and/or items to be provided. In particular, Contractor is put on notice that Owner will require compliance with Chapter 176 of the Texas Local Government Code (hereinafter referred to as the "Act") requiring any person who contracts or seeks to contract with the Owner to disclose potential conflicts of interest as defined in the Act in accordance with the provisions of the Act. Failure to comply with provisions of the Act, may result in: i) the forfeiture by Contractor of all benefits of the Contract; ii) the retainage by Owner of all services performed by Contractor and iii) the recovery by Owner of all consideration, or the value of all consideration, paid to Contractor pursuant to any awarded contract. Additionally, CONTRACTOR must comply with Section 2252.908 of the Texas Government Code, which was enacted in 2015 by the Texas Legislature pursuant to HB 1295, providing that a governmental entity may not enter into certain contracts with a business entity on or after January 1, 2016, unless the business entity submits a disclosure of interested parties (FORM1295) to the governmental entity at the time the business entity submits the signed contract to the governmental entity. Further information regarding the disclosure of interested parties law and instructions on filing FORM1295 can be found at the Texas Ethics Commission web site at the following web address:

https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm

107.12 LABOR AND MATERIALS
Add the following subsection:
107.12.1. LABOR CLASSIFICATION AND MINIMUM WAGE SCALE
In compliance with State Law, the Contractor is required to pay all workers, including employees of subcontractors, for the construction of any public work project not less than the general prevailing rate of per diem wages in the locality for work of a similar character as determined by the City. The City has

adopted the prevailing wage rates as determined by the U.S. Department of Labor in accordance with the Federal Davis Bacon Act for this Contract as provided by law.

Attention is called to the fact that the inclusion of a minimum scale of wages to be paid to employees engaged in the work under this Contract does not release the Contractor from compliance with any Federal or State Wage Law that may be applicable to the project. The Contractor shall abide by Federal and State Wage and Hour Laws and must not pay less than the wages legally prescribed as set forth herein. In order to verify compliance with Federal or State wage laws and regulations, the Contractor may be required to submit a weekly certified payroll of all workers on the project listing name, social security number, labor classification, wage rates, hours worked and compensation paid.

Under the provisions of the Texas Government Code, Title 10, Subchapter F, Section 2258.023, the Contractor shall forfeit as a penalty to the City on whose behalf the Contract is made or awarded, Sixty Dollars ($60.00) for each laborer, workman or mechanic employed, for each calendar day or portion thereof that such laborer, workman or mechanic is paid less than the said stipulated rates for any work under the Contract, by him or by any sub-contractor under him.

Such wage determinations must be for projects in Dallas County, Texas dated no more than 3 years prior to the date this Contract was advertised for bid.

In addition, the Contractor is required to obtain skilled and unskilled labor used on the work, when qualified, fit and available, first from residents within the City of Mesquite, Texas, and second from residents of Dallas County, if practical and available. However, the Contractor may bring his superintendent, foreman, sub-foreman, machine operators and sufficient key men to round his organization.

107.13 EQUAL EMPLOYMENT OPPORTUNITY

107.13.5 Reports
Add at the end of the first sentence: “if required by the Owner”.

Add the following subsections:
107.13.6. Protection of Resident Workers: The Owner actively supports the immigration and Nationality Act (NA) which includes provisions addressing employment eligibility, employment verification, and nondiscrimination. Under the INA, employers may hire only persons who may legally work in the United States (i.e., citizens and nationals of the U.S.) and aliens authorized to work in the U.S. The employer must verify the identity and employment eligibility of anyone to be hired, which includes completing the Employment Eligibility Verification Form (I-9). The Contractor shall establish appropriate procedures and controls so no services or products under the Contract Documents will be performed or manufactured by any worker who is not legally eligible to perform such services or employment.

107.13.7. Handicapped Discrimination Regulations:
The handicapped discrimination regulations mandate equal opportunity and require that outside organizations such as labor unions and contractors who provide services to the local governments must not discriminate against qualified handicapped persons in employment decisions.

107.13.8. Non-Compliance with Equal Employment Opportunity Provisions
In the event of the Contractor's non-compliance with the nondiscrimination clauses of this Contract or with any of the said rules, regulations, or orders, this Contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

107.14 STATE AND LOCAL SALES AND USE TAXES
Add: If the Contractor performs under a separated contract as defined by Rule 3.291 by obtaining the necessary permit or permits from the State Comptroller's office allowing the purchase of materials for incorporation in this project without having to pay the Limited Sales and Use Tax at the time of purchase, the Contractor shall identify separately from all other charges the total agreed contract price for materials incorporated into the project. Total materials shall include only materials physically incorporated into the project.

If the Contractor operates under a "separated contract," the Purchasing Division will furnish the Contractor with an exemption certificate for the applicable materials. In order to comply with the requirements of Rule 3.291, as mentioned above, Bidder shall obtain a sales tax permit. It shall be necessary that the Bidder issue resale certificates to suppliers.

Sales tax application for a sales tax permit and information regarding resale certificates may be obtained by writing to:

Comptroller of Public Accounts
Capitol Station
Austin, Texas 78774

The Contractor may also receive information or request sales tax permit applications by calling the State Comptroller's local Mesquite office at **(214) 289-3400**.

Subcontractors are eligible for sales tax exemption if the subcontract is made in such a manner that the charge for materials is separated from all other charges. The procedure described above will effect a satisfactory separation. When subcontracts are handled in this manner, the Contractor shall issue a resale certificate to the subcontractor, in turn, must issue a resale certificate to his supplier.

107.16 COMPLIANCE WITH LAWS
Add: The Contractor shall indemnify and save harmless the Owner against any claims arising from the violation of any such law, ordinances and regulations.

107.16.1 Storm Water Permit.
Delete entire paragraph and Replace with:
If the project disturbs more than one-acre of land the Contractor shall obtain a Storm Water Discharge permit required for construction of this project under regulations contained in the Texas Commission on Environmental Quality (TCEQ) Texas Pollution Discharge Elimination System (TPDES) General Permit TXR150000. The Contractor shall implement a storm water pollution prevention plan (SWP3); post the appropriate Construction Site Notice (CSN), and if the disturbed land area is 5-acres or more complete and submit a Notice of Intent (NOI) to the TCEQ, including the $350 by mail or $250 by electronic payment, NOI fee. For permitting information and requirements, contact the Texas Commission on Environmental Quality (TCEQ) and the City of Mesquite.

If a permit is required, the Contractor shall provide measures to control soil erosion, sediment, and water pollution created by construction operations for the duration of the Contract per the approved construction documents and as directed by the Owner’s Representative.

107.18 PUBLIC CONVENIENCE AND SAFETY
Add the following subsections:

107.18.1. Temporary Water and Sanitary Sewer Service. When existing water or sanitary sewer mains or services have to be taken up or removed, the Contractor shall, at his own cost and expense, provide and maintain temporary outlets and connections for all private or public water, sanitary sewer and drain connections. The Contractor shall also take care of all sewage and drainage which will be received from these sanitary sewers and drains; and for this purpose he shall provide and maintain, at his own expense, adequate pumping facilities and temporary outlets or diversions. The Contractor, at

his own expense, shall construct such piping, troughs, or other structures necessary, and be prepared at all times to dispose of sanitary sewer and drainage received from these temporary connections until such time as the permanent connections are built and in service. The existing water, sanitary sewer and drain connections shall be kept in service and maintained under the Contract, except where specified or ordered to be abandoned by the Owner's Representative. All water, sewage or drainage shall be disposed of in a satisfactory manner so that no nuisance is created, and so that the work under construction will be adequately protected.

107.18.2. Explosives. Explosives shall not be used in the prosecution of this project.

107.19.2. Protection of Persons and Property
Add: At the end of the first sentence in the last paragraph "and City of Mesquite Work Zone Traffic Control Guidelines Manual".

Add: At the end of the section "In order to document site conditions and assist in resolving claims for construction damage the Contractor shall take digital pictures and/or digital video recordings of the site before construction. In addition, the Contractor shall during the course of construction periodically record site conditions using digital pictures and/or digital video recordings. The Contractor shall make these recordings at least monthly or more frequently if the Owner's Inspector so orders. Copies of all digital photographs and/or video recordings shall be burned to DVD or other digital media acceptable to the Owner and provided to the Owner's Inspector."

Add to end of section the following subsection:

107.19.2.1. Access to Property. The Contractor shall schedule the work such that inconvenience to the public and adjoining property owners shall be at a minimum. Access to all businesses shall be provided at all times during business hours.

The Contractor will schedule work through residential areas in a manner that would expedite construction operations and will restore drive approach access at the end of each working day during execution of the project (except during paving operations of the specific residential drive approach). The Contractors shall maintain temporary drive approaches to the satisfaction of the Owner's Representative. Private drives to residences shall not be closed for more than 10 days at any one time during paving operations.

The Contractor will notify the Owner's Representative Office one (1) week prior to any street or driveway closure.

107.19.3.6. Payment for Trench Safety and Special Shoring.
Delete the first sentence and Replace with: "Payment for trench safety shall be by the lineal feet of trench regardless of depth."

107.23.4. Utility Coordination and Protection
Delete the first sentence and Replace with:
"No franchise utility relocations have taken place in preparation for the project, and the location of existing utilities may not be shown on the plans. It is the Contractor's responsibility to notify utility companies to arrange for exact locations at least 48 hours prior to beginning construction. The Contractor is fully responsible to coordinate necessary utility relocation with the utility companies and will make all efforts to coordinate necessary relocation of utilities with the utility owner. The Owner shall not be held responsible by the contractor for any delays created by a franchise utility company relocating their facilities. The time of construction given for the project includes all necessary utility work involved with franchise utility companies. The Owner will make an effort to assist the Contractor in coordinating relocations before and during the project."

Delete: Table 107.23.4.(a) Utility Coordination

Replace with:

Franchised Utilities ***(Electric, Phone, Cable & Gas)***

Texas One Call Dial **811** or by internet at: **http://tickets.texas811.org/tickets/submit**

City of Mesquite ***(City Owned Water, Sanitary Sewer & Storm Sewer)***	**Engineering Records Room for Obtaining Record Drawings for Existing City Utilities** Email: **engineering.records@cityofmesquite.com** **Or** 972-329-8536
City of Mesquite ***(Field Locates for City Owned Water and Sanitary Sewer)***	972-216-6278 or 972-216-6973 or 972-216-8797
City of Mesquite ***(Traffic Signal and City owned Optic Fiber)***	**Traffic Signal Conduit & Loop Detectors Location:** **Fill out - *TRAFFIC SIGNAL & FREEWAY LIGHTING UTILITY LOCATE FORM*:** **http://www.cityofmesquite.com/engineering/documents/Locate_Frm.doc**

Add to the end of the section the following subsections:

107.23.5. Arrangement and Charge for Water Furnished by the City. Where Contractor desires to use City water in connection with any construction work, he shall make arrangements with the Mesquite Water Accounting Division for so doing. Where meters are used, the charge for water will be at the regular established rate; where no meters are used, the charge will be as prescribed by ordinance; or, where no ordinance applies, payment shall be made on estimates made by the Mesquite Engineering Division.

107.23.6. Use of Fire Hydrants. No person shall open, turn off, interfere with, attach any pipe or hose to, or connect anything with any fire hydrant, stop valve or stopcock, or tap any water main belonging to the City, unless duly authorized to do so by the Mesquite Utilities Division.

107.23.7. Operation of Existing Valves. The Contractor is not permitted to operate any valve in the existing City of Mesquite water system. The valves must be operated by City of Mesquite Utility Division employees only.

107.26 RESTORATION OF PROPERTY
Add: The Contractor shall exercise special care to minimize damage to trees, plants, shrubs and irrigation systems along the route of the work. The Contractor shall notify adjacent property owners before beginning construction operations adjacent to their property of trees, plants and shrubs which lie inside the right-of-way or easements lines and within the normal limits of work. The property owner's shall be allowed to remove and protect their property, and all trees, plants and shrubs not so protected by the adjacent property owners shall be removed and disposed of by the Contractor, as directed by the Owner's Representative.

Add the following section:
107.27 ANTI-KICKBACK ACT
For any project funded by a Federal grant, the Contractor shall comply with the Copeland "Anti-Kickback" Act (18 U.S.C. 874) or supplemented by Department of Labor regulations (29 CFR, Part 3). This Act provides that each contractor or sub grantee shall be prohibited from inducing, by any means, any person employed in the construction, completion or repair of public work, to give up any part of the compensation to which he is otherwise entitled. The grantee shall report all suspected or reported violations to the grantor agency.

108.1 PROGRESS SCHEDULE
Add: A monthly payment schedule is not required unless requested by the Owner.

109.1 PAYMENT FOR LABOR AND MATERIAL; NO LIENS
Add: The Contractor is not required to furnish payrolls and records unless this submittal is required as a Special Provision to the Contract. The Contractor is still required to comply with the minimum wage rates published by the Owner.

109.2 PAYMENT FOR MATERIALS
Add: The Owner will not pay for Material on Hand unless specified in a Special Provision of the Contract.

109.2.1. Materials On-Hand. – Delete entire subsection.

109.2.2. Materials Stored Off-Site. – Delete entire subsection.

109.5 MONTHLY ESTIMATE, PARTIAL PAYMENTS, RETAINAGE, FINAL ACCEPTANCE AND FINAL PAYMENT.
Delete the first sentence of the first paragraph and Replace with: "If the last number of a contract number is odd, between the 25th day and the last day of each month, the Owner shall make an approximate estimate of the value of work done during the period under the specifications. If the last number of a contract is even, between the 10th day and the 15th day of the month, the Owner shall make an approximate estimate of the value of work done during the period under the specifications.

The City Public Works Construction Inspector shall meet with a representative of the Contractor on the job site to measure and otherwise determine the quantity of each bid item completed since the last estimate period. In case an agreement cannot be reached, the quantities determined by the City Public Works Construction Inspector shall be used. Payment or partial payment of any item does not constitute final acceptance of the work. The City Public Works Construction Inspector shall prepare a draft monthly estimate for processing by the Owner for payment. The City Public Works Construction Inspector will forward a copy of this estimate to the Contractor along with any calculations or sketches used in calculating quantities. The Contractor is not required to submit an invoice or billing for monthly work completed."

In the first paragraph, second sentence, delete the words: "the 15th day of the month next following" and **Replace with:** "within 30 days".

Delete the third sentence in the first paragraph and Replace with: "Payment for material on hand will not be paid unless so specified in a Special Provision to this Contract."

Delete the entire second paragraph of this subsection and Replace with:
Owner shall not be liable for interest on any late or delayed payment caused by any claim, dispute, discrepancy in the quantities, any failure to provide supporting documentation or other information required of the Contractor by the Owner or as a condition to payment under the Contract, or due to any payment the Owner has a right to withhold under the Contract.

109.5.4. Final Payment.
Add at the end of the first paragraph: (4) Marked up set of plans showing all changes, revisions and alterations to the original plans.

109.6 WIRE TRANSFERS
Delete Entire Section 109.6 and Replace with: "The City of Mesquite has chosen the Paymode-X™ service through Bank of America to make electronic payments to contractors, vendors and suppliers.

The City of Mesquite recognizes the importance of expediting the payment process to Contractors vendors and suppliers. Our Accounts Payable department utilizes Paymode-X to replace paper checks with electronic payments. We strongly encouraging our vendors and suppliers to enroll in Paymode-X so that future payments are made electronically. Contract the assigned Owner's Inspector to receive further information on how to process online enrollment to the Paymode-X electronic payment system."

SPECIAL PROVISIONS

These Special Provisions are to be used in conjunction with the ***North Central Texas Council of Governments Public Works Construction Standards, Fourth Edition (October 2004), Division 100 General Provisions, as amended***. Should any discrepancies arise, the governing order shall be: Special Provisions, Plans, Technical Specifications, and General Provisions.

THE FOLLOWING SPECIAL PROVISIONS HEREBY MODIFY THE *North Central Texas Council of Governments Public Works Construction Standards, Fourth Edition (October 2004), Division 100 General Provisions*. Where reference is made in these specifications to specifications compiled by others, such reference is made for expediency and standardization, and such specifications referred to are hereby made a part of these specifications.

SP-1 PROJECT DESCRIPTION:
This project is for the **HAILEY PUMP STATION VARIABLE FREQUENCY DRIVE IMPROVEMENTS, City Contract No. E2017-003.**

SP-2 PRE-BID MEETING:
A pre-bid meeting will be held at 10:00 am April 11, 2017 at the City of Mesquite Art Center located at 1527 N. Galloway Avenue, Mesquite, Texas 75149 in the Rehearsal Hall. The pre-bid meeting will be held to permit prospective bidders the opportunity to ask questions of the design staff regarding the project, plans and specifications.

SP-3 BIDDERS QUALIFICATION INFORMATION:
Regarding the qualification information stipulated in these Specifications, for this particular project, the Current CPA Certified Financial Statement will not be required.

SP-4 LIQUIDATED DAMAGES:
This project is calendar day project. Project shall be completed in 100 calendar days of the 2nd Notice to Proceed – Authorization to Start of Construction date.

The 1st Notice to Proceed – Authorization to Acquire Equipment will be issued once contracts are fully executed and a preconstruction meeting is held with City staff. The 1st Notice to Proceed – Authorization to Acquire Equipment, is intended to authorize the contractor and their equipment suppliers to:

- Prepare and submit to the City and City's consulting engineer the required equipment submittals for review and approval.
- Once equipment submittals are approved by the City and the City's consulting engineer the contractor will order the equipment.

The **2nd Notice to Proceed – Authorization to Start of Construction** will not be issued until the submittals for the Variable Frequency Drives (VFD) are approved by the City and the VFD's are received by the contractor from their supplier. Issuance of the **2nd Notice to Proceed – Authorization to Start of Construction** will start contract time. Liquidated damages are per the provisions of GP 108.8.

SP-5 CONSTRUCTION SEQUENCE:
The Contractor shall prepare a Construction Sequencing Plan which shows staging for the installation of the construction and submit it to the Owner's Representative at the Pre-Construction Conference. This Plan shall include keeping the existing Hailey Pump Station operational at all time.

Hailey Pump Station is configured with two independent incoming services: 1600A and 1200A coming into two MCC lineups of the same size. Two existing 400HP pumps that will be upgraded with the new variable frequency drives are located in each of motor control centers. The contractor shall plan his activities in such way that only one MCC will be shut down at the time for installation of the new equipment. The plan of shutdown shall include:

1. Planned date and duration of the shutdown of MCC "A" for the installation of the Pump No. 2, 400 HP VFD;

2. Planned date and duration of the shutdown of MCC "B" for the installation of the Pump No. 4, 400 HP VFD;

3. Planned date and duration of the shutdown to upload modified RTU program;

4. Planned date and duration of the shutdown to upgrade a grounding conductor on 1600A service;

SP-6 ATERNATIVE BIDS:
All Bidders must prepare the Base Bid. Bidding the Alternative 1 is optional.

The Bid Proposal is showing the Base Bid with Eaton CPX9000 clean power, 18-pulse Variable Frequency Drives. As an alternative, an alternative manufacturer is also allowed: Danfoss.

The Bid results and the low bidder determination shall be based on the Base Bid amounts.

Depending on the price difference between the Base and the Alternate Bid and the overall project cost, the Owner reserves the right not to select the Alternate Bid even if the offered price is lower than the Base Bid price.

SP-7 PUMP STATION OPERATION:
Any request for change in Hailey Pump Station operation shall be given to the City's Water Department by email at least 48-hours before the operation needs to be performed. These changes must closely coordination with the City's Water Department and performed by the City's personnel only. Contractor shall not de-energize two MCCs, ATS or start/stop the individual pump operation at the station at any time during the project without coordination and presence of City's Water Department personnel.

SP-8 SUBMITTALS:
The Contractor shall provide submittals of the following items to the Owner's Representative at the pre-construction conference:

1. List of Subcontractors and Material Suppliers (including Material's Testing Laboratory and Surveyor for construction staking).
2. Project Schedule & Construction Sequence per SP-5
3. Schedule of Values
4. Contractor Contact List with listing of personnel for 24 hour – 7 days a week contact.
5. Other Items as requested by the Owner's Representative or required by contract documents, specifications or plans.

TECHNICAL SPECIFICATIONS

Table of Contents

DIVISION 01

GENERAL REQUIREMENTS

SECTION 01 31 00

COORDINATION

PART 1: GENERAL

1.01 PROJECT COORDINATION

No attempt has been made in the contract documents to segregate work to be performed by any trade or subcontract. Any segregation between trades and crafts will be solely a matter for agreement between the Contractor and his subcontractors. The Contractor will be responsible for the coordination of all trades and work under the various divisions and sections of the specifications. All transactions of the Engineer will be with the Contractor. Subcontractors will be considered only in the capacity of employees or workers, and shall be subject to the same requirements as to character and competency as the Contractor.

1.02 HAILEY PUMP STATION SHUTDOWNS

A. Only partial shutdown of the Hailey Pump Station shall be allowed during this project. Hailey Pump Station is configured with two independent incoming services: 1600A and 1200A coming into two MCC lineups, MCC-A and MCC-B respectively. Two existing 400HP pumps that will be upgraded with the new variable frequency drives are located one (1) in each of motor control centers. The contractor shall plans his activities in such way that only one MCC will be shut down at the time for installation of the new equipment. Pump #4 VFD shall be installed first and be fully functional before the Pump #2 VFD is installed and tested. The plan of shutdown shall include:

1. Planned date and duration of the shutdown of MCC “B” for the installation of the Pump No. 4, 400 HP VFD;

2. Planned date and duration of the shutdown of MCC “A” for the installation of the Pump No. 2, 400 HP VFD;

3. Planned date and duration of the shutdown to upload modified RTU program;

4. Planned date and duration of the shutdown to upgrade a grounding conductor on 1600A service;

B. Generally, perform all work in a way that causes no service interruptions. Where, due to fault of the Contractor, work must be performed which will result in the interruption water service to any area, give at least 48 hours’ notice to the Owner and the Engineer that the work is to be performed.

C. Whenever work is to be performed that will result in the interruption of the operation of the pump station, give at least 48 hours’ notice to the Owner and the Engineer that the work is to be performed. The Contractor shall submit at least 90 days in advance, a schedule of proposed interruptions. The Engineer shall resolve any conflicts in the schedule between the Owner and the Contractor, and his decision shall be final.

D. The Contractor may be required to perform the work that results in a service interruption after midnight or at another time selected by the Owner that would result in a minimal inconvenience to the Owner's customers.

E. Where potential service interruptions are the result of the Contractor's errors or improper scheduling, the Owner may require the Contractor to provide, operate and maintain such temporary facilities as are required to maintain the degree of service specified by the Owner.

SECTION 01 31 19

PROJECT MEETINGS

1.1 PRECONSTRUCTION CONFERENCE

Before any construction begins on the project a pre-construction conference may be held at the direction of the Owner. The date, time and location of meeting will be selected by the Owner. The Contractor shall arrange to have the following parties attend the meeting:

A. The Contractor's contract coordinator;

B. The Contractor's superintendent;

C. The Contractor's key foreman;

D. Representatives of key subcontractors;

E. Representatives the city of Mesquite including the following departments:

1. Building Inspection

2. Public Works

F. Representatives of utility companies (if necessary) to include:

1. Oncor

Representatives of the Owner and the Consulting Engineer will attend the meeting.

1.2 PROGRESS MEETINGS

At the direction of the Owner or Engineer, the Contractor and his superintendent shall attend job progress meetings to discuss critical aspects in the prosecution of the work. The Owner or his representatives may also attend these meetings. The meetings will be held at a place and time selected by the Owner or Engineer.

END OF SECTION

SECTION 01 41 13

APPLICABLE CODES

PART 1: GENERAL

1.1 REFERENCE SPECIFICATIONS

Whenever reference is made to the furnishing of materials or testing thereof to conform to the Standards of any technical society, organization, or body, it shall be construed to mean the latest standard, code, specification or tentative specification adopted and published at the time of advertisement for bids, even though reference has been made to an earlier standard. Such standards are made a part hereof to the extent that is indicated or intended.

The following are names and abbreviations of such groups:

AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ADAAG	Americans with Disabilities Act Accessibility Guidelines
AGMA	American Gear Manufacturers Association
AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
ANSI	American National Standards Institute
ASCE	American Society of Civil Engineers
ASA	American Standards Association
ASHE	American Society of Heating and Ventilating Engineers
ASTM	American Society for Testing Materials
AWSC	American Welding Society Code
AWWA	American Water Works Association
Fed. Spec.	Federal Specification
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NCTCOG	North Central Texas Council of Governments Standard Specifications for Public Works Construction
U.L. Inc.	Underwriter's Laboratories, Incorporated

Where no reference is made to a code, standard, or specification, the Standard Specifications of the agencies listed above, as appropriate, shall govern.

1.2 LOCAL CODES, LAWS AND REGULATIONS

A. This project is constructed within the city limits of the city of Mesquite and accordingly is subject to all city ordinances, regulations and codes. In particular, the following sub-systems must meet city of Mesquite codes:

1. General building construction
2. Electrical

1.3 FEDERAL AND STATE LAWS AND REGULATIONS

The Contractor shall also meet the requirements of any laws, and regulations of the United States and the state of Texas including but not limited to the following:

A. National Electric Code (NEC)

B. U.S. Occupational Safety and Health Agency

1.4 COORDINATION OF SPECIFICATIONS AND CODES

If the Specifications and Drawings show requirements that are in excess of codes and ordinances, then the Specifications and Drawings shall be followed. Should there be any conflicts between the Specifications, Drawings, codes, and ordinances having jurisdiction, the Contractor shall report these in his bid. However, the Contractor is responsible for meeting the more stringent of the requirements in the Specifications, Drawings, codes, and ordinances at no additional cost to the Owner.

END OF SECTION

SECTION 01 42 13

ABBREVIATIONS, ACRONYMS, AND DEFINITIONS

PART 1: GENERAL

1.1 ABBREVIATIONS AND ACRONYMS

The abbreviations and acronyms in the General Provisions as well as the following abbreviations and acronyms are used in the Specifications and Drawings. The Contractor shall notify the Engineer if the meaning of any abbreviation or symbol is unclear.

Notation	Meaning
Assy.	Assembly
@	At
Ave.	Avenue
BL or BL	Base Line
Bot or Btm.	Bottom
BV or B.V.	Butterfly Valve
CIP	Cast Iron Pipe
Cl	Clear
CL or cL	Center Line
CMU	Concrete Masonry Unit
C.	Conduit (for electrical notation)
Cu.	Cubic
CF	Cubic Feet
CV or C.V.	Check Valve
DIP	Ductile Iron Pipe
Dia. or	Diameter
Dwls	Dowels
°	Degree
EA.	Each
EF	Each Face
Elev. or EL.	Elevation

Notation	Meaning
EW	Each way
Flg.	Flange
F.L.. or FL	Flow Line
Ft. or '	Foot or Feet
Galv.	Galvanized
Gkt.	Gasket
GPM or G.P.M.	Gallon per minute
GV or G.V.	Gate Valve
HDG	Hot-dip galvanized
Hor.	Horizontal
In. or "	Inches
L.F.	Linear Foot
"M"	Dimension determined by equipment used
MJ	Mechanical Joint
'	Minutes
NCTCOG	North Central Texas Council of Governments
NCTCOG Specs	Standard Specifications for Public Works Construction as published by the North Central Texas Council of Governments
No. or #	Number
OC	On Center
OCEF	On Center Each Face
OCEW	On Center Each Way
/	Per
%	Per Cent
	Phase or Diameter
PE	Plain End
PV or P.V.	Plug Valve
RCCP	Reinforced Concrete Cylinder Pipe

Notation	Meaning
RSGV or R.S.G.V.	Resilient seated gate valve
"	Seconds
Sim.	Similar
Spa.	Spaces or Spacing
SF or S.F.	Square Feet
SY or S.Y.	Square Yard
Str.	Strength or Structure
SL or SL	Survey Line
Sym.	Symmetrical
TDH	Total Dynamic Head
Typ.	Typical
T & B	Top and Bottom
VCT	Vitrified Clay Tile Pipe
Vol.	Volume
w/	With
WWF	Welded Wire Fabric

1.2 DEFINITIONS

Supplementing the Definition of Terms contained in the General Provisions, words, phrases or other expressions used in these Contract Documents shall have the meanings as follows:

A. "Contract Documents" shall be synonymous with the term "Contract."

B. "Owner" shall be synonymous with the term "City" and shall mean the city of Mesquite.

C. “Engineer” and “Architect” shall mean the City Engineer of the city of Mesquite. The Engineer may delegate his authority to the Consulting Engineer as needed but the authority of the “Engineer” in this Contract shall be the of the City Engineer and his decision shall be final.

D. "Consulting Engineer" shall mean the firm of Freeman - Millican, Inc., 12160 North Abrams Road, Suite 508, Dallas, Texas 75243, or its duly authorized agents acting within the scope of the particular duties entrusted them in each case.

E. "Drawings" or "plans" shall mean all (a) drawings furnished by the Owner or a basis for Proposals, (b) supplementary drawings furnished by the Owner to clarify and to define in greater detail the intent of the contract drawings and specifications, (c) drawings submitted by the successful bidder with his Proposal, provided such drawings are acceptable to the Owner,

(d) drawings furnished by the Owner to the Contractor during the progress of the work, and (e) engineering data and drawings submitted by the Contractor during the progress of the work, provided such drawings are acceptable to the Consulting Engineer.

F. Whenever in these Contract Documents the words "as ordered," "as directed," "as required," "as allowed" or words or phrases of like importance are used, it shall be understood that the order, direction, requirement, permission or allowance of the Owner or Consulting Engineer is intended only to the extent of judging compliance with the terms of the contract. None of these terms shall imply the Owner or the Consulting Engineer has any authority or responsibility for supervision of the Contractor's forces or construction operations. Such supervision and the sole responsibility therefore are strictly reserved for the Contractor.

G. Similarly the words "approved," "reasonable," "suitable," "acceptable," "proper," "satisfactory," or words of like effect and import are used, it shall be understood that such work, materials and methods shall be approved, reasonable, suitable, acceptable, proper, or satisfactory in the judgment of the Owner or Consulting Engineer to the extent provided in "E" above.

H. Whenever in these Contract Documents the expression "it is understood and agreed," or an expression of like import is used, such expression means the mutual understanding and agreement of the parties executing the Contract.

I. Whenever in these Contract Documents the words "Provide, "Furnish and Install," "Install" or words of like effect and import, unless otherwise particularly specified, shall mean that the Contractor is to both purchase all materials and provide all labor and equipment required to perform the work described. The Owner will not furnish any material, labor or equipment unless specifically provided for in the Contract Documents.

J. Whenever in these Contract Documents, the word "Proposed" or words of like effect and import are used, it shall be understood that the work described as being "proposed" is to be constructed as a part of this contract.

K. Whenever in these Contract Documents, the word "New" or words of like effect and import are used, it shall be understood that the work described as being "new" is to be constructed as a part of this contract.

L. Whenever in these contract documents, the word "Future" or words of like effect and import are used, it shall be understood that the work described as being "future" is not to be constructed as a part of this contract but is contemplated in the future and is referenced in these documents only for the information of the Owner and Contractor.

END OF SECTION

SECTION 01 45 00

QUALITY CONTROL

1.1 ENGINEERING OBSERVATION SERVICES

A. The Owner may appoint (either directly or through the Engineer) such observers as the Owner deems proper to review the material furnished and the work performed for compliance with the drawings and specifications. The Contractor shall furnish all reasonable assistance required by the Engineer, or observers, for the proper observation of the work. Should the Contractor object to any interpretation of the contract by an observer, the Contractor may make written appeal to the Engineer for a decision.

B. Observers shall have the authority to reject work that is unsatisfactory, faulty, or defective or does not conform to the requirements of the drawings and specifications. Observation shall not relieve the Contractor from any obligation to construct the work strictly in accordance with the drawings and specifications. Work not so constructed shall be removed and replaced by the Contractor at his own expense.

1.2 REMOVAL OF DEFECTIVE AND UNAUTHORIZED WORK

A. All work that has been rejected or condemned shall be repaired or if it cannot be repaired satisfactorily, it shall be removed and replaced at the Contractor's expense. Defective materials shall be immediately removed from the site of the work. Work done without line and grade having been given, work done beyond the lines or not in conformity with the grades shown on the plans or as given (save as herein provided), work done without proper inspection, or any extra or unclassified work done without written authority and prior agreement in writing as to prices, may be ordered removed at the Contractor's expense. Upon failure to repair satisfactorily or to remove and replace (if so directed) rejected, unauthorized or condemned work or materials immediately after receiving notice from the Engineer, the Engineer will (after giving written notice to the Contractor) have the authority to cause defective work to be remedied, removed, replaced, or to cause unauthorized work to be removed and to deduct the cost thereof from any monies due (or to become due) to the Contractor.

B. In the event defective work or unauthorized work cannot be satisfactorily removed from the work as determined by the Owner and the Engineer, the Owner may deduct from any monies due (or to become due) the Contractor such amount as would be required, as determined by the Engineer, to remove and replace such defective work or unauthorized work even though such work may remain in place.

C. Neither the observation by the Owner or Consulting Engineer or any of their officials, employees, or agents nor any order by the Owner or Consulting Engineer for payment of money, or any payment for, or acceptance of, the whole or any part of the work by the Owner or Consulting Engineer, nor any extension of time, nor any possession taken by the Owner or its employees, shall operate as a waiver of provision of this Contract, or of any power herein reserved to the Owner, or any right to damages herein provided, nor shall waiver of any breach in this Contract be held to be a waiver of any other subsequent breach.

1.3 UNFAVORABLE CONSTRUCTION CONDITIONS

During unfavorable weather, wet ground, or other unsuitable construction conditions, the Contractor shall confine his operations to work which will not be affected adversely thereby. No portions of the work shall be constructed under conditions that would affect adversely the quality or efficiency thereof, unless special means or precautions are taken by the Contractor to perform the work in a proper and satisfactory manner.

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

1.1 TEMPORARY CONSTRUCTION ELECTRICITY

All power for lighting, operation of the Contractor's plant or equipment, or for any other use by the Contractor shall be provided by the Owner through the existing electrical outlets at the pump station..

1.2 TEMPORARY SANITARY FACILITIES

Enforce strict observance of sanitary and health regulations by employees on the plant site. Furnish an adequate number of chemical toilets. The chemical toilets and their maintenance shall meet requirements of the Texas Commission on Environmental Quality. Immediately correct facilities or maintenance methods failing to meet these requirements.

1.3 FIRE WATCH

A. Each section shall conduct its portion of the work with care in prevention of and protection against fire.

B. No operations such as welding and/or burning of metal shall be conducted unless a portable CO_2 fire extinguisher of not less than ten (10) pound capacity, with full charge and in good condition, is available within ten (10') feet.

C. Before leaving the site at the end of a day, areas where sparks occurred shall be reinspected in search of smoldering fire.

1.4 PROTECTION AND RESTORATION OF PROPERTY

The Contractor shall be responsible for all damage or injury to property of any character by any act by the Contractor, or agents, or any time due to defective works or materials or due to his failure reasonably or properly to prosecute the work, and said responsibility shall not be released until the work shall have been completed or accepted. When and where any such damage or injury is done to public or private property by the Contractor, he shall restore or have restored at his own cost and expense such property to a condition similar or equal to that existing before such damage was done, by repairing, rebuilding, or otherwise restoring as may be directed, or he shall make good such damage or injury in a manner acceptable to the Owner or the Engineer. In case of failure by the Contractor to restore such property or make good such damage or injury, the Engineer may, upon forty-eight hours written notice, under ordinary circumstances, and without notice when a nuisance or hazardous condition results, proceed to repair, rebuild or otherwise restore such property as may be determined necessary, and the cost thereof will be deducted from any monies due the Contractor under his contract.

1.5 CONSTRUCTION ACCESS

The Contractor's access to the construction site shall be from existing City streets and highways. The Owner will provide land and rights-of-way for the work to be completed under this contract and make suitable provisions for ingress and egress. The Owner will select the land to be used for equipment storage and employee parking. Before the project is completed, remove the temporary access roads and parking and grade to the contours shown on the plans; or if no contours are shown on the plans, to the original contours.

1.6 LAND FOR CONSTRUCTION PURPOSES

The Contractor shall confine his construction operations to stay within the limits of the property owned by the Owner or easements obtained by the Owner. Authority to enter private property outside these limits shall be obtained in writing from the owner of the property and a copy filed with the Owner.

1.7 CONTROL OF TRASH AND DEBRIS

Clean the working areas each day, remove all trash and waste materials, and maintain the site in a neat and orderly condition throughout the construction period. The Engineer shall have the right to determine what is waste material or rubbish and the manner and place of disposal. On or before the completion of the work, carefully clean out all pits, pipes, chambers or conduits; remove all temporary structures and remove all rubbish from the area, leaving them in first-class condition.

1.8 FIELD OFFICES

A. Contractor's Office

1. During the performance of this Contract, the Contractor does not have to set up the field office.

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1: GENERAL

1.1 MATERIALS AND CONSTRUCTION METHODS

A. The detailed Specifications herein are divided into several sections, covering various materials and methods of construction, and the applicable parts of each section shall apply to the Contract work.

B. Rejected or condemned materials shall be immediately removed from the site of the work.

C. All materials to be used in this project must be new, except for the encasement pipe for highway bores. Do not incorporate materials which have been used for temporary purposes into the permanent construction unless written consent of the Engineer has been obtained.

1.2 ACCEPTANCE AND SUBSTITUTIONS

A. Where materials or equipment are specified by the trade or brand name, it is not the intention of the Owner to discriminate against an equal product of another manufacturer, but rather to establish an equal basis for the evaluation of bids. Where the words "equivalent," "proper", or "equal to" are used, they shall be understood to mean that the article or process is equal, in the opinion or judgment of the Engineer, to the article or process specified by name. Unless otherwise specified, all materials shall be the best of their respective kinds and shall be in all cases fully equal to approved samples. Not withstanding that the words "equal to" or other such expressions are not used in the Specifications, the material, manufactured article, or process specifically designated shall be used. A substitute shall be approved in writing by the Engineer, and the Engineer shall have the right to require the use of such specifically designated material, article or process.

B. Substitutions after the award of Contract shall be made only within sixty (60) days after the notice to proceed. Furnish all required supporting data. The submittal of substitutions for review shall not be cause for time extensions.

C. Where substitutions are offered, the substituted product shall meet the product performance as set forth in the specified manufacturer's current catalog literature, as well as meeting the details of the Contract Documents.

D. The details on the drawings and the requirements of the Specifications are based on the first listed material or equipment. If any other than the first listed material or equipment is furnished, then assume responsibility for the correct function, operation, and accommodation of the substituted item. If there are misfits or changes in work required, either in this section or other sections of the Contract, or in both, bear all costs concerning all changes arising out of the use of other than the first listed item specified.

E. Substitutions of products under several sections of this project may occur. Make necessary coordination, adjustments and additions to work in all trades to accommodate those substitutions.

F. Energy efficiency of each item of power consuming equipment shall be considered a standard for evaluation.

1.3 STORAGE OF MATERIALS

Materials shall be stored so as to insure the preservation of their quality and fitness for the work. When directed by the Engineer, they shall be placed on wooden platforms or other hard, clean surfaces and not on the ground and shall be placed under cover when so directed. Stored materials shall be placed and located to facilitate prompt inspections.

1.4 STORAGE OF EQUIPMENT

A. All equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage. All equipment shall be protected from exposure to the elements and shall be kept thoroughly dry at all times. Pumps, motors, electrical equipment and other equipment having anti-friction or sleeve bearings shall be stored in weather tight warehouses which are maintained at temperature at least 60^{o} F.

B. Equipment shall be stored according to the manufacturer's recommendations.

C. Painted surfaces shall be protected against impact, abrasion, discoloration and other damage. All painted surfaces damaged before acceptance of equipment shall be repainted to the satisfaction of the Engineer.

D. Electrical equipment, controls, and insulation shall be protected against moisture or water damage. All space heaters provided in the equipment shall be kept connected and operating at all times until equipment is placed in service.

END OF SECTION

SECTION 01 74 00

CLEANING

PART 1: GENERAL

1.1 DESCRIPTION

A. Throughout the construction period, maintain the project in a standard of cleanliness as described in this Section.

B. Beyond the standards described in this Section, comply with requirements for cleaning up as described in various other Sections of these Specifications.

1.2 QUALITY ASSURANCE

A. Conduct daily inspection to verify that requirements of cleanliness are being met.

B. In addition to the standards described in this Section, comply with pertinent requirements of governmental agencies having jurisdiction.

PART 2: PRODUCTS

2.1 CLEANING MATERIALS AND EQUIPMENT

Provide personnel, equipment and materials needed to maintain the specified standard of cleanliness.

2.2 COMPATIBILITY

Use only cleaning materials and equipment that are compatible with the surface being cleaned, as recommended by the manufacturer of the material or as approved by the Engineer.

PART 3: EXECUTION

3.1 PROGRESS CLEANING

A. General

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

2. Do not allow the accumulation of scrap, debris and waste material.

3. Provide adequate storage for items awaiting removal from the job site, observing requirements for fire protection and protection of the ecology.

B. Site

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

2. Weekly inspect arrangements of materials stored on the site; restack, tidy or otherwise service all arrangements to meet the requirements of paragraph above.

3. Maintain the site in a neat and orderly condition to the approval of the Engineer.

C. Structures

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

2. Weekly sweep interior spaces clean. "Clean," for the purpose of this subparagraph, shall be interpreted as meaning free from dust and other material capable of being removed by reasonable diligence using a hand-held broom.

3. As required preparatory to installation of succeeding materials, clean the structures or pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using equipment and materials required to achieve the required cleanliness.

4. Following the installation of finish floor materials, clean the finish floor daily (and more often if necessary) while work is being performed in the space in which finish materials have been installed. "Clean," for the purpose of this subparagraph, shall be interpreted as meaning free from foreign material that, in the opinion of the Engineer, may be harmful to the finish floor material.

3.2 FINAL CLEANING

A. Except as otherwise specifically provided, "clean" (for the purpose of this Article) shall be interpreted as meaning the level of cleanliness generally provided by commercial building maintenance subcontractors using commercial quality building maintenance equipment and materials.

B. Before completion of the Work, remove from the job site all tools, surplus materials, equipment, scrap, debris and waste. Conduct final progress cleaning as described in Article above.

C. Unless otherwise specifically directed by the Engineer, hose down all paved areas on the site and all sidewalks. Completely remove all resultant debris.

D. Exterior - Structures

Visually inspect all exterior surfaces and remove all traces of soil, waste material, smudges and other foreign matter. Remove all traces of splashed material from adjacent surfaces. If necessary to achieve a uniform degree of exterior cleanliness, hose down the exterior of the structure. Where there are stubborn stains not removable with water, the Engineer may require light sandblasting, repainting, or other cleaning at no additional cost to the Owner.

E. To all surface requiring the routine application of buffed polish, apply the specified polish as recommended by the manufacturer of the material being polished.

F. Schedule final cleaning as approved by the Engineer to enable the Owner to accept a completely clean project.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

1.1 CLEANING

Upon completion of the work, the Contractor shall remove from the site all plant materials, tools, and equipment belonging to him and leave the site with an appearance acceptable to the Engineer. The Contractor shall thoroughly clean and polish all equipment and materials installed by him and deliver over such materials and equipment in a bright, clean, polished and new-appearing condition.

1.2 FINAL OBSERVATION

When the work has been substantially completed, and at a time mutually agreeable to the Owner, Consulting Engineer, and Contractor, the Consulting Engineer will make a final observation of the work and report to the Owner his findings as to the acceptability and completeness of the work.

1.3 PROJECT RECORD DOCUMENTS

Before final payment on the project is made, the Contractor will be furnished with two sets of Plans to record project data. Project data shall include but not be limited to the following:

A. Changes in construction not covered by a change order or field order including:

   1. Changes in dimensions.

   2. Changes in material.

   3. Any variation in construction details.

   4. Any critical dimensions not shown on the original Plans to include:

      a. Location of electrical conduits.

      b. Location of miscellaneous piping and utilities, including all utilities uncovered or otherwise located during the construction of the project

B. Mark both sets of prints and submit to Engineer for approval.

1.4 OPERATIONS AND MAINTENANCE DATA

A. The Contractor shall furnish, before initial testing, four (4) copies of an indexed Maintenance Manual, composed of suppliers' brochures on all equipment and materials with moving parts, including performance curves, with size, model, figure number, etc., indicated to identify the unit furnished. Maintenance Manuals are to be of a hard back, loose-leaf type and of a durable quality. Manuals shall be indexed and tabbed.

B. Each set to include the following:

   1. Manufacturers' parts list identified with the make, model and serial number of the equipment furnished.

   2. Control and wiring diagrams.

   3. Installation, operation, lubrication and maintenance instructions.

   4. Manufacturers' recommended spare parts lists.

C. Provide schematic system flow and control diagrams identifying the location and function of all system components, valves and controls.

D. Two (2) copies are to be supplied to the Owner and two (2) copies to the Engineer before the inspection and testing of the equipment. Following the testing phase, the Engineer's approval of the submitted documents shall be requested by the Contractor. Final Payment on the project will not be made until an approved manual (4 copies) has been delivered.

1.5 FINAL PAYMENT

A. Before final payment will be made, the Contractor shall furnish the Owner a consent of surety issued by the regional or national office of the surety (not the local agent) and an affidavit or other satisfactory evidence that all indebtedness connected with the work and all sums of money due for any labor, materials, apparatus, fixtures or machinery furnished for and used in the performance of the work have been paid or otherwise satisfied, or that the person or persons to whom the same may respectively be due have consented to such final payment.

B. Acceptance by the Contractor of the final payment shall be a release to the Owner, Engineer and every officer and agent thereof, from all claims and liability hereunder for anything done or furnished for, relating to the work, or for any act or neglect of the Owner or of any person relating to or affecting the work.

1.6 GUARANTEE

A. Scope and Period of Guarantee

1. The Contractor shall guarantee the materials and workmanship furnished under this Contract to be as specified and to be free from defects for a period of two years after the date of completion and acceptance of the improvements.

2. The Contractor shall guarantee the machinery and equipment furnished under this Contract to be free from defects in materials, workmanship and design for a period of two years after the date of completion and acceptance of the improvements.

3. The guarantee shall cover all work, equipment, and materials that are a part of this project, whether or not a warranty is specified in the specification section describing that particular aspect of the work. Where a warranty of duration greater than the guarantee period is specified for a particular aspect of the work, that warranty shall govern.

4. The cost of all materials, parts, labor, transportation, supervision, tools, and supplies required for replacement of parts or correction of defects shall be paid by the Contractor or the Surety. The guarantee shall be extended to cover all replacements and corrections furnished under the guarantee. If the date of completion of a replacement or correction is less than one year from the end of the guarantee period, the guarantee for each such replacement or correction shall be one year after completion of the replacement or correction.

B. Notification and Service under the Guarantee

1. Upon notification, the Contractor shall promptly make all adjustments, repairs, or replacements which, in the opinion of the Consulting Engineer or Owner, arose out of defects and became necessary during the guarantee period.

2. If within (10) ten days after the Owner has notified the Contractor of the defect, failure, or abnormality in the work, the Contractor has not started to make the necessary repairs or adjustments, the Owner is hereby authorized to make the repairs or adjustments, or to order

the work done by a third party, and the cost of the work shall be paid by the Contractor or the Surety.

3. In the event of an emergency where, in the judgment of the Owner, delay would cause serious loss or damage, repairs or adjustments may be made by the Owner, or a third party chosen by the Owner, without advance notice to the Contractor, and the cost of the work shall be paid by the Contractor or the Surety.

END OF SECTION

DIVISION 23

HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)

SECTION 23 81 26.13

MINI-SPLIT AIR CONDITIONING SYSTEMS

PART 1: GENERAL

1.01 SYSTEM DESCRIPTION

The heat pump system shall be a Mitsubishi Electric split system with Variable Speed Inverter Compressor technology. The system shall consist of a horizontal discharge, single phase outdoor unit, a matched capacity indoor section that shall be equipped with a wired wall-mounted, wireless wall-mounted or wireless handheld remote controller.

1.02 OUTDOOR UNIT CAPACITY

Model Number	Cooling Capacity [BTU/h]	Heating Capacity [BTU/h]
PUZ-A36NHA6	35,000	37,000

1.03 SYSTEM EFFICIENCY

System efficiency shall meet SEER/HSPF values below:

Indoor unit Model used	SEER	HSPF
PKA (wall mounted model)	14	8.9

1.04 QUALITY ASSURANCE

A. The units shall be tested by a Nationally Recognized Testing Laboratory (NRTL) and shall bear the ETL label.

B. All wiring shall be in accordance with the National Electrical Code (N.E.C.) and local codes as required.

C. The units shall be rated in accordance with Air-conditioning, Heating, and Refrigeration Institute's (AHRI) Standard 240 and bear the ARI Certification label.

D. The units shall be manufactured in a facility registered to ISO 9001 and ISO 14001, which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

E. A dry air holding charge shall be provided in the indoor section.

F. The outdoor unit shall be pre-charged with R-410a refrigerant for 70 feet (20 meters) of refrigerant tubing.

1.05 DELIVERY, STORAGE AND HANDLING

A. Unit shall be stored and handled according to the manufacturer's recommendations.

B. The controller shall be shipped separately and shall be able to withstand 105°F storage temperatures and 95% relative humidity without adverse effect.

1.06 WARRANTY

A. The units shall have a manufacturer's parts and defects warranty for a period five (5) year from date of installation. The compressor shall have a warranty of seven (7) years from date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty does not include labor.

B. Manufacturer shall have over twenty (20) years of continuous experience in the U.S. market.

PART 2: PRODUCTS

2.01 OUTDOOR UNIT DESIGN

A. General

1. The outdoor unit shall be compatible with the PKA - wall mounted. The connected indoor unit shall be of the same capacity as the outdoor unit.

2. The outdoor unit shall be equipped with an electronic control board that interfaces with the indoor unit to perform all necessary operation functions.

3. The outdoor unit shall be capable of cooling operation down to 32°F (0°C) ambient temperature without additional low ambient controls (optional wind baffle shall be required).

4. The outdoor unit shall be able to operate with a maximum height difference of 100 feet (30 meters) between indoor and outdoor units.

5. System shall operate at up to a maximum refrigerant tubing length of 165 feet (50 meters) for the 36,000 BTU/h unit between indoor and outdoor units without the need for line size changes, traps or additional oil. Models PUZ-A36NHA6 shall be pre-charged for a maximum of 70 feet (20 meters) of refrigerant tubing.

6. The outdoor unit shall be completely factory assembled, piped, and wired. Each unit must be test run at the factory.

7. Outdoor unit sound level shall not exceed 48 dB(A) in cooling mode and 50 dB(A) in heating mode.

B. Cabinet

1. The casing shall be constructed from galvanized steel plate, finished with an electrostatically applied, thermally fused acrylic or polyester powder coating for corrosion protection and have a Munsell 3Y 7.8/1.1 finish.

2. Mounting feet shall be provided and shall be welded to the base of the cabinet and be of sufficient size to afford reliable equipment mount and stability.

3. Easy access shall be afforded to all serviceable parts by means of removable panel sections.

4. The fan grill shall be of ABS plastic.

5. Cabinet mounting and construction shall be sufficient to withstand 155 MPH wind speed conditions for use in Hurricane condition areas. Mounting, base support, and other installation to meet Hurricane Code Conditions shall be by others.

C. Fan

1. Models PUZ-36NHA6 shall be furnished with a single DC fan motor.

2. The fan blade(s) shall be of aerodynamic design for quiet operation, and the fan motor bearings shall be permanently lubricated.

3. The outdoor unit shall have horizontal discharge airflow. The fan shall be mounted in front of the coil, pulling air across it from the rear and dispelling it through the front. The fan shall be provided with a raised guard to prevent external contact with moving parts.

D. Coil

1. The L shaped condenser coil shall be of copper tubing with flat aluminum fins to reduce debris build up and allow maximum airflow. The coil shall be protected with an integral metal guard.

2. Refrigerant flow from the condenser shall be controlled by means of an electronic linear expansion valve (LEV) metering device. The LEV shall be control by a microprocessor controlled step motor.

3. All refrigerant lines between outdoor and indoor units shall be of annealed, refrigeration grade copper tubing, ARC Type, meeting ASTM B280 requirements, individually insulated in twin-tube, flexible, closed-cell, CFC-free (ozone depletion potential of zero), elastomeric material for the insulation of refrigerant pipes and tubes with thermal conductivity equal to or better than 0.27 BTU-inch/hour per Sq Ft / °F, a water vapor transmission equal to or better than 0.08 Perm-inch and superior fire ratings such that insulation will not contribute significantly to fire and up to 1” thick insulation shall have a - Flame-Spread Index of less than 25 and a Smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102.

E. Compressor

1. The compressor for models PUZ-36NHA6 shall be a DC twin-rotor rotary compressor with Variable Speed Inverter Drive Technology.

2. The compressor shall be driven by inverter circuit to control compressor speed. The compressor speed shall dynamically vary to match the room load for significantly increasing the efficiency of the system which shall result in significant energy savings.

3. To prevent liquid from accumulating in the compressor during the off cycle, a minimal amount of current shall be automatically, intermittently applied to the compressor motor windings to maintain sufficient heat to vaporize any refrigerant. No crankcase heater is to be used.

4. The outdoor unit shall have an accumulator and high pressure safety switch. The compressor shall be mounted to avoid the transmission of vibration.

F. Electrical

1. The electrical power of the unit shall be 208volts or 230 volts, single phase, 60 hertz. The unit shall be capable of satisfactory operation within voltage limits of 187 volts to 253 volts.

2. Power for the indoor unit shall be supplied from the outdoor unit via Mitsubishi Electric A-Control using three (3) fourteen (14) gauge AWG conductors plus ground wire connecting the units.

3. The outdoor unit shall be controlled by the microprocessor located in the indoor unit.

4. The control signal between the indoor unit and the outdoor unit shall be pulse signal 24 volts DC.

5. The unit shall have Pulse Amplitude Modulation circuit to utilize 98% of input power supply.

G. Operating Range

Operating Range		Indoor Air Intake Temperature	Outdoor Air Intake Temperature
Cooling	Max	D.B. 95°F (35°C); W.B. 71°F (31.7°C)	D.B. 115°F (46°C)
	Min	D.B. 67°F (19.4°C); W.B. 57°F (13.9°C)	D.B. 32°F (0°C)
Heating	Max	D.B. 80°F (26.7°C); W.B. 67°F (19.4°C)	D.B. 70°F (21.1°C); W.B. 59°F (15°C)
	Mini	D.B. 70°F (21.1°C); W.B. 60°F (15.6°C)	D.B. 12°F (-11.1°C); W.B. 10°F (-12.2°C)

1. Unit shall be able to provide min. 80% capacity when operating at 0ºF outdoor air temperature

2.02 INDOOR UNIT DESIGN

A. PKA Wall Mounted Type

1. General

The indoor unit shall be factory assembled, wired and tested. Contained within the unit shall be all factory wiring and internal piping, control circuit board and fan motor. The unit, in conjunction with the wired wall-mounted, wireless wall-mounted or wireless handheld controller, shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be purged with dry air before shipment from the factory.

2. Indoor Unit Capacity

Model Number	Cooling Capacity [BTU/h]	Heating Capacity [BTU/h]
PKA-A36KA6	34,200	38,000

3. Unit Cabinet:

   The cabinet shall be formed from high strength molded plastic with smooth finish, flat front panel design with access for filter. Cabinet color shall be white – Munsell 1.0Y 9.2/0.2. The unit shall be wall mounted by means of a factory supplied, pre-drilled, mounting plate.

4. Fan

   The indoor unit fan shall be high performance, double inlet, forward curve, direct drive sirocco fan with a single motor. The fans shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings. The indoor fan shall consist of three (3) speeds: Low, Mid, and Hi and Auto. The fan shall have a selectable Auto fan setting that will adjust the fan speed based on the difference between controller set-point and space temperature.

5. Indoor Sound Level

   Indoor unit sound level shall not exceed the levels below:

Model Number	Low Sped	Mid Sped	High Speed
PKA-A36KA6	43 dB(A)	46 dB(A)	49 dB(A)

6. Vane:

   There shall be a motorized horizontal vane to automatically direct air flow in a horizontal and downward direction for uniform air distribution. The horizontal vane shall significantly decrease downward air resistance for lower sound levels, and shall close the outlet port when operation is stopped. There shall also be a set of vertical vanes to provide horizontal swing airflow movement.

7. Filter:

   Return air shall be filtered by means of an easily removable washable filter.

8. Coil

   The evaporator coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing. The multi-angled heat exchanger shall have a modified fin shape that reduces air resistance for a smoother, quieter airflow. All tube joints shall be brazed with PhosCopper or silver alloy. The coils shall be pressure tested at the factory. A condensate pan and drain shall be provided under the coil. An optional drain pan level switch (DPLS1), designed to connect to the control board, shall be provided if required, and installed on the condensate pan to prevent condensate from overflowing. [Option: A condensate mini-pump shall be provided to provide a means of condensate disposal when a gravity drain is not available.]

9. Electrical:

   The electrical power of the unit shall be 208 volts or 230 volts, 1 phase, 60 hertz. The system shall be capable of satisfactory operation within voltage limits of 187 volts to 253 volts. The power to the indoor unit shall be supplied from the outdoor unit, using the Mitsubishi Electric A-Control system. For A-Control, a three (3) conductor AWG-14 wire with ground shall provide power feed and bi-directional control transmission between the outdoor and indoor units.

10. Performance:

    Each system shall perform in accordance to the ratings shown in the table below. Cooling performance shall be based on 80°F DB, 67°F WB (26.7°C DB, 19.4°C WB) for the indoor unit and 95°F DB, 75°F WB (35°C DB, 29.3°C WB) for the outdoor unit. Heating performance shall be based on 70°F DB, 60°F WB (21.1°C DB, 15.6°C WB) for the indoor unit and 47°F DB, 15°F WB (8.3°C DB, 6.1°C WB) for the outdoor unit.

Model Number	**Cooling Capacity Btu/h**	**Heating Capacity Btu/h**	**TPW Cooling**	**TPW Heating**	**SEER**	**HSPF IV (V)**	**CFM (Hi/Dry)**
PKA-A36KA4	12,000-34,200	12,000-38,000	5,030	3,610	14	9.3 (7.5)	920

TPW – Total Power Watts

11. System Control

    The control system shall consist of a minimum of two (2) microprocessors, one on each indoor and outdoor unit, interconnected by a single non-polar two-wire cable. The microprocessor located in the indoor unit shall have the capability of monitoring return air temperature and indoor coil temperature, receiving and processing commands from a wireless or wired controller, providing emergency operation and controlling the outdoor unit. The control signal between the indoor and outdoor unit shall be pulse signal 24 volts DC. Indoor units shall have the ability to control supplemental heat via connector CN152 and a 12 VDC output

2.03 REMOTE CONTROLLERS

All remote controllers need to be ordered separately from the unit.

A. Wireless, wall mounted remote controller kit (MHK1)

   The Wireless, wall mounted remote controller kit (MHK1) shall consist of a wireless, wall mounted controller (MRCH1), a wireless receiver (MIFH1) and a cable (MRC1) to connect the receiver to the indoor unit. The controller shall be white in color with a light-green LCD display and a backlight feature. The MRCH1 shall consist of four Function buttons below the display, and Increase/Decrease Set Temperature buttons and a Hold button to the right of the display. The controller shall have a built-in temperature sensor and a battery holder, using two AA alkaline batteries. Temperature shall be displayed in either Fahrenheit (°F) or Celsius (°C), and temperature changes shall be by increments of 1°F (0.5°C).

   The MHK1 uses Honeywell RedLINKTM technology, and the wireless receiver is specially designed for Mitsubishi units. Linking to the wireless network shall be done from the receiver and from the remote controller. There shall not be any interference with other wireless devices

or neighboring RedLINKTM products. Communication shall be automatically restored after power resumes and after batteries are replaced.

The basic functions are:

Wireless, Wall Mounted Remote Controller Kit (MHK1)	
Item	**Description**
Number of Units Controllable	1 unit
ON/OFF	Run and stop operation
Operation Mode	Switches between Cool/Drying/Auto/Fan/Heat.
Temperature Setting (Range and modes depend on connected unit model)	Controller general setpoint temperature range: Cool/Dry: 50°F-99°F Heat: 40°F-90°F Auto: 50°F-90°F Controller temperature range when connected to the PKA/PUZ system: Cool/Dry: 67°F-87°F Heat: 63°F-83°F Auto: 67°F-83°F
Fan Speed Setting (Range and modes depend on connected unit model)	Hi/Mid-2/Mid-1/Low/Auto
Air Flow Direction Setting (Air flow direction settings depend on the unit model)	Air flow direction angles 100%-80%-60%-40%, Swing.
Dual Setpoint Control	Separate heating and cooling setpoints. Adjustable deadband from 2ºF to 8ºF. Automatically adjusts setpoints to ensure deadband. System changeover with dual setpoints.

Wireless, Wall Mounted Remote Controller Kit (MHK1)	
Item	**Description**
Scheduling	5-2 and 5-1-1 schedules Separate Heat/Cool schedules Allows operation in AUTO with Scheduling setbacks and dual setpoint Simple temperature setting can be done up to 4 times one day in the week. The time can be set by the 15-minute interval. Remote controller shall be programmable as either a residential controller, which will offer residential scheduling options only; or as a commercial controller, which will offer commercial scheduling options only.
Optimal Start	Set occupied time and desired set temperature Remote controller learns when to start warm up or cool down so that space is at set temperature at start of occupied time
Operating Conditions Display	Setpoint and room temperature. Default sensing is at the remote controller. Installer setting to select at return air sensor. Automatically switches to return air sensor if communication to remote controller is lost Outdoor temperature and humidity (Requires optional air sensor MOS1)
Additional Functions	Hold Function Temporary Schedule Override Reset to factory default
Error	When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed
Auto Lock Out Function	Setting/releasing of simplified locking for remote control settings can be performed. • Locking of all settings • Locking of ON/OFF setting • Locking of system setting (Heat, Cool, Off, Auto, etc.) • Locking of fan setting • Locking of temperature setting • Locking of Clock/Day/Schedule

PART 3: INSTALLATION

3.01 GENERAL

A. The unit shall be installed by authorized technician, not general contractor.

B. Follow the instructions in the Installation Manual and use tools and pipe components specifically made for use with refrigerant specified in the outdoor unit installation manual

C. The unit must be securely installed on a structure that can sustain its weight.

D. All electric work must be performed by a qualified technician according to local regulations, National Electric Code and the instructions given in this manual. Use only specified cables for wiring. Furnish overcurrent protective devices of the rating prescribed by the A/C manufacturer as shown on the unit nameplates.

E. Power and control cable for the A/C air handler and compressor unit must be installed exposed, inside rigid metallic aluminum conduit. The last segment from the support at the wall to the unit conduit inlet shall be flex-tite conduit.

F. When installing or relocating, or servicing the air conditioner, use only the specified refrigerant (R410A) to charge the refrigerant lines. Do not mix it with any other refrigerant and do not allow air to remain in the lines. If air is mixed with the refrigerant, then it can be the cause of abnormal high pressure in the refrigerant line, and may result in an explosion and other hazards.

3.02 INDOOR UNIT

A. The indoor unit shall be handled by two man crew due to the weight in excess of 40 lb.

B. The unit shall be installed on the wall of a material that has sufficient bearing capacity to safely support the unit with the minimum safety factor of 2:1. Installer shall provide the support anchor system specifically designed for the type of the wall where the air handler unit will be installed.

C. The air handler must be installed using the original mounting plate furnished as part of the A/C package. No other generic sheet metal mounting plate can be used to support the unit of the wall.

D. Thermal insulation of the refrigerant pipe is necessary to prevent condensation. If the refrigerant pipe is not properly insulated, condensation will be formed. Correctly install the drain pipe and route to a drain in the mechanical room.

E. When commercially available copper pipes are used, wrap liquid and gas pipes with commercially available insulation materials (heat-resistant to 100 °C, 212 °F or more, thickness of 12 mm, 1/2 inch or more).

F. The indoor parts of the drain pipe should be wrapped with polyethylene foam insulation materials (specific gravity of 0.03, thickness of 9 mm, 23/64 inch or more).

G. Apply thin layer of refrigerant oil to pipe and joint seating surface before tightening flare nut.

H. Use two wrenches to tighten piping connections. •

I. Use refrigerant piping insulation provided with the unit to insulated the air handler connections

J. Turn on the main power switch more than 12 hours before starting operation. Starting operation just after turning on the power switch can severely damage the internal parts.

K. Before starting operation, check that all panels, guards and other protective parts are correctly installed.

L. Do not operate the air conditioner without the air filter set in place. If the air filter is not installed, dust may accumulate and breakdown may result.

M. Do not touch the refrigerant pipes with bare hands during operation.

N. After stopping operation, be sure to wait at least five minutes before turning off the main power

O. Service technician shall also program the remote wireless controller and train the Owner personnel how to set up and operate the air handler/wireless remote temperature control system.

3.03 OUTDOOR UNIT

A. Check that the difference between the heights of the indoor and outdoor units, the length of refrigerant pipe, and the number of bends in the pipe are within the limits shown below.

Models	Pipe Length (one way)	Height Difference between A/C Handler and A/C compressor units *	Number of bends (one way)
PUZ-A24, A30, A36, A42	Max 165 ft.	Max 100 ft.	Max. 15

*Height difference limitations are binding regardless of which unit, indoor or outdoor is positioned higher.

B. Install the compressor unit away from direct sunlight or other sources of heat.

C. The wall that will be used to mount the unit bracket shall be capable of bearing the weight and vibration of the unit.

D. The brackets to be used for a wall mounting shall be hot dip galvanized and painted to match the color of the unit. The bracket shall be standard products with minimum 2:1 loading safety ration and equal to Anvil Figure 194, brackets #1; #2 or #3 depending of the size of the air compressor unit.

E. After installation of the outdoor unit on the wall bracket, the unit shall be connected with insulated copper liquid and gas lines to the air handler unit inside the room. The size of the refrigerant piping, the length and number of fittings shall be strictly determined from the A/C manufacturer installation instructions.

F. Authorized technician shall adequately charge the installation with an approved refrigerants in quantities shown in installation manual table and as determined by the A/C equipment manufacturer.

G. Electrical contractor shall energize the air handler and air compressor units following the unit wiring diagram, provided by the A/C manufacturer in the installation instructions, per local regulation and National Electric Code.

3.04 TESTING

A. After completing installation and the wiring and piping of the indoor and outdoor units, check for refrigerant leakage, looseness in the power supply or control wiring, wrong polarity, and no disconnection of one phase in the supply.

B. Use a 500-volt megger to check that the resistance between the power supply terminals and ground is at least 1 MOhm. Do not carry out this resistance test on control wires.

C. Perform the A/C performance check by checking the pressures in both liquid and gas lines and corresponding refrigerant temperatures at the compressor piping inlet. Measure voltage and full load amperes of both units.

D. Record measured values, compare against manufacturer prescribed performance range for the unit and attach to the outdoor unit in a sealed pouch.

E. In case of the unit underperformance, the authorized technician and contractor shall take all necessary corrective actions at no additional cost to the Owner until the specified performance is achieved.

DIVISION 25

INTEGRATED AUTOMATION

SECTION 25 13 00

INSTRUMENTATION AND CONTROL

PART 1: GENERAL

1.01 SCOPE OF THE PROJECT

A. Hardware modifications of the existing SCADA panel at Hailey Pump Station

1. Existing Motorola MOSCAD RTU shall be modified to allow the RTU control of two new 400 HP Variable Frequency Drives.

2. Contractor shall provide Discrete Inputs and Outputs for the following VFD control functionality:

a. Discrete RTU relay outputs:

(1) “Call for VFD #2”

(2) “Call for VFD #4”

These two RTU outputs shall be wiring as discrete inputs of the VFDs

b. Discrete RTU inputs:

(1) “VFD #2 is running”;

(2) “VFD #2 Failed”;

(3) “VFD #4 is running”;

(4) “VFD #4 Failed”;

A pair of Run/ Fail discrete outputs from each new VFD shall be hard wired into discrete input card of the existing Moscad RTU

c. Analog Input:

(1) Room temperature analog signal from temperature probe/transmitter and door mounted display.

3. System integrator shall verify that there still will be 20% of inputs and outputs available on the existing RTU cards after addition of these I/O points. If the spares cannot be provided, the Owner shall provide addition input or output card for the Hailey RTU from its stock of the spare parts.

B. Programming and network modifications of the existing SCADA panel at Hailey Pump Station

In addition to the local and hard wired discrete control of the VFD, the system integrator shall also set up a Modbus RS485 network between the RTU and two new VFDs that will further expand the remote-control capabilities for the City of Mesquite Water Department personnel, in particular:

1. Remote drive Start/Stop and Speed Control via mobile phone from the main HMI computer at Mesquite Dispatch center or from the operator’s mobile phone (phone access software to be provided by the Mesquite IT department);

2. Additional status parameters like:

    a. Drive faults;

    b. Drive operating speed/frequency;

    c. Any other drive parameters available in the Modbus VFD registry and as requested by the City of Mesquite Water Department Supervisor

3. The RTU program modification shall be required to allow control of the two new drives. The new VFD control functionality at Hailey pump station must mimic the VFD control at the Barnes Bridge Pump Station both in local and remote control features and reporting;

4. In case that the VFDs end up being model CPX9000 by Eaton, the Owner's expectation is that the VFD local and remote control and reporting will be identical;

C. HMI Screen Update at Mesquite Operations Center

1. As a part of this project, the system integrator shall design additional VFD control graphics and reporting on the existing HMI screen at Mesquite Service Center.

2. The graphic on the HMI screen for two new VFDs at Hailey Pump Station shall mimic the graphics shown for the Barnes Bridge Pump Station both in appearance and the functionality.

3. System Integrator shall verify if the upgrade of the license for the Intellution Software will be required during his bid preparation and include the cost in is quote to the general contractor.

4. No additional payment for the license upgrade to increase number of graphic nodes shall be allowed in form of a Change Order later in the project.

1.02 QUALITY ASSURANCE

A. Referenced Standards

1. Institute of Electrical and Electronic Engineers (IEEE):

    a. 518, Guide for the Installation of Electrical Equipment to Minimize Electrical Noise Inputs to Controllers from External Sources.

    b. C37.90.1, IEEE Standard Surge Withstand Capability (SWC) Tests for Protective Relays and Relay Systems.

    c. C37.90.2, Trial Use Standard Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers

    d. C62.41, IEEE Guide for Surge Voltages in Low-Voltage AC Power Circuits

2. Instrument Society of America (ISA)

    a. S5.1, Instrumentation Symbols and Identification

    b. S5.2, Binary Logic Diagrams for Process Operations

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

    d. S5.4, Standard Instrument Loop Diagrams.

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

f. RP7, 1-56, Pneumatic Control Circuit Pressure Test.

g. RS-232-C, Interface between Data Terminal Equipment and Data Communication Equipment Employing Serial Binary Data Interchange.

h. RS-422-A, Electrical Characteristics of Balanced Voltage Digital Interface Circuits.

3. National Institute of Standards and Technology (NIST).

4. Joint Industrial Council (JIC) - EMP-1, Mass Production Equipment.

5. National Electrical Manufacturers Association (NEMA):

a. ICS 1, General Standards for Industrial Control and Systems.

b. ICS 1.1, Safety Guidelines for the Application, Installation and Maintenance of Solid State Control.

c. ICS 4, Terminal Blocks for Industrial Use.

d. ICS 6, Enclosures for Industrial Controls and Systems.

e. 250, Enclosures for Electrical Equipment (1000 V Maximum).

6. National Electrical Code (NEC).

B. Qualifications of Instrumentation and Controls Subcontractor

1. The instrumentation and control system shall be designed and supplied by a single instrumentation subcontractor. The instrumentation subcontractor shall be responsible for functional operations of all systems, performance of control system engineering, supervision of installation, final connections, calibrations, preparation of drawings and operation and maintenance manuals, startup, training, demonstration of substantial completion and all other aspects of the control system.

2. The instrumentation system shall be detailed and installed by a subcontractor who has specialized experience for at least five years in the design and installation of instrumentation and control systems. The subcontractor shall demonstrate that he has sufficient financial capability to complete the work on this project and provide the required warranty service. The subcontractor shall have a qualified technical staff and competent service, startup and training personnel.

3. Installation supervisor shall have had experience in overseeing installation and start up of at least three similar installations.

4. Programmer(s) shall have had experience in programming PLCs for at least two projects of similar size and complexity.

5. System supplier shall assume complete system responsibility, including coordination and interfacing with all subsystems and equipment suppliers and manufacturer.

C. Miscellaneous

1. Prior to placement of conduit feeds, assure approved control and terminal panel layouts are available.

2. Provide panel with the required NEMA rating per NEMA Publication No. 250 to meet classifications shown on drawings or specifications.

1.03 RELATED WORK SPECIFIED ELSEWHERE

A. Section 10 14 00 - Nameplates, Signs and Letters

B. Section 26 05 19 - Wire and Cable

1.04 DESCRIPTION OF THE CONTROL SYSTEMS

A. Pump Control at Hailey Pump Station Equal to Barnes Bridge Pump Station

1. It is imperative that the VFD pump control at Hailey Pump Station be as similar to the Barnes Bridge Pump Station as practically possible.

2. The existing hardwired MCC pump control must stay intact. The main change is that the “call for the pump” signal from the RTU will be redirected from the existing across the line starter inside the existing MCC to start the new VFD.

3. Similar to the Barnes Bridge Pump Station, the new control system will start pumps based on the level drop in the controlling elevated tank and shut them down when level in the tank reached set values defined at the HMI screen. The pump control shall be ON/OFF with user selected fixed VFD speed (entered into VFD memory via VFD keypad) throughout the pump run.

4. ‘Call for pump’ from the existing RTU will first initialize electric check valve opening. After the valve is opened approximately 5 percent limit switch contacts at valve will close and start the pump. Once the RTU signals that the particular pump is no longer needed, the valve will start closing first. Once valve is 95 percent closed the pump will be stopped. This control description is part of the existing hard wired control and will not be modified.

5. Two (2) VFD controlled pumps shall alternate in AUTO sequence or shall be started manually locally or remotely from the operations center or via smart mobile phone of the Water Department Supervisor. The smart phone connectivity software and licensing shall be provided by City of Mesquite IT department.

6. The RS-485 Modbus network, similar to the Barnes Bridge pump control shall allow expanded VFD status monitoring and allow the operator to remotely Start/Stop and change the VFD speed.

7. Modes of Operations

a. VFD in "REMOTE" on the VFD Keypad and HOA in AUTO on MCC

This is the normal model of pump operation. In this mode of operation, the pump shall be “remotely” controlled by the RTU program that will turn the VFD pump automatically based on the elevated tank level drop at preset fixed speed stored in VFD or overridden remotely by the operator. Two VFD pumps shall alternate unless the HOA switch on the MCC is put in OFF position. In this mode, the operator shall be able to override the local control, remotely, from the operation center or mobile smart phone and start/stop the pump and set the pump speed also remotely. Once the “Call for Pump” is energized, the electric check valve of the pump starts opening first. After the valve is 5-10 percent open, the limit switch on the top of the check valve will trigger the VFD start and gradual ramp up to the selected speed. In similar fashion, when the RTU de-energizes “Call for Pump” contacts, the electric check valve start closing first. When the valve is 5-10% closed, the limit switch at the top of the electric check valve will de-energizes causing the VFD to start ramping down until it fully stops.

b. VFD in "REMOTE" on the VFD Keypad and HOA in HAND on MCC

Instead of the RTU controlling the valve open/pump start and valve Close/pump stop sequence the MCC Start and Stop push buttons are controlling that action, the pump shall be manually controlled by the operator from the MCC. The remote pump override will not be possible in this mode. This mode of operation would be used if RTU fails and some pumping is still required from the pump station, typically, at reduced speed.

c. VFD in "LOCAL" on the VFD Keypad and MCC HOA in OFF

In this mode of operation, only the pump motor will start without opening the electric check valve. The pump, under operator's close supervision, may run at much reduced speed and against the closed electric check valve. This mode of operation may be used in low demand winter months for a short duration in order to briefly exercise the pump/motor and provide shaft rotation and lubricate the pump and motor bearings. No water would be pumped into the system in this mode of operation.

1.05 MODBUS NETWORK

A. The Modbus network master (RTU) shall poll the slaves (VFDs) mainly for status info and for speed adjustment. VFD Start/Stop and failure shall be implemented via discrete inputs/outputs. Each of the above listed equipment shall be furnished with Modbus ports. The VFD equipment manufacturer shall provide the following components to system integrator to set up of the Modbus network:

1. Software drivers/programs and connecting hardware (if necessary);

2. Control card registry list with clear indications of the available process variables that can be accessed and mapped remotely through the Modbus connection;

3. Written instruction for the system Integrator describing how to map the generator control card registry;

4. Live technical support to system integrator if necessary.

This technical support by equipment manufacturer shall be included in their base bid and no additional payment will be allowed for assisting the system Integrator in establishing communication with the controller cards.

The system integrator shall be responsible for the entire network functionality and transparency. The system integrator shall inform the Engineer in a timely manner if the assistance from the equipment manufacturer is not at the level that will allow project completion on time.

1.06 PERFORMANCE AND DESIGN REQUIREMENTS

A. System Operating Criteria

1. Stability

After controls have taken corrective action, as result of a change in the controlled variable or a change in setpoint, oscillation of final control element shall not exceed two cycles per minute or a magnitude of movement of 0.5 percent full travel.

2. Response

Any change in setpoint or change in controlled variable shall produce a corresponding corrective change in position of final control element and become stabilized within 30 seconds.

3. Agreement

   Setpoint indication of controlled variable and measured indication of controlled variable shall agree within 3 percent of full scale over a 6:1 operating range.

4. Repeatability

   For any repeated magnitude of control signal, from either an increasing or decreasing direction, the final control element shall take a repeated position within 0.5 percent of full travel regardless of force required to position final element.

5. Sensitivity

   Controls shall respond to setpoint deviations and measured variable deviations within 1.0 percent of full scale.

6. Performance

   All instruments and control devices shall perform in accordance with manufacturer's specifications.

B. Equipment Surge Protection

1. Provide power supplies for electronic equipment to successfully withstand surges in AC power circuits per the wave form, voltage amplitude, current amplitude, and frequency per IEEE C62.41. Successfully withstanding transients requires neither erroneous output, component failure or calibration change results from an AC power surge or transient.

1.07 SUBMITTALS

A. Shop Drawings

Submit the following data to the Engineer for his review:

1. Manufacturer product literature on all components. In addition, include the following:

   a. Acknowledgment that products submitted meet requirements of standards referenced.

   b. Manufacturer's installation instructions.

2. A complete loop diagrams of the instrumentation and control.

   a. Prepare and submit loop diagrams per ISA S5.4. Each loop diagram and description shall be on a separate 8½" x 11" sheet. Each sheet shall contain the following minimum information.

      (1) All loop devices clearly identified.

      (2) Identification of the loop and each loop component, including connections to such things as recorders, PLCs, and computers. Numbering and tagging must agree with the P&ID.

      (3) All interconnections with identifying numbers for electrical cables, conductor pairs, pneumatic or hydraulic tubing.

      (4) Identification of connections including junction boxes, terminals, bulkheads, ports, PLC or computer input/output connections, and grounding systems.

      (5) Signal levels and ranges

(6) Device location

(7) Energy sources designating voltage, amperage, pressure, and other applicable requirements.

(8) Enough process lines and equipment to clearly show the process side of the loop and provide clarity of control action. This includes a description of what is being measured, what is being controlled, and other information required to complete the process loop.

(9) Reference to supplementary records and drawings to show interrelation to other control loops.

(10) Controller action.

(11) Control valve action upon electronic, hydraulic, or pneumatic failure.

3. Control schematics. Diagrams shall include the following:

   a. Terminal identification

   b. Unique identification of all control devices and contacts. Utilize Owner's device identification numbers where applicable.

   c. Wire identification

   d. Equipment identification

   e. Indication of remote and local devices and wiring

   f. Overcurrent protection indication

   g. Voltage

   h. All control logic.

4. Comprehensive set of point-to-point wiring diagrams showing all interconnections between packaged systems or equipment control panels, motor control centers, instrumentation and all other electrical equipment as required to depict a complete and functional plant-wide electrical control system. Instrumentation wiring already shown on loop diagrams need not be included on point-to-point wiring diagrams. Diagrams shall provide the following minimum information:

   a. Terminal block identification including terminals on remote equipment furnished by Others.

   b. Ground points.

   c. Interconnection requirements to existing systems or equipment furnished by Others

   Diagrams shall be provided on drawings of sufficient size to minimize the number of drawings. Drawings shall be prepared on either 11" x 17" or 24" x 36" sheets.

5. PLC and Equipment

   Submit product technical data including the following:

   a. Manufacturer’s standard product literature

b. Detailed specifications for specific equipment showing memory and storage capacities, speed, accuracies, features, accessories, allowable environmental conditions and other data to show compliance with the specifications.

c. Software programs for PLC systems.

(1) Submit program for discrete logic in ladder diagram format as used for the specific PLC system. Annotate program listing to include the following:

(a) Written description of each rung's function.

(b) Reference to control loop number for each rung where applicable.

(c) Reference to instrumentation tag number of I/O devices for each rung where applicable.

(2) Annotation for analog logic programming shall include the following:

(a) Written description of functions.

(b) Reference to control loop numbers.

(c) Reference to instrumentation tag number of I/O devices.

d. Results of factory testing procedures.

e. Arrangement drawings for PLC system components.

f. Panel and enclosure plans, sections and details.

g. Access opening locations and required clearances for each panel and enclosure.

h. Enclosure internal wiring and terminal blocks.

i. Full size diagrams of all CRT process control displays with identification of actual colors.

j. Diagrams of all keyboards included in PLC system.

k. Tabular I/O listing including the following data:

(1) Each I/O point.

(2) Name of I/O device such as solenoid valve or limit switch.

(3) Instrumentation tag number of the I/O device in the Contract Documents.

(4) Electrical characteristics of I/O signal

(5) PLC system internal and external address of each I/O.

l. Listing of all training offered by PLC system equipment manufacturers including operations and maintenance.

m. Warranty of equipment, accessories and spare parts.

6. Certifications.

a. Qualifications of installation supervisor.

b. Qualifications of programmer(s).

7. Factory test reports.

8. A statement of all accuracies for each variable measurement.

9. Complete working drawings showing all electrical wiring and piping required for each instrument to be installed. Include requirements for all piping and valves including sizes of each, Show mounting requirements for each instrument.

10. Provide circuit diagrams and certification with the shop drawing indicating how voltage transient protection requirements are met.

11. Instrumentation and Terminal Panels

    a. Scaled and dimensioned panel face and subpanel face instrument and nameplate layout drawings. The drawings should also show the structural members required to provide rigidity.

    b. Panel and subpanel materials of construction.

    c. Panel and subpanel dimensions and weights.

    d. Panel access openings.

    e. Conduit and wiring access locations.

    f. Internal wiring and terminal block drawings.

12. Provide copies of all equipment warranties and a list of factory authorized service agents.

B. Samples

Furnish the following samples for review:

1. Samples of the colors available for the panel exterior.

2. Sample of the micarta labels.

C. Operation and Maintenance Manual

1. The equipment supplier shall provide four (4) complete operation and maintenance manuals describing all types of equipment supplied, as well as the overall theory of operation of the system. The manual shall include suggested maintenance and operational tips, including suggested procedures for coping with radio failure and power failure at remote and central panels.

2. The manual shall include all manufacturer's product literature, product data sheets, drawings, installation instructions, and operator's handbooks, manuals or instructions.

3. Include all software operator's manuals and programming manuals. Provide a copy of all PLC and PC programs on a DVD.

4. Submit maintenance procedures available to Owner. Include the location and phone numbers of service centers (including 24 hr. "hot lines"). Provide specific information including operation and maintenance requirements, programming assistance, troubleshooting guide, parts ordering, field service personnel requests, and service contracts.

D. As-Built Drawings

After the installation of the equipment and panel is complete, submit to the Engineer for approval, six (6) copies of "as-built" drawings of the completed facility. Include final PLC program listings. One (1) copy of the approved drawings is to be placed in a plan pocket located inside the telemetry panel at each site.

1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials

Unload and store equipment as it arrives in the original packing crate. Do not uncrate or unpack equipment until the manufacturer's representative service representative has been notified and is present to check the incoming equipment for damage.

B. Storage of Materials and Equipment

1. All equipment specified in this section shall be stored inside a weatherproof and heated building until such time the equipment is to be installed.

2. Every effort should be made to prevent condensation of moisture in the equipment. Place heating devices in enclosures.

3. Do not remove shipping blocks, plugs, caps, and desiccant dryers installed to protect the instrumentation during shipment until the instruments are installed and permanent connections are made.

C. Handling of Materials and Equipment

Where possible, all equipment should be left in the original packing boxes and crates until after the materials have been delivered to the location at which they are to be installed and have been placed in position for final installation.

D. Protection of Equipment after Installation

After the equipment has been installed, protect the equipment from potential damage by placing a protective cover over each piece of equipment. Place protective boards around the instrumentation panel to prevent denting and abrasions to the surface of the panel during subsequent construction.

1.09 GUARANTEE

The equipment manufacturer shall furnish, through the Contractor, a guarantee for a period of two (2) years from the date of start-up to protect the Owner against defective workmanship and materials. The guarantee shall cover the accuracy and correctness of the entire system, as well as each piece of equipment. The manufacturer of the equipment shall also guarantee the individual components will perform according to the standards which have been published by the manufacturer in any of his literature. Any claim made by the manufacturer regarding performance of his equipment shall be guaranteed to perform accordingly.

PART 2: PRODUCTS

2.01 MATERIALS

A. MOSCAD RTU HARDWARE (by Owner)

The following RTU hardware will be furnished by the Owner if, after addition of the I/O points in this project, the I/O spare count falls below 20 percent.

1. RTU Discrete Input Card (MOSCAD V115)

2. RTU Discrete Output Card (MOSCAD V516)

3. RTU Analog Input Card(MOSCAD V278)

B. HMI Supervisory software (Intellution Software, increase of the allowed nodes, by General Contractor). Contractor shall verify if the current HMI software version provides enough nodes to modify the existing main HMI Screen. If the license already reached allowed number of nodes, before or during the screen modification, the System Integrator shall purchase additional nodes while providing 20% reserve.

C. Temperature Pt100 RTD probe and transmitter

1. Furnish TH11 temperature probe with head transmitter by Endress-Houser, or approved equal.

2. Furnish RTU door mounted temperature display, model PD765, Trident Series by Precision Digital, or approved equal.

PART 3: EXECUTION

3.01 INSPECTION

Each piece of equipment shall be inspected for damage in the presence of the manufacturer's representative as soon as it is uncrated. Check the shipment for missing parts and reorder immediately.

3.02 PREPARATION

Assist the Owner in determining the telephone service requirements and make recommendations regarding the service required. It is understood that the telephone line service shall not exceed the requirements for a standard 3002 voice grade line.

3.03 INSTALLATION

A. General

1. Coordinate the installation of the equipment with electrical and mechanical trades.

2. Instrumentation and appurtenances requiring electrical wiring shall be wired in accordance with such approved wiring diagrams of the manufacturer as set forth in the applicable provisions of the electrical section of these specifications.

3. Failure to specify or to indicate in the plans all miscellaneous wiring or piping, of whatever nature required to satisfy operation and compliance with this section of the specifications will not relieve the Contractor from such work. No additional payment will be made for such work. The Contractor shall familiarize himself with the work to be performed.

3.04 TESTING AND CALIBRATION

A. General

1. After all equipment is installed, provide and pay for the services of a factory trained technician to adjust all instruments. Demonstrate to the Engineer that all equipment is functioning properly and that each device will accurately measure and record each variable over the full span of the instrument.

2. Provide to the Owner all additional piping, devices, and equipment necessary for this calibration. For some devices, it will be necessary to artificially control the variable being measured, in order to calibrate the instruments across the entire span.

3. Maintain accurate daily log of all startup activities, calibration functions, and final setpoint adjustments.

4. In the event that instrument air is not available during calibration and testing, supply either filtered, dry, instrument quality air from a portable compressor or bottled, dry, instrument quality air. Do not, under any circumstances, apply hydrostatic test to any part of the air supply system or pneumatic control system.

B. Instrumentation Calibration

1. Verify that all instruments and control devices are calibrated to provide the performance required by the Contract Documents.

2. Calibrate all field-mounted instruments, other than local pressure and temperature gages, after the device is mounted in place to assure proper installed operation.

3. Calibrate in accordance with the manufacturer's specifications.

4. Bench calibrate pressure and temperature gages. Field mount gage within 1 day of calibration.

5. Calibrate each transmitter and gage across its specified range at 0, 25, 50, 75, and 100 percent. Check for both increasing and decreasing input signals to detect hysteresis.

6. Replace any instrument which cannot be properly adjusted.

7. Stroke control valves with clean dry air to verify control action, positioner settings, and solenoid functions.

8. Mark range, date, set point and calibrator's initials on each instrument by means of blue or black ink on a waterproof tag affixed to the instrument.

9. Certify calibration equipment by an independent agency with traceability to NIST immediately prior to utilization of the equipment on this Project. Re-certify calibration equipment if the accuracy of the equipment is questioned by the Engineer.

C. Loop Checkout

1. Check control signal generation, transmission, reception and response for all control loops under simulated operating conditions by imposing a signal in the loop at the instrument

connections. Use actual signals where available. Closely observe controllers, recorders, alarm and trip units, remote setpoints, ratio systems, and other control components. Make corrections as required.

2. Following any corrections, retest the loop as before. Stroke all control valves, cylinders, drives and connecting linkages from the local control station and from the control room operator interface.

3. Check all interlocks to the maximum extent possible.

4. In addition to any other as-recorded documents, record all setpoint and calibration changes on all affected Contract Documents and turn over to the Owner.

D. Provide verification of system assembly, power, ground, and I/O tests.

E. Verify existence and measure adequacy of all grounds required for instrumentation and controls.

F. During the demonstration period, observe each signal circuit for the existence of electrical noise. Utilize noise suppression techniques given in Section 6.5, "Suppressive Techniques," of IEEE 518 for all circuits for which electrical noise introduces an error greater than the instrumentation accuracy.

1.2 START-UP SERVICES

A. There shall be provided two (2) periods of start-up assistance by qualified manufacturer's service representatives during the start-up and checkup of the work specified under this section. The manufacturer's service representative shall be present to check the incoming shipment for damage and shall consult with the general contractor or his representative to coordinate field installation. The manufacturer's representative shall check to be sure the installer of the equipment has a complete understanding of the equipment and its desired functions. The assistance shall include, but not be limited to checking packing lists against received equipment to be sure all equipment is received, checking the central control panel and all remote cabinets for any obvious damage which may interfere with either the installation or the operation of the equipment, and an in depth discussion with the electrician responsible for all exterior wiring, as to the circuits required.

B. The second period shall be for initial start-up of the equipment. The Contractor shall notify the instrument manufacturer at least 48 hours prior to the initial start-up and shall check to be sure all external wiring is completed. On this second trip the manufacturer's service representative shall calibrate all instruments and demonstrate to the Engineer that all are functioning properly.

C. There is no specific requirement for the length of the first and second service trips. However, the first period should be long enough to allow the manufacturer's representative sufficient time to inspect each piece of equipment and to send an additional 4 hours in instructing the Contractor and electrician in the installation techniques to be used. For the second period of start-up assistance, the manufacturer's representative shall remain on the job until all instruments are calibrated to the satisfaction of the Owner.

END OF SECTION

SECTION 25 64 00

HMI SYSTEMS

PART 1: GENERAL

1.01 SCOPE

A. This section covers programming of the existing HMI (human machine interface) software to:

1. If necessary, provide an upgrade of the existing HMI software license to include new I/O points defined as part of the Hailey Pump Station VFD Improvements Project while still providing minimum 20% of I/O spares;

2. Modify existing HMI at Mesquite Water Department HMI screen to allow for monitoring and remote control of the pumps;

3. Provide reporting for the new Hailey Pump Station VFDs with trends or summaries as selected by the Owner;

4. Software for mobile phone access to SCADA system shall be provided by City of Mesquite IT Department.

1.02 QUALITY ASSURANCE

A. Comply with Section 25 13 00, Part 1.2.

1.03 RELATED WORK

A. Section 25 13 00, Instrumentation

1.04 SUBMITTALS AND SHOP DRAWINGS

A. Process catalog submittals, and equipment data for the following:

1. Existing HMI Software License Upgrade Data Sheet.

PART 2: PRODUCTS

2.01 SOFTWARE

A. The existing City of Mesquite HMI software consists of the licensed copies of HMI software package, autodialer alarm software, and office suite software all of which are certified and suitable for use on Windows operating system.

B. HMI software is the Windows version of Wonderware Intouch, latest version product by Intellution. Furnish necessary upgrade of the existing Wonderware license that will allow programming of all new I/O points that will be added as part of the this project. After all new points are added software license shall still have approximately 20 percent of spare I/O left.

C. At the service center, program HMI main screen functionality as shown on the plans. Remote VFD drive control shall be programmed as part of the new HMI screens. Program remote operation using a REMOTE/LOCAL HMI screen selector switch such that it overrides any active control at that moment. Program this Remote operation such that it returns to the previous state after 30 minutes of inactivity.

D. At the service center, modify the HMI main screen functionality to mimic two VFD controlled pumps at Barnes Bridge Pump Station. If the Base Bid is awarded, the expectation is that the pump control shall be identical to the VFD pump control implemented at Barnes Bridge Pump Station. Description of the HMI functionality is as follows:

1. Include VFD Run/Fail status, elapsed time meter and remote/local control override on the HMI screen for each VFD;

2. Using the remote/local control override, the operator will be able to remotely control the VFD either from the service center or from his mobile device. This functionality will allow him to start or stop the VFD remotely and set up the VFD speed.

3. Allow in the bid for programming of up to 10 other VFD parameters via Modbus interface and using the register map provided by the VFD manufacturer as directed by the Owner or the Engineer.

PART 3: EXECUTION

3.01 CONFIGURATION

A. Screen colors for animated objects linked to I/O or process:

1. Green for devices in a safe condition. Examples: Valve closed, or pump motor off.

2. Red for operating devices. Examples: Pump motor run or valve open.

3. For valves in transition between open and closed, the red and green indicators shall blink.

4. Devices that fail to activate after a control command is issued shall blink yellow.

5. Analog values which are questionable due to open or shorted loops shall blink yellow.

6. Colors for process piping shall conform to AWWA standards and shall be as follows:

CHEMICAL	COLOR
Potable water	Light blue
Compressed Air	Light green
Instrument Air	Light green with dark green bands
Chlorine (gas, liquid or vent)	Yellow
Chlorine (solution)	Yellow with red bands
Liquid Alum	Yellow with orange bands
Alum (solution)	Yellow with green bands
Ammonia	Yellow with brown bands
Chlorine Dioxide (solution)	Yellow with blue bands
Ferric chloride	Brown with red bands

CHEMICAL	COLOR
Ferric sulfate	Brown with yellow bands
Polymers	White with green bands
Liquid caustic	White with orange bands
Flouride	White with yellow bands
Ozone	Stainless steel with white bands
Green	Green

B. Real-time and historical trending. Create graphical trend displays of real-time or historical data. The work shall include but not be limited to the following:

1. Bid shall include up to 10 real time historical trend groups or screens, or pumping or alarm summaries as selected by the Owner. See detailed list of values in 3.01.C.

2. Trend displays shall be made for flow rates and pumping to determine approximate efficiency of pumping scheme at the pump station.

C. Design and configure automatic report generation. The report generation shall be Microsoft Excel based, OLE linked, menu driven, and custom designed for this project. Report routines shall be user definable through a menu driven system to select desired report. Hour, day, month, and year time frame and data shall be selectable. Submit report format to Owner for review. The reports shall include the following:

1. Current value, minimum value, maximum value, average value, totals, volumes, totalized flow, chemical usage, equipment run times, and historical data for each pump station and its individual pressure zones and its associated remote elevated tank, incoming meter station and associated pressure reducing or pressure point sites. Each report shall have max hour and max day flows. .

2. Reports shall have the capability to be generated on a hourly, shift, daily, monthly, and annual basis. Printing shall be operator initiated.

3. Data for reports shall be written to the Wonderware Intouch historical data base on no greater than 15 minute intervals to ensure retention of data in the event of a power loss or equipment failure.

4. Report generation shall not require the incorporation of any other software or proprietary programming.

5. Allow in bid time to coordinate with City personnel for report format and desired data for up to 10 reports.

D. Alarm report generation. Alarm reports shall be automatically generated and printed on an hourly, shift, and daily basis as determined by the Owner.

3.02 FAT TEST

Perform Factory Acceptance Test of computer system and test all newly created HMI Screens.

A. Test must not be performed on real process variables. Digital and analog input simulators shall be used to perform the test.

B. One representative of City and the representative of the system integrator company shall be at the Hailey Pump Station Site and Programmer and City's Water Department Chief Operator at Service Center.

C. Using Digital Input Simulator connected to the pump station PLC simulate discrete inputs on the screen and check functionality.

D. Using Analog Lop Simulator connected to the pump station PLC simulate analog inputs on the screen and check functionality.

E. From Service Center initiate remote control and check functionality at the pump station end.

F. Check newly programmed autodialer alarms one by one by simulating PLC inputs at the pump station.

G. Make record of all checked inputs and outputs, autodialer alarms and sign by programmer and the Owner.

3.03 TRAINING

A. Provide training for Owner's operators at the Owners site. The training shall be for up to three individuals on the operation and maintenance of the SCADA system including personal computer system, HMI software system, radio system maintenance, and RTU operation and maintenance. The main focus shall be from an operations perspective, but maintenance of the system shall also be covered.

B. The schedule of training shall be as follows:

1. On completion of the installation – two (2) hours.

2. One year after substantial completion –two (2) hours

3.04 DOCUMENTATION

A. The final software configuration shall be fully documented and annotated. This documentation shall include the RTU programming and radio system settings. Furnish printouts in O&M manuals.

B. The final software configuration shall be burned onto a CD and delivered to the Owner for backup purposes. The backup files shall be for each created screen.

END OF SECTION

DIVISION 26

ELECTRICAL

SECTION 26 05 00

COMMON REQUIREMENTS FOR ELECTRICAL SYSTEM

PART 1: GENERAL

1.1 GENERAL CONDITIONS

A. The General Conditions and Requirements, Special Provisions, are hereby made a part of this Section.

B. The Electrical Drawings and Specifications under this Section shall be made a part of the Contract Documents. The Drawings and Specifications of other sections of this contract, with supplements issued thereto, information to bidders and pertinent documents issued by the Owner's Representative are a part of these Drawings and Specifications and shall be followed in every respect. All the above documents will be on file at the office of the Owner's representative and shall be examined by all the bidders. Failure to examine all documents shall not relieve the responsibility or be used as a basis for additional compensation due to omission of details or other section from the electrical documents.

C. Furnish all work, labor, tools, superintendence, material, equipment and operations necessary to provide for a complete and workable electrical system as defined by the Contract Documents.

D. Be responsible for visiting the sites and checking the existing conditions. Ascertain the conditions to be met for the work to be performed and allow in bid accordingly.

E. It is the intent of the Contract Documents that upon completion of the electrical work, the entire system shall be in a finished, workable first class condition.

F. All work that may be called for in the Specifications but not shown on the Drawings, or, all work that may be shown on the Drawings but not called for in the Specifications, shall be performed by the Contractor as if described in both. Should work be required which is not set forth in either document, but which work is nevertheless required for fulfilling of the intent thereof, then the Contractor shall perform all work as fully as if it were specifically set forth in the Contract Documents.

G. The definition of terms used throughout the Contract Documents shall be as specified by the following agencies:

1. Underwriters Laboratories
2. National Electrical Manufacturers Association
3. American National Standards Institute
4. Insulated Power Cable Engineers Association
5. National Electrical Code
6. National Fire Protection Association

H. The use of the terms "as (or where) indicated," "as (or where) shown," "as (or where) specified," or "as (or where) scheduled" shall be taken to mean that the reference is made to the Contract Documents, either on the Drawings or in the Specifications, or both documents.

I. The use of the words "furnish," "provide," or "install" shall be taken to mean that the item or facility is to be both furnished and installed under Division 16, unless stated to the contrary that the item or facility is to be furnished either under another Division or under another Contract, furnished under this Division and installed under another Division or under another Contract, or furnished and installed under another Division or under another Contract.

1.2 PERMITS, CODES AND UTILITIES

A. Secure all permits, licenses, and inspection as required by all authorities having jurisdiction. Give all notices and comply with all laws, ordinances, rules, regulations and contract requirements bearing on the work.

B. The minimum requirements of the electrical system installation shall conform to the latest edition of the National Electrical Code, and state and local codes.

C. Codes and ordinances having jurisdiction and specified codes shall serve as minimum requirements, but, if the Contract Documents indicate requirements that are greater than those minimum requirements, then the requirements of the Contract Documents shall be followed. Should there be any conflicts between the Contract Documents and codes, or any ordinances, report these with the bid.

D. Determine the exact requirements for the electric utility service connections and metering facilities as set forth by the utility that will serve the project, and pay for and perform all work as required by that utility.

E. Determine the exact requirements for the telephone utility service connections as set forth by the utility that will serve the project, and pay for initial installation charges. Perform all work as required by that utility.

PART 2: PRODUCTS

2.1 STANDARDS

A. All materials and equipment shall conform to the requirements of the Contract Documents. They shall be new, free from defects, and they shall conform to the following standards where these organizations have set standards:

1. Underwriters Laboratories (UL)

2. National Electrical Manufacturer's Association (NEMA)

3. American National Standards Association (ANSI)

4. Insulated Cable Engineers Association (ICEA)

B. All material and equipment of the same class shall be supplied by the same manufacturer, unless specified to the contrary.

C. All shop built products shall bear UL labels where standards have been set for listing.

2.2 SHOP DRAWINGS AND SUBMITTALS

A. Shop drawings shall be taken to mean detailed drawings with dimensions, schedules, weights, capacities, installation details and pertinent information that will be needed to describe the material or equipment in detail.

B. Submittals shall be taken to mean catalog cuts, general descriptive information, catalog numbers and manufacturer's name.

C. Refer to Section 01 33 00 for submittal requirements.

PART 3: EXECUTION

3.1 EXCAVATION AND BACKFILLING

A. Do all excavating and backfilling necessary for the installation of the work. This shall include shoring and pumping in ditches to keep them dry until the work in question has been installed. All shoring required to protect the excavation and safeguard employees shall be properly performed.

B. All excavations shall be made to proper depth, with allowances made for floors, forms, beams, piping, finished grades, etc. Ground under conduits shall be well compacted before conduits are installed.

C. All backfilling shall be made with selected soil, free of rocks and debris, and shall be pneumatically tamped in six (6") inch layers to secure a density of 90% Standard Proctor. Backfill under pavement and structures shall be compacted to 95% Standard Proctor Density.

D. All excavated material not suitable and not used in the backfill shall be removed to the onsite disposal area. Area shall be as directed by the Engineer.

E. Field check and verify the locations of all underground utilities before excavating. Avoid disturbing these as far as possible. In the event existing utilities are broken into or damaged, they shall be repaired to make their operation equal to that before the trenching was started.

F. Where the excavation requires the opening of existing walks, drives or other existing pavement, these facilities shall be cut as required to install new lines and to make connections to existing lines. The sizes of the cut shall be held to a minimum, consistent with the work to be installed. After installation of new work is completed and the excavation has been backfilled according to the above, repair existing walks, drives or other existing pavement to match existing installation.

3.2 CUTTING AND PATCHING

A. Cutting and patching required under this section shall be done in a neat skillful manner. Cutting lines shall be uniform and smooth.

B. Use concrete saws for large cuts in concrete and use core drills for small round cuts in concrete.

C. Where openings are cut through masonry walls, provide lintel or other structural support to protect the remaining masonry. Adequate support shall be provided during the cutting operation to prevent damage to masonry.

D. Where large openings are cut through metal surfaces, attach a metal angle around the opening.

E. Patch concrete openings that are to be filled with non-shrinking cementing compound. Finish concrete patching shall be troweled smooth and shall be uniform with surrounding surfaces.

3.3 WATERPROOFING

A. Provide waterproof flashing for each penetration of exterior walls and roofs.

B. Penetrations through walls at below ground elevations shall be waterproofed by conduit sealing fittings or other methods as indicated.

C. Interior of raceways that are likely to have water ingress, such as runs from hand holes into below-grade installations, shall have waterstops installed to prevent water from entering into installations.

D. Flashing for conduit penetrations through built-up roofs shall be made with pitch pans filled with pitch. Conduit penetrations through poured concrete roofs shall be made with sleeves and annulus caulked.

3.4 INSTALLATION

A. Locating and Placing Equipment

1. Except where specifically noted or shown, the locations and elevations of equipment are approximate and are subject to small revisions as may prove necessary or desirable at the time the work is installed.

2. Final locations shall be confirmed with the Engineer before construction. Confirmed locations shall be made for the following:

   a. Receptacles

   b. Rough-ins and connections for equipment

   c. Safety switches

   d. Wall switches

   e. Motors

   f. Motor controllers

   g. Pole fixtures.

   h. Pilot operators.

   i. Switchgears.

3. Standard Device Mounting Locations

   Unless otherwise indicated on the drawings, the following mounting heights shall be used as measured from the finished floor elevation:

   a. Light switch: 48 inches

   b. Receptacles: 12 inches

   c. Safety switch: 54 inches

   d. Panelboard (to top): 72 inches

   e. Motor starter: 54 inches

B. Coordination with Other Trades

Where equipment is being furnished under another Division, request from Engineer an accepted drawing that will show exact dimensions of required locations or connections. Install the

required facilities to the exact requirements of the accepted drawings. Arrange for the building in of equipment during structure construction. Where equipment cannot be built-in during construction, arrange for sleeves, box-outs, openings, etc., as required to allow installation of equipment after structure construction is complete.

C. All work shall be done in the best and most skillful manner by qualified, careful electricians who are skilled in their trade. The standards of work required throughout shall be of the first class only, and electricians whose work is unsatisfactory to the Engineer shall be dismissed from the work upon written notice from the Engineer.

D. Unless shown in detail, the Drawings are diagrammatic and do not give exact details as to elevations and routing of conduits, nor do they show all offsets and fittings; nevertheless, install the conduit system to conform to the structural and mechanical conditions of the construction.

E. Holes for raceway penetration into sheet metal cabinets and boxes shall be accurately made with an approved tool. Cutting openings with a torch or other device that produces a jagged, rough cut will not be acceptable.

F. Cabling inside equipment shall be carefully routed, trained and laced. Cables so placed that they obstruct equipment devices will not be acceptable.

G. Equipment shall be set level and plumb. Supporting devices installed shall be set and so braced that equipment is held in a rigid, tight-fitting manner.

H. Verify that equipment will fit support layouts indicated.

I. Equipment Dimensions and Clearances:

1. Do not use equipment that exceeds the indicated dimensions.

2. Except as approved in writing by the Engineer. Do not use equipment or arrangements of equipment that reduce required clearances or exceed the space allocation.

J. Install equipment in accordance with the manufacturer's instructions.

K. Equipment Access:

1. Install equipment so it is readily accessible for operation and maintenance. Equipment shall not be blocked or concealed.

2. Do not install electrical equipment such that it interferes with normal maintenance requirements of other equipment.

L. Outdoor wall-mounted equipment and indoor equipment mounted on earth or water bearing walls shall be provided with corrosion-resistant spacers to maintain ¼-inch separation between the equipment and the wall.

M. Screen or seal all openings into outdoor equipment to prevent the entrance of rodents and insects.

N. Equipment fabricated from aluminum shall not be placed in direct contact with earth or concrete.

O. Anchoring and Supports

1. Provide all necessary anchoring devices and supports.

2. Use supports as detailed on the Drawings and as specified.

3. Where not detailed on the Drawings or specified, use supports and anchoring devices rated for the equipment load.

4. Supports and anchoring devices shall be rated and sized based on dimensions and weights verified from approved equipment submittals.

5. Hardware shall be malleable type, corrosion resistant and shall be supported by heavily plated machine screws or brass, bronze or stainless steel bolts.

P. Do not mount safety switches and external equipment to other equipment enclosures, unless enclosure mounting surface is properly braced to accept mounting of external equipment.

Q. Provide concrete foundations or pads required for electrical equipment as indicated or specified. All floor-mounted equipment shall be mounted on a 4-inch concrete housekeeping pad whether or not such pad is shown on the drawings. Pad shall be poured on top of the finished floor or slab.

R. Material that may cause rusting or streaking on a building surface shall not be used.

S. To avoid interference with structural members and equipment of other trades, it may be necessary to adjust the intended location of electrical equipment. Unless specifically dimensioned or detailed, the Contractor may, at his discretion, make minor adjustments in equipment location without obtaining the Engineer's approval. Minor adjustments are defined as a distance not to exceed one foot.

T. Particular attention shall be paid to door swings, piping, radiation, ductwork, and structural steel.

1. In general, waste and vent lines and large pipe and ductwork shall be given priority for the locations and space shown.

2. Electrical lighting fixtures shall, in general, be given priority for ceiling space.

3. No additional compensation will be allowed for the moving of misplaced outlets, wiring, or equipment.

U. Provide tagging of electrical equipment, conduits, and conductors in accordance with Section 10 14 00.

1. Each equipment shall be provided with a nameplate identifying the equipment by the tag number indicated on the Drawings.

2. Each branch circuit and feeder shall be provided with a nameplate identifying, by name and tag number as indicated on the Drawings, the load served. Do not abbreviate.

3. Each control device shall be provided with an escutcheon defining the device function and a nameplate identifying the controlled equipment.

4. Provide electrical danger, caution, warning or safety instruction signs in accordance with Section 10 14 00.

V. Field paint in accordance with Section 09 90 00.

W. Do not remove or damage fireproofing materials

1. Install hangers, inserts, supports, and anchors prior to installation of fireproofing.

2. Repair or replace fireproofing removed or damaged.

X. Make all penetrations through roofs prior to installation of roofing. For penetrations required after installation of roofing:

1. In built-up roofing, provide all curbs, cants and base flashings.

2. In elastic sheet roofing, arrange and pay for base flashing work by authorized roofer.

Y. Make all penetrations of electrical work through walls and roofs water and weather-tight.

3.5 EQUIPMENT PROTECTION

A. Provide suitable protection for all equipment, work and property against damage during construction.

B. Assume full responsibility for material and equipment stored at the site.

C. Conduit openings shall be closed with caps or plugs during installation. All outlet boxes and cabinets shall be kept free of concrete, plaster, dirt and debris.

D. Equipment shall be covered and tightly sealed against entrance of dust, dirt and moisture.

E. All dry transformers before energization shall be protected against moisture and dirt absorption by suitable covering. Also, maintain heat inside the covering by means of 100 watt minimum lamps.

F. Interiors of switchgear and motor control centers shall be kept clean and dry before energization. Maintain heat inside each unit with one (1) 100 watt lamp at bottom of each vertical section.

3.6 COOPERATION WITH WORK UNDER OTHER DIVISIONS

A. Cooperate with all other trades to facilitate the general progress of their work. Allow all other trades every reasonable opportunity for the installation of their work and the storage of their materials.

B. The work under this section shall follow the general building construction closely. Set all pipe sleeves, inserts, etc., and see that openings for chases, pipes, etc., are provided before concrete is placed or masonry installed.

C. Work with other trades in determining exact locations of outlets, conduits, fixtures, and pieces of equipment to avoid interference with lines as required to maintain proper installation of other work.

D. Make such progress in work that will not delay the work of other trades. Schedule the work so that completion dates as established by the Engineer are met. Furnish sufficient labor or work overtime to accomplish these requirements if directed to do so.

3.7 INSTALLATION AND CONNECTION OF WORK UNDER ANOTHER DIVISION

A. Except as otherwise indicated, details of control and signal wiring required are not shown; however, ascertain the requirements and install wiring as required under that division. If wiring and requirements differ from that shown under Division 16, request clarification from the Engineer before installation of work.

B. Verify the electrical capacities of all electrical equipment furnished under other sections, or furnished by the Owner, and request wiring information from the Engineer if wiring requirements are different from that specified under this Section. Do not make rough-ins until equipment verification has been received.

C. Install all motors, terminal boxes, pilot devices, controllers and miscellaneous items of electrical equipment that are not integrally mounted with the equipment furnished under other divisions. All such equipment shall be securely mounted and adequately supported in a neat and workmanlike manner.

3.8 CLEAN UP

A. Remove all temporary labels, dirt, paint, grease and stains from all exposed equipment. Upon completion of work, clean equipment and the entire installation to present a first class job suitable for occupancy. No loose parts or scraps of equipment shall be left on the premises.

B. Equipment paint scars shall be repaired with paint kits supplied by the equipment manufacturer or with an approved paint.

C. Clean interiors of each item of electrical equipment. At completion of work all equipment interiors shall be free from dust, dirt and debris.

D. Replace nameplates or labels damaged during construction.

3.9 TESTS

A. General

1. Replace equipment and systems found inoperative or defective and re-test.

2. If equipment or system fails re-test, replace it with products which conform with Contract Documents.

3. Continue remedial measures and re-tests until satisfactory results are obtained.

4. Remedial measures and re-tests will be done at no cost to the Owner.

5. Test to ensure all equipment is free of short circuits and improper grounds.

6. Test to ensure all equipment is operational.

B. Each run of 600V class power and control wiring shall be tested before connection of line and load. Make tests with 1000 V DC hand-crank ohmmeter. Each run of wiring shall be tested phase-to-phase and/or phase-to-neutral, and phase-to-ground. Test results for each test shall be equal to or greater than 1,500,000 ohms with 1000V dc applied. All tests shall be made in the presence of the Engineer, and the results shall be recorded.

C. Test all runs of signal wiring with 500V dc megger. Insulation values shall meet or exceed 100,000 ohms per 1000 feet (cable to shield).

D. A ground resistance test shall be made at each point ground connections are made.

E. A ground fault test shall be conducted of all three phase power systems with a solid neutral. Ground fault tests shall comply with Article 230-95 of the National Electrical Code.

F. All equipment shall be put through a trial run-in test to ascertain that the performance complies with the intent of the Specifications. All run-in tests shall be made in the presence of the Engineer. Phase to phase and phase to ground voltages shall be measured and recorded at the load side of all motor starters.

G. Perform all tests required or recommended by the equipment manufacturer.

H. All tests described above shall be recorded and copies inserted in the Operation and Maintenance Manual.

3.10 RECORD DRAWINGS

A. At the start and during the progress of the job, keep one separate set of blue-line prints for making construction notes and markups.

B. Show conduit routing and wiring runs as constructed and identify each.

C. Record all deviations from the Contract Documents.

D. Submit set of marked-up drawings for review.

3.11 OPERATIONS AND MAINTENANCE MANUALS

A. Six (6) weeks before the completion of the project, compile an Operations and Maintenance Manual on each item of equipment. These manuals shall include detailed instructions and maintenance as well as spare parts lists.

B. Submit four (4) copies for review. See Section 01 70 00.

SECTION 26 05 19

LOW VOLTAGE POWER AND CONTROL WIRE AND CABLE

PART 1: GENERAL

1.1 SCOPE

This section includes the following:

A. Power, lighting, multiconductor control and instrument wire and cable (600 volt and below).

B. Terminating devices, splice kits, labeling, and appurtenances.

1.2 QUALITY ASSURANCE

Reference Standards - Wire and Cable shall conform to the latest applicable standards published by the following agencies:

A. National Fire Protection Association (NFPA)

B. National Electrical Code (NEC).

C. Underwriters Laboratories, Inc. (UL):

D. Insulated Cable Engineers Association (ICEA)

E. National Electrical Manufacturers Association (NEMA)

1.3 SUBMITTALS AND SHOP DRAWINGS

A. Process catalog submittals for the following:

1. Power cable
2. Control cable
3. Instrument cable
4. Conductor Connectors
5. Tape Products
6. Labels

B. Submit the following additional information obtained from the manufacturer:

1. Acknowledgment that products submitted meet requirements of standards referenced.
2. Manufacturer's installation instructions.
3. Test reports

C. Samples

1. Provide sample of largest size of each type of cable for review before installation.
2. Sample shall have a legible and complete surface printing of cable identification.

PART 2: PRODUCTS

2.1 WIRE AND CABLE

A. All conductors shall be soft-drawn, stranded annealed copper that meets ANSI 44, ASTM B3/B8. Copper conductors shall be uncoated, except as otherwise specified. Acceptable manufacturers are as follows:

1. American Insulated Wire Corp.
2. Belden
3. Cablec Corp.
4. Dekoron
5. Southwire.
6. Okonite Co.
7. Pirelli Cable Corp.
8. Rome Cable Corp.
9. Triangle PWC, Inc. .

B. Insulation for all single-conductor power wires that are used on 480 V circuits shall be cross-linked polyethylene. Furnish type XHHW wire.

C. Insulation for all single-conductor power wires in sizes #1 AWG, and smaller, that are used on 120/240 V power circuits and control wiring shall be PVC insulated with nylon sheath. Furnish type THHN wire.

D. Ground conductors and neutrals shall have the same type of insulation as the power wiring serving the electrical load being served by the neutral or ground.

E. All single conductor THHN power cables #6 AWG and XHHW power cables #10 AWG and smaller shall be factory pigmented color coded. All power single conductor cables in larger sizes may be color coded or have factory pigmented black insulation.

F. Instrumentation and signal cable shall be shielded multi-conductor type with tin-plated stranded copper conductors insulated with PVC. Wires shall be twisted pairs or triads shielded with aluminum-polyester shield. A drain wire of two wire gauges less than the conductor size, shall be continuous and integral with the shield. Furnish #18 AWG wire size in twisted pair, unless triads or other types or larger sizes are indicated.

G. Multiconductor control cable shall be 7 or 19 strands, concentric-lay, uncoated copper. Conductors shall have type THHN insulation and have an overall jacket of not less than 15 mils average of PVC insulation.

H. Multiconductor cords shall consist of rubber insulated high-stranded copper conductors contained within neoprene jacket. Furnish Type SO/600V class for 480V applications and furnish Type SJO/300V class for 120/240V class applications.

2.2 CONNECTORS

A. Mechanical connectors shall be tin-plated copper alloy bolted pressure type with bronze tin-plated hardware. Furnish connectors equal to those specified as follows:

	Manufacturer		
Type	Square D	O-Z/Gedney	Blackburn
Single conductor to flat-plate connector (one-hole)	LUTP	XLH	LH
Single conductor to flat-plate connector (two-hole)	LU2TP	XLH	L2H
Multiple conductor to flat-plate connector	LU3TP		TLH
Two-bolt parallel connector	KRTP	XTP	2BPW
Cross connector	XPTP	XTP	XT
Splice connector	SSTP	XW	S

B. Connectors for control conductor connections to screw terminals shall be crimp-type with vinyl insulated barrel and tin-plated copper ring-tongue style connector.

C. Terminal strip terminal connectors for control wiring shall consist of an array of channel mounted box lug terminals complete with mounting hardware, and closures and fitments that snap into metal mounting rail.

Terminal unit insulation shall be polyamide material that is non-hygroscopic and has a voltage rating of 300V. Terminal unit metallic connectors shall be chromated zinc plated steel and current-carrying parts shall be additionally plated with tin.

All terminals shall be Square D class 9080 Type GM3, or equal, and that have wire capacity range of 22 AWG through 12 AWG. Furnish all rails, plastic partitions and end closures, and fitments to make a complete installation. Furnish fuses unit terminals where indicated. Each array of terminals shall consist of number required to accommodate indicated control and/or signal functions plus at least 10% spares. For each terminal, furnish a plastic numbered label that shall have capacity for two numbers.

D. Ground bus connectors shall be Square D type "LU-TP" or equal.

2.3 INSULATING PRODUCTS

A. Tape products shall be furnished as hereinafter specified and shall by Plymouth, Okonite, 3M, or equal.

B. General purpose electrical tape shall be 7 mil thick stretchable vinyl plastic, pressure adhesive type, "Slipknot Grey," 3M Scotch 33+, or equal.

C. Insulating void-filling tape and high voltage bedding tape shall be stretchable ethylene propylene rubber with high-tack and fast fusing surfaces. Tape shall be rated for 90° C continuous, 130° C overload, and shall be moisture-proof. Void filling tape shall be "Plysafe," 3M Scotch 23, or equal.

D. High temperature protective tape shall be rated 180° C continuous indoor/outdoor, stretchable, self-bonding silicone rubber. High temperature tape shall be Plysil #3455, 3M Scotch 70, or equal.

E. Insulation putty filler-tape shall be Plymouth #32074, 3M Scotchfill, or equal.

F. Arc and fireproofing tape shall be Plymouth #3318, 3M Scotch #70 or equal.

2.4 LABELS

A. Colored banding tape shall be 5 mil stretchable vinyl with permanent solid color. Colors shall be as hereinafter specified. Tape shall be Plymouth "Slipknot 45", 3M Scotch #35, or equal.

B. Numbered wire marking labels shall be PVC sleeve-type markers, T&B, Brady or equal.

C. Cable identification ties shall be weather resistant polyester with blank write-on space, T&B, Brady or equal.

2.5 MISCELLANEOUS MATERIAL

A. Cable saddle supports shall be glazed porcelain type assigned to slip into 1 " wide slotted channel or, clamp split type porcelain saddles with stainless straps and hardware. Furnish B-Line or equal porcelain saddles.

B. Cable grips shall be grip-type wire mesh with machined metal support. Furnish Kellems, Appleton, or equal products.

C. Conduit pullcords shall be glass-fiber reinforced type, foot-marked. Pull tape for rigid nonmetallic conduit shall be nylon or polyethylene.

D. Wire pulling compound shall be cable manufacturer's standard containing no petroleum or other products which will deteriorate insulation and be non-crumbling and non-combustible.

E. Fireproof conduit sealant: Nonhardening, putty-like consistency workable at temperatures as low as 35 deg F. Compound shall not slump at a temperature of 300 deg F and shall readily adhere to clean surfaces of plastic ducts, metallic conduits conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and the common metals. Compound shall have no injurious effect on worker's hands or materials.

PART 3: EXECUTION

3.1 POWER, CONTROL, AND INSTRUMENTATION WIRING

A. Conductors shall be sized as shown and where no size is indicated, the minimum conductor size shall be #12 AWG for power conductors and #14 AWG for control and signal conductors.

B. Install all wiring in conduit. Use multiconductor cords only where shown on the drawings.

C. Install feeders and 480 V branch circuits in individual conduits unless otherwise indicated on Drawings.

D. Do not install 120/208/240 V circuit in same conduit as 480 V circuit, except when the 120 V control circuit and the 480 V circuit are serving and controlling the same equipment.

E. Install instrumentation and control circuits in separate conduits as follows:

1. Do not combine 4-20 mA DC, 24 V DC, or 120 V AC conductors in common conduit.

2. Do not combine 4-20 mA DC, or 24 V DC conductors in common conduit with 240 or 480 V AC conductors.

3. Do not combine 120 V AC feeders or branch circuits in common conduit with 240 or 480 VAC conductors unless specifically called for on the Drawings.

4. Ground drain wire of shielded conductors at one end only.

5. Maintain electrical continuity of the shield when splicing twisted shielded pair conductors.

F. Specified sizes of wire shall be installed with factory-pigmented colors. Phase label black pigmented power wire with colored banding tape. Color of tape applied shall be that specified as follows:

Conductor	120/208/240V Systems	480V Systems
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Grey
Equipment Ground	Green	Green

G. Wiring Support

1. All cables in large handholes and manholes shall be adequately and safety supported. Loose, sloppy and inadequately supported cables will not be acceptable.

2. All wiring inside equipment enclosures and inside handholes and manholes will be neatly trained and laced with nylon tiewraps.

3. Cables in vertical risers shall be supported by Kellums, or equal, woven grips where necessary to prevent heavy loading on cable connections.

H. Cable shall not be pulled tight against bushings nor pressed heavily against enclosures.

I. Branch circuits may be spliced for receptacle, lighting and small appliance load inside appropriate junction boxes. Feeders shall be installed from line-to-line without splices.

J. Spare cable ends shall be taped and coiled unless otherwise specified.

K. Cables shall not be bent to a radius of less than the manufacturer's recommended minimum bending radius.

L. All cables, including grounds, in one conduit over 1 foot long, or with any bends, shall be pulled in or out of raceway simultaneously.

M. All conduits that may allow hazardous or corrosive gasses or water to enter any building, enclosure or equipment shall be completely sealed with fireproof conduit sealant after the wiring has been installed.

3.2 CONDUCTOR CONNECTIONS

A. Except as otherwise specified, taps and splices with #10 AWG and smaller, shall be made with insulated crimp wire connectors or by soldering. Stranded conductors shall not be connected

using twist on connectors. Connectors in damp or wet locations shall be waterproofed by filling interstices around wires with silicone rubber and further insulating with an envelope of stretched piece of EPR tape around each wire. Then, apply one-half lapped layer of electrical tape over all.

B. Taps, splices, and connections in #8 AWG and larger wires shall be made with copper alloy bolted pressure connectors. Each such connector shall be insulated by means of applying insulation putty over sharp edges so as to present a smooth bonding surface. Next, apply at least four (4) layers, half-lapped each layer of EPR tape. Then, make final wrapping of at least three (3) layers, half-lapped each layer of electrical tape.

C. Motor connections made with #10 AWG and smaller wire shall be made up with set-screwed copper lugs with threaded-on insulating jacket. After make-up of each connector, install two (2) layers half-lapped, of high temperature tape over connector barrel and down over wires into connector one (1") inch.

D. Motor connections made with #8 AWG and larger wires shall be made up with cast copper alloy splice connector. Apply over each connector and down 1.5 inches over each wire entry, wrapping of high temperature tape. Apply at least three (3) layers, half-lapped each layer of such tape with maximum build-up over the connector. Then, apply final wrapping of at least three (3) layers, half-lapped each layer of electrical tape.

E. Terminate instrumentation and control wiring at control panels and motor control centers, at terminal boards mounted inside the equipment.

   1. Contractor shall supply terminal boards if equipment is not furnished with terminal boards.

   2. Do not field wire directly to devices.

   3. Ground both ends of spare wires.

F. Control wiring connections to stud type and screw type terminals shall be made with ring-tongue type crimp connectors.

G. Each wire connection shall be made up tightly so that resistance of connection is as low as equivalent length of associated conductor resistance.

3.3 MARKING AND LABELING

A. Install PVC sleeve type numbered marking labels to identify circuit numbers from panelboards. Install labels on each wire in each panelboard, junction, pullbox and device connection.

B. Label each wiring run with write-on waterproof labels inside each motor control center and in service switchboard. Install write-on label ties around wire group at conduit entrance and write-on label the wire size, conduit size and service.

C. Install PVC sleeve type numbered marking on each control wire termination at each terminal strip and at each device. Do this in motor control centers, terminal cabinets, safety switches, remote controllers, pilot operators, and instrumentation equipment. Number selected shall correspond to number on terminal strip.

D. Apply numbered wire marking labels to each signal wire termination. Use PVC sleeve type labels.

E. Phase band each black pigmented power wire with colored banding tape. Do this at each termination.

F. Install waterproof plastic write-on labels over each set of power cables, control cables in each motor control center, switchboard, manhole and handhole to identify functions of wiring. Identification shall show:

1. Wire Size

2. Conduit Trade Size

3. Load Served

4. Source

3.4 GROUND WIRING

A. Each item of equipment shall be adequately and thoroughly grounded. Comply with Article 250 of N.E.C., except where higher standards of grounding have been specified.

B. Equipment grounding conductors (EGC) shall be installed where indicated. These wires shall be green colored in sizes #6 AWG and smaller and green banded in larger sizes.

C. EGC runs into equipment shall be grounded to equipment bus where available, or to equipment ground lugs.

D. Where grounding type bushings are installed, bond EGC thereto, and furthermore, ground each bushing lug to equipment ground bus or ground lug, or ground rod.

E. In each motor terminal box, install equipment ground lug and connect EGC thereto.

F. In each floodlight pole, install ground connector to pole and to ground rod and bond to conduit bushing and to EGC in branch circuit.

G. Install ground mat. Set in excavation at footing and at indicated elevation. Use specified tin-plated copper conductors for all ground mat and upcomer wiring. Exothermally weld all connections.

H. Terminate upcomers from ground mat to underside of flush floor connectors and make run-back to nearest rebar and exothermally weld thereto.

I. Bond top side of each flush floor ground connector to equipment bus and grounds as shown. Use tin-plated bronze connector and bolt.

END OF SECTION

SECTION 26 05 26

GROUNDING SYSTEMS

PART 1: GENERAL

1.1 SCOPE

Upgrade existing grounding systems in accordance with Article 250 of N.E.C. and as shown on the Drawings and as specified herein.

Contractor shall upgrade grounded conductor (neutral) and equipment grounding conductor (EGC) at the locations indicated on the plans.

1.2 ACCEPTABLE METHODS FOR GROUNDING SYSTEM UPGRADE

A. Using Existing Ground Wire to Pull New Larger Ground Wire

1. Contractor shall make every effort to use existing ground wire to pull in new ground conductor inside 4-inch conduit without removal of existing 750 MCM power conductors.

B. Pulling Out All conductors From the Conduit and Reinstalling with Larger Ground Wire

1. If pulling in new ground conductor by using the existing ground wire is not possible, Contractor shall inform Engineer who will visit the site and witness the process.

2. Engineer and Owner reserves the right to propose an alternate method of grounding conductor pull inside existing conduit.

3. If no pull-in method will work, if approved by the Engineer and Owner, Contractor shall remove all conductors from 4-inch conduit and reinstall with the new grounding conductor. Contractor cannot start with this activity without prior approval from the Engineer and the Owner. The payment for this additional work will be per pricing provided by the Contractor in Proposal, item RP1. The given price in RP1 is for pulling out from one (1) 4-inch conduit a total length of 100 linear feet of three 750 MCM conductors and the ground and reinstall them with the new larger grounding conductor. The price shall be proportionally adjusted based on the number of conduits and total length.

1.3 SUBMITTALS

A. Submit manufacturers' catalog sheets with catalog numbers marked for the items furnished, which shall include:

1. Copper ground cable;

2. Ground connection hardware;

3. Long barrel butt splice connector;

4. Reducer long barrel connector;

5. Cold-shrink insulator;

B. Submit shop drawings in accordance with the requirements of Section 16010.

PART 2: PRODUCTS

2.1 MATERIALS

A. Wire shall be as specified under Section 26 05 19.

B. Long Barrel Butt-Splice Connector: Burndy YS28, no equal

C. Long Barrel Butt-Splice Connector Reducer: Y282CR, no equal

D. Cold Shrink Sleeve: Series 8420, Model 8428-17 by 3M

E. Wire Lubricant: Ideal Industries Yellow 77 Plus or better.

F. Exothermic Welds

Molds, cartridges, materials and accessories shall be as recommended by the manufacturer of the molds for the items to be welded. Molds and powder shall be furnished by the same manufacturer. Equipment shall be as manufactured by Cadweld, or equal.

G. Ground Connection Hardware

Bolts and nuts shall be high strength, high conductivity copper alloy.

PART 3: EXECUTION

3.1 INSTALLATION - GENERAL

A. Equipment grounding conductors shall be run with all single and three phase feeders and branch circuits.

B. Grounding conductors shall be run in all conduits containing power, and control wiring.

C. Conduits stubbed-up below a switchgear or motor control center shall be fitted with insulated grounding bushings and connected to the equipment ground bus. The grounding wire shall be sized in accordance with Table 250-95 of the National Electrical Code, except that a minimum No. 12 AWG shall be used.

D. Liquid-tight flexible metal conduit in sizes 1½" and larger shall have bonding jumper.

E. All equipment enclosures, motor and transformer frames, conduit systems, cable armor, exposed structural steel and similar items shall be grounded.

F. Exposed connections shall be made by means of grounding clamps. Exposed connections between different metals shall be sealed with No-Oxide Paint Grade A or equal. All buried or inaccessible connections shall be made by welding process equal to Cadweld.

G. All underground conductors shall be laid slack and where exposed to mechanical injury, shall be protected by pipes or other substantial guards. If guards are iron pipe or other magnetic material, conductors shall be electrically connected to both ends of the guard. Connections shall be made as hereinbefore specified.

H. Care shall be taken to insure good ground continuity, in particular between the conduit system and equipment frames and enclosures. Where necessary, jumper wires shall be installed.

3.2 INSTALLATION – NEW GROUNDING CONDUCTOR IN EXISTING 4-INCH CONDUIT

A. Using butt-splice long barrel connector connect existing grounding conductor and the new larger grounding conductor.

B. Use properly sized reducer fitting to accommodate smaller wire on one end of the barrel. The reducer fitting and the barrel must be produced by the same manufacturer.

C. Use only hydraulic crimping tool specified by the connector manufacturer. No improvised or inadequate hydraulic crimping tool will be allowed. Having properly crimped conductor is essential for successful pulling operation, therefore, job inspector shall be asked to be present during this operation.

D. Protect the joint by cold shrink sleeve that will cover entire joint.

E. In addition, tape the join with min. four (4) half-lapped layers of vinyl insulating tape.

F. Apply ample wire pull lubricant at all time during the pull operation.

G. Terminate ground wire at ground bus at terminal equipment.

H. Test cable insulation of all conductors inside each conduit using the megger test.

3.3 TESTS

A. Test the ground resistance of the system. All test equipment shall be provided under this Section and approved by the Engineer. Dry season resistance of the system shall not exceed five ohms. If such resistance cannot be obtained with the system as shown, provide additional grounding as directed by the Engineer, without additionally payment.

B. All exothermal weld connections shall successfully resist moderate hammer blows. Any connection which fails such test or which, upon inspection, indicates a porous or deformed weld, shall be remade.

C. All exothermal welds shall encompass 100 percent of the ends of the materials being welded. Welds which do not meet this requirement shall be remade.

END OF SECTION

SECTION 26 05 33

RACEWAYS

PART 1: GENERAL

1.01 SCOPE

A. This section shall include raceways, boxes, supporting devices ancillary fittings and appurtenances. Furnish and install the complete raceway systems as shown on the Drawings and as specified herein.

B. Raceway is a broad-scope term that shall be defined by the National Electrical Code under Article 100.

C. Damp locations, dry locations, and wet locations shall be as defined by the National Electrical Code under Article 100. All locations are considered to be dry on this project other than locatins outside the electrical room.

1.02 APPLICATIONS

Except as otherwise shown on the Drawings, or specified herein, all conduit raceways shall be of the following type:

A. Exposed power and control conduit shall be rigid aluminum conduit.

B. Instrumentation and intrinsically safe cables shall be installed in rigid metallic conduit above grade.

C. Outdoor exposed power and control conduit shall be rigid aluminum conduit.

D. Lighting and receptacle circuits concealed in slab shall be Schedule 40 PVC with plastic coated rigid steel conduit bends.

E. Conduit concealed in masonry shall be PVC with plastic coated rigid steel conduit bends.

F. NEMA 1 wireways may be used for in the electrical room only.

G. NEMA 4x stainless steel wireways shall be used for all other locations.

1.03 SUBMITTALS AND SHOP DRAWINGS

A. Process catalog submittals for the following:

1. Rigid Metallic Aluminum Conduit
2. Rigid Metallic Steel Conduit
3. Plastic Jacketed Metallic Conduit
4. Rigid Non-Metallic Conduit
5. Liquid - tight Flexible Conduit
6. Liquid - tight Fittings
7. Conduit Bushings

8. Conduit Bodies

9. Conduit Sealing Fittings

10. Expansion - Deflection Fittings

11. Expansion Fittings

12. Conduit Connectors

13. Cast Metal Boxes

14. Marking and Pull Tape Products

15. Wireways

16. Supporting Devices

17. Labels

18. Fireproof Conduit Sealant

B. Submit the following information:

Product technical data including but not limited to:

1. Manufacturer's technical information on products to be used.

2. Acknowledgment that products submitted meet the requirements of the standards referenced.

3. Acknowledgment that products submitted are UL or ETL listed or that no UL listing has been established for that product.

4. When general data sheets constitute part of the submittal specifically, identify the products to be used on this Project.

PART 2: PRODUCTS

2.01 CONDUIT AND WIREWAYS

A. Rigid metallic aluminum conduit shall be manufactured of 6063 alloy, T-1 temper, with no more than 0.02% copper content. All conduit couplings shall be threaded aluminum. All such conduit shall comply with UL-6 ANSI C80.5.

B. Rigid metallic steel conduit shall be hot-dipped galvanized inside and outside and over threads, and shall comply with UL-6, Federal Specification WWC-581, and ANSI C-80.1. Acceptable manufacturers:

1. Allied Tube and Conduit Corp.

2. Triangle PWC Inc.

3. Western Tube and Conduit Corp.

4. Wheatland Tube Co.

C. Plastic coated rigid metallic conduit shall consist of rigid steel body that complies with above specifications for rigid metallic steel conduit, plus conduit shall have 40 mil thick heat-fused PVC over outside and 3 mil coat of fully catalyzed phenolic inside. The inside coat shall have the chemical resistance of the outer coating and shall not dissolve in lacquer thinner. All couplings shall be equipped with PVC sleeves that extend one pipe diameter or 2", whichever is less, beyond the end of the coupling. All plastic coated conduit shall conform to NEMA Standard #RN-I (Type A) and ANSI C80.1. Acceptable manufacturers:

1. Occidental Coating Co.
2. Protective Coating Division Triangle PWC Inc.
3. Rob-Roy Industries

D. Nonmetallic rigid conduit for direct burial shall be Schedule 40 PVC. Such conduit shall be UL listed for 90° C and shall conform to NEMA TC-2 and UL-651 standards. Furnish manufacturer's approved solvent for joining couplings. Acceptable manufacturers:

1. Carlon.
2. Certainteed Corp.
3. Highland Plastics Inc.
4. Western Plastics Corp.

E. Nonmetallic rigid conduit for concrete encasement shall be type "EB" PVC, manufactured in conformity with NEMA TC-6.

F. Liquid-tight flexible conduit shall consist of hot-dipped galvanized, flexible interlocking steel core with polyvinyl sunlight resistant jacket, integral copper ground wire (through 1-1/4" trade size). Acceptable Manufacturers

1. Anaconda Metal Hose Division.
2. Carol Cable Co.
3. Electri-Flex Co.
4. International Metal Hose Co.
5. OZ Gedney.

G. Metallic NEMA. 1 and/or NEMA 3R wireways shall be painted steel with hinged covers and screw catches. All surfaces shall be primed with two coats of baked enamel. All such wireways shall be Hoffman Bulletin F40, Square D "Square-Duct," or equal.

H. Metallic NEMA 4 wireways shall be stainless steel with bolt-on stainless steel covers and with gasketed stainless steel bolted-on flanged end covers. All such wireways shall be Hoffman, or equal.

2.02 CONDUIT FITTINGS

A. General

Conduit fittings shall be furnished by the following manufacturers:

1. Adalet

2. Appleton
3. Carlon
4. Certainteed
5. Midwest
6. Occidental Coating Co.
7. OZ Gedney Co.
8. Rob-Roy Industries
9. Steel City
10. Thomas & Betts
11. Triangle PWC Inc.
12. Western Plastics Co.

B. Locknuts

1. NEMA 1 locknuts for rigid metallic conduits - galvanized steel.
2. NEMA 4 locknuts for rigid metallic conduit - galvanized steel body with neoprene sealing ring.

C. Conduit Hubs

1. Field-applied hubs for sheet metal enclosures shall be hot-dipped galvanized steel body with recessed neoprene sealing ring, nylon throat, threaded N.P.T. insert.
2. Rigid Metallic Conduit Fittings
3. Chase nipples, slip fittings, unions, reducers, and enlargers, shall be hot-dip galvanized malleable iron or aluminum products.
4. Ells shall be hot-dip galvanized malleable iron with N.P.T. threaded hubs and male ends. Throats shall be smooth and free from burrs.
5. Split couplings shall have threaded body with split tightening shelves with neoprene sandwich. Furnish PVC coated malleable iron for rigid steel conduit and copper-free aluminum for aluminum conduit.
6. Grounding bushings shall be aluminum body with threaded hub, Bakelite insulated throat, and tin-plated copper ground lug.
7. Insulating bushings shall be non-combustible high impact thermosetting phenolic with 150 C. temperature rating.
8. Expansion fittings shall consist of metallic barrel joined to hubs at each end. One hubs shall be threaded to barrel and other hub shall have slip fit to allow up to two (2") inches of conduit straight line movement in any direction. Provide external bonding jumper and insulating bushing for each expansion joint.

9. Expansion/deflection fittings shall consist of galvanized malleable iron hubs with heat-fused epoxy coating, flexible neoprene joining sleeve banded to hubs with stainless steel bands. Fittings shall allow two (2") inches of conduit straight line movement in any direction and 30° deflection in all directions. Furnish with internal bonding jumper, guide cones and insulating bushings.

10. Service entrance heads shall be weather resistant and of hot-dipped galvanized malleable iron or copper-free aluminum.

11. All conduit fittings for plastic coated conduits shall be coated with the same PVC coating on the outside and phenolic coating on the inside as specified above. All fittings shall be equipped with PVC sleeves that extend one pipe diameter or 2" whichever is less, beyond the end of the fitting.

12. Mogul pulling elbows shall be die cast copper free aluminum with cast aluminum gasketed covers.

D. Through Wall and Drain Fittings

1. Through-wall conduit sealing fittings for new job cast walls shall consist of hot-dip galvanized malleable iron head with PVC coated clamping ring with neoprene sealing grommet, PVC through-wall sleeve, and grade 316 stainless steel hardware. Furnish double-head or single-head types as indicated. Through-wall sealing fittings shall be OZ/Gedney type "FSK," or equal.

2. Conduit thru-wall fittings for existing or precast concrete walls shall consist of sleeve of Schedule 40 PVC and assembly of interlocking neoprene gland-ring with stainless steel compression hardware. Furnish Thunderline "Link-seal" or equal.

3. Hub drain fittings shall be stainless steel, labyrinth design with allows breathing action and condensation to escape. Such fittings shall be Crouse-Hinds "ECD" Universal or equal.

E. Couplings and Connectors

1. Couplings for plastic coated conduits shall be coated with the same PVC coating on the outside and shall be equipped with PVC sleeves that extend one pipe diameter or 2" whichever is less, beyond the end of the coupling.

2. Non-liquid tight flex connectors shall be galvanized clamp-type on flex side and threaded type on box side.

F. Liquid-tight Flexible Conduit Fittings

1. Hot-dip galvanized malleable iron body with hot-dip galvanized malleable iron internal locking ring and ground cone. Ferrules shall be zinc coated steel.

2. Furnish straight or angle connectors as required. Furnish neoprene sealing gaskets for wet location installations.

3. Meet provisions of UL 514.

G. Rigid Nonmetallic Fittings

1. Fittings shall be of the same material, thickness and construction as the conduits with which they are used.

2. Solvent cement for welding fittings shall be supplied by the same manufacturer as the conduit and fittings. Cement shall not be used after one year of the date of manufacture.

2.03 CONDUIT BODIES AND BOXES

1. Conduit bodies such as "C," "LB," "T" and like pulling fittings shall be zinc coated with sand-cast iron or sand-cast aluminum (no die-cast). Covers for damp and/or wet location use shall be gasketed cast metal with stainless steel screws.

2. Conduit bodies such as "GUA," "GUAT," "GUAL," and the like pulling/splicing fittings shall be zinc coated cast iron with threaded cast metal zinc coated covers.

3. Cast metal outlet boxes, pullboxes, and junction boxes whose volume is smaller than 100 cubic inches, and cast metal device boxes, shall be sand-cast, copper-free aluminum or zinc coated sand-cast malleable iron. All boxes shall have threaded hubs.

4. Covers for conduit bodies and boxes cast metal boxes shall be gasketed cast metal covers with stainless steel screws for wet locations and aluminum with plated screws in dry locations.

2.04 PULL AND JUNCTION BOXES

1. Pullboxes and junction boxes whose volume is less than 100 cubic inches shall be furnished as specified above. except where fiberglass reinforced polyester boxes are shown, in which cases, provide such types as specified.

2. Pullboxes and junction boxes for wet and damp locations whose volume is 100 cubic inches and greater shall be constructed of stainless steel and meet NEMA 4 standards. Boxes shall be fabricated of 14 gauge minimum and shall have hinged door with captive screws. Furnish mounting panel when terminal strips are indicated. Furnish Hoffman or equal boxes.

3. Pullboxes and junction boxes for dry locations whose volume is 100 cubic inches and greater shall be constructed of steel and meet NEMA 1 standards. Boxes shall be fabricated of 14 gauge minimum and shall have hinged door. Furnish mounting panel when terminal strips are indicated. Furnish Hoffman or equal boxes.

4. Cast metal junction boxes shall be cast aluminum type with gasketed, cast metal covers and with stainless steel cover screws.

2.05 LABELS

1. Buried conduit marking tape for marking path of secondary buried conduits shall be four (4") inch nominal width strip of polyethylene with highly visible, repetitive marking "BURIED CONDUIT" or similar language, repeated along its length.

2. Voltage warning labels for cabinets shall be waterproof vinyl sheets with adhesive back and shall have "DANGER 480V" lettering in highly visible red letters on white background.

3. Voltage warning labels for power and control handholes and manholes shall be waterproof vinyl strips about 1/32" thick and shall have "DANGER 480V" or "DANGER 240V", or "DANGER 120V" depending upon maximum voltage present, lettering in high visible red letters on white background. Furnish stainless steel screws.

4. For signal conduit in handholes furnish labels on each conduit with wording: "LOW ENERGY SIGNAL CIRCUITS ONLY."

2.06 SUPPORTING DEVICES

1. Acceptable Manufacturers

   a. B-Line Systems Inc.

   b. Crouse-Hinds

   c. Kindorf

   d. Unistrut Building Systems

   e. OZ Gedney Co.

   f. Steel City

   g. Thomas & Betts

   h. Phillips

   i. Wej-it

2. Mounting hardware, nuts, bolts, lockwashers, and washers, shall be Type 304 or 316 stainless steel.

3. Unless otherwise indicated, slotted channel framing and supporting devices shall be manufactured of ASTM 6063, T6 grade aluminum; 1 " wide x 3¼" deep (double opening type). Clamp nuts for use with slotted channels shall be grade 304 stainless steel.

4. Conduit straps for use with slotted channels shall be stainless steel or aluminum with stainless steel hardware.

5. After-set concrete inserts shall consist of stainless steel expansion bolts, ¼" minimum diameter, 500 lbs. minimum pull-out resistance.

6. Hanger rod shall be " minimum diameter Type 316 stainless steel all-thread.

7. Nest-back or clamp-back conduit supports shall be two-piece hot-dip galvanized malleable iron devices.

8. One-hole conduit clamps shall be hot-dip galvanized malleable iron type. Each clamp shall have nest-back or clamp-back spacer.

9. Conduit hangers shall be constructed of Type 304 stainless steel. Furnish B-Line "B1155" series or equal with stainless steel bolts.

10. Conduit "J" hangers shall consist of steel straddle with detachable bolt. Finish shall be hot dipped galvanized.

11. Conduit "U" bolts shall be hot-dip galvanized steel with galvanized hex-head bolts.

12. Conduit beam clamps shall be hot-dip galvanized malleable iron. Minimum bolt size shall be ¼".

13. Hanger rod beam clamps shall be clamp type with hardened steel, bolt, Steel City "500" Series, Crouse-Hinds type "MW," or equal. Furnish swivel stud for each rod make-up.

14. Conduit clamps for supporting conduit off of structural beams shall be Steel City type "RC," "EC," or type "PC" as required.

15. Equipment stands for supporting freestanding devices such as safety switches shall consist of two (2) pipe supports with horizontal aluminum slotted channel members. Each pipe support shall be two (2") inch I.D. Schedule 40 steel that shall be welded to a 5" x 5" steel plate with four (4) ½" diameter bolt holes. Provide each pipe with top-cap and hot-dip galvanize with 3-mil minimum thickness, each pipe after fabrication. Use stainless steel hardware for assembly of slotted channels and for attachment bolts.

16. Plastic saddles for supporting buried conduits shall be interlocking type that provides separation between conduit vertically and laterally and between bottom of conduits and trench floor.

17. Cable saddle supports shall be glazed porcelain type assigned to slip into 1 " wide slotted channel or, clamp split type porcelain saddles with stainless straps and hardware. Furnish B-Line or equal porcelain saddles.

18. Slotted channel combination wireway and lighting fixture support shall consist of lengths of 1-5/8" x 3-1/4" single-face, painted, 12-gauge steel channel. Furnish snap cover for enclosing wireway, section joiners, beam clamps, conduit entries, fixture wiring stud nuts, and closures for making a complete, finished installation.

19. Cable tray and cable wall bracket supports shall be fabricated of 1-5/8" wide x 3-1/4" deep double face channel, one end of which shall be welded to a wall support plate. All metal material shall be grade 316 stainless steel.

20. Plywood for exterior use shall be solid core marine grade in size and thickness required or indicated. Interior use plywood shall be solid core, C-D grade. All exterior plywood shall be edge trimmed with ¾" No. 1 fir strips with mitered corners.

2.07 MISCELLANEOUS MATERIAL

A. Double bushings for insulating wiring through sheet metal panels shall consist of mating male and female threaded phenolic bushings. Phenolic insulation shall be high-impact thermosetting plastic rated 150 degrees C.

B. Conduit pull-cords for use in empty raceways shall be glass fiber reinforced tape with foot-marked identification along its length.

C. Conduit thread coating compound shall be conductive, non-galling, and corrosion-inhibiting.

D. Fireproof conduit sealant: Non-hardening, putty-like consistency workable at temperatures as low as 35 deg F. Compound shall not slump at a temperature of 300 deg F and shall readily adhere to clean surfaces of plastic ducts, metallic conduits conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and the common metals. Compound shall have no injurious effect on worker's hands or materials.

E. Corrosion inhibitors shall be vapor-emitted chemical packet that causes a protective film covering over interior parts of enclosed equipment. Furnish Hoffman type "A-HCI", Cutler-Hammer type "C799", or equal products and in sizes to match the volume of each enclosure so protected.

PART 3: EXECUTION

3.01 RACEWAYS

A. General

1. Install the conduit system to provide the facility with the utmost degree of reliability and maintenance free operation. The conduit system shall have the appearance of having been installed by competent workmen. Kinked conduit, conduit inadequately supported or carelessly installed, do not give such reliability and maintenance free operation and will not be accepted.

2. Raceways shall be installed for all wiring runs, except as otherwise indicated.

3. Conduit sizes, where not indicated, shall be N.E.C. code-sized to accommodate the number and diameter of wires to be pulled into the conduit. Unless otherwise indicated, ¾" trade-size shall be minimum size conduit.

4. The total number of bends in a conduit run shall not exceed 360°. Install pull boxes, conduit bodies, pulling elbows or tees as needed.

5. All conduit runs shall be watertight over their lengths of run, except where drain fittings are indicated. In which cases, install specified drain fittings.

B. Location of Conduits

1. The Drawings only show conduits diagrammatically. All conduits are to be located in the field except where a specific conduit routing is shown. Site conditions will affect the routing of conduits. Coordinate the location and measurement with equipment manufacturers to avoid conflicts.

2. Conduits shall be routed parallel to the lines of the building, structure or equipment. Conduit crossovers are prohibited.

3. Unless otherwise noted, conduit runs shall be installed exposed except in the following locations:

   a. Above suspended ceilings. No raceways service devices mounted in or above suspended ceilings may be run exposed.

   b. Within stud, masonry or concrete walls in finished areas. Finished areas are defined as those that have any of the following:

      (1) Ceiling treatments other than exposed structure.

      (2) Finished flooring material other than troweled or brushed concrete, plywood flooring or unfinished wood deck.

      (3) Conduits may not be run exposed in Rooms 101-104 in the Pump Building

   c. On the exterior of buildings.

4. Conduits shall be routed not to interfere with, or prevent access to piping, valves, ductwork or other equipment for operation maintenance or repair.

5. Maintain minimum 6 inches separation between instrumentation and power conduits.

6. Maintain minimum 6 inches separation from process, gas, air and water pipes.

C. Field Bending of Conduits

1. Utilize tools and equipment designed for the purpose and for the material being processed to make all field bends.

2. Do not reduce the internal diameter of the conduit when making conduit bends.

3. For rigid metallic conduit:

   a. Use an EMT bending shoe to make bends in ½ inch and ¾ inch conduit.

   b. Use a hydraulic bender to make bends in 1 inch and larger conduit.

   c. Use plastic coated bending tools or take other steps to prevent damage to the coating of PVC coated rigid metallic conduit.

4. For rigid nonmetallic conduit use a "hotbox" heater utilizing infrared heat and a bending guide or jig to make bends in all sizes of conduit.

D. Field Cutting and Threading Conduit

1. Utilize tools and equipment designed for the purpose and for the material being processed when cutting and threading.

2. For rigid metallic conduit:

   a. Use pipe roller cutter for cutting to length.

   b. Use reamer to debur, smooth, and evenly chamfer the inside.

   c. Use pipe threader to thread the conduit. For PVC coated conduit, use a special die that has rear reamed out oversize so as to slip over plastic coating. Do not attempt to cut threads on plastic coated conduit with regular dies, whereby plastic coating is skinned back to allow the incorrect die to be used. Coat any minor damage to conduit coating with a PVC coating system purchased from the conduit manufacturer.

   d. Degrease threads after threading and apply a zinc rich paint.

3. For rigid nonmetallic conduit:

   a. Use fine tooth handsaw and miter box for cutting to length.

   b. Use reamer to debur, smooth, and evenly chamfer the inside.

   c. Smooth exterior to remove all burrs.

4. For flexible conduit:

   a. Use hacksaw and cutting vise or miter box for cutting to length.

   b. Debur interior and exterior after cutting.

E. Conduit Connections

1. Plastic coated metallic conduit lengths shall be joined with threaded metallic coupling that shall be each equipped with a 40-mil thickness sleeve that shall extend over the threads of the joined conduit.

2. Rigid metallic conduit runs shall have their couplings and connections made with screwed fittings and shall be made up wrench tight. Check all threaded conduit joints prior to wire pull.

3. Rigid nonmetallic conduit and fittings shall be joined utilizing solvent cement. Immediately after installation of conduit and fitting, the fitting or conduit shall be rotated ¼ turn to provide uniform contact.

F. Underground Conduit Runs

1. Underground conduit runs shall be installed at least eighteen (18") inches below finished grade, but do not install at depths greater than twenty-four (24") inches unless otherwise indicated. Install continuous "Buried Conduit" labeled tape over each yard run. Where runs are grouped, install one tape to serve the group of conduits. Set continuous tape at approximately eight (8") inches below finished grade.

2. Place all joints side by side horizontally.

3. Raceways shall be installed to drain away from buildings; raceways between manholes or handholes shall drain toward the handholes. Raceway slopes shall not be less than 3-in per 100 ft.

4. Where conduit leaves a structure horizontally underground, the first five (5') feet of conduit leaving the structure shall be plastic coated rigid steel conduit.

5. Where bends in raceways are required, plastic coated rigid steel, long radius elbows, sweeps and offsets shall be used. Minimum bending radius shall be 24-in.

6. Conduit upturns from below-grade earthen runs, unless otherwise indicated shall be installed as follows:

   a. Conduit upturns from below-grade earth runs shall be brought up with plastic coated rigid metallic conduit. Continue thence with plastic coated metallic conduit to at least 6" above finished grade. Make transition to structure run with metallic conduit.

   b. Install expansion fitting on each conduit that rises from below-grade and proceeds along surface of structure. Thread each hub of the outer barrel on end of upturn riser out of earth, continue thence with metallic conduit run.

   c. Conduit upturns through concrete slabs located on grade, shall be each equipped with Schedule 40 PVC oversize sleeve. Make upturn with plastic coated rigid metallic conduit and extend outgoing line to 2'-0" outside of grade beam with plastic coated rigid metallic conduit. Fill annulus caulked between conduit and sleeve with fireproof conduit sealant.

7. Conduit Supports and Separators

   a. Supports shall provide a uniform minimum clearance of 2 inches between conduits and between the bottom of the trench and the bottom row of conduit.

   b. Place supports and separators on maximum centers as follows:

Trade Size	Maximum Support & Spacer Spacing (feet)	
	Rigid Metallic Conduit	Rigid Nonmetallic conduit
1" & Less	10	3
1¼" - 3"	14	5
3" - 6"	20	7

   c. Securely anchor conduits to supports and separators to prevent movement during placement of concrete or soil.

   d. Do not place concrete or soil until conduits have been observed by the Engineer.

G. Conduit Terminations and Penetrations

1. Conduit entrances into equipment shall be carefully planned. Cutting away of enclosure structure, torching out sill or braces, and removal of enclosure structural members, will not be acceptable.

2. Conduit runs into boxes, cabinets, and enclosures shall be set in a neat manner. Vertical runs shall be set plumb. Conduits set cocked or out of plumb will not be acceptable.

3. Use approved hole cutting tools for entrances into sheet metal enclosure. Use of cutting torch or incorrect tools will not be acceptable. Holes shall be cleanly cut and they shall be free from burrs, jagged edges, and torn metal.

4. Where conduits terminate into bottom of floor-mounted equipment such as a motor control center, provide threaded ends and set top of each conduit high enough above finished concrete so that grounding bushings can be fully threaded onto ends of conduit.

5. Where conduits terminate into bottoms of NEMA 1 and 12 enclosures install termination with coupling, nipple, double locknuts and grounding bushing inside.

6. Where conduits terminate into bottoms of NEMA 3R, 4 and 4X enclosures install termination with a threaded hub, and grounding bushing inside.

7. Ground each bushing lug to the enclosure ground.

8. Where sufficient room exists within the housing, conduits to roof-mounted equipment shall be stubbed up inside the housing.

9. Where conduits enter pull, junction and transformer boxes:

   a. Terminate rigid PVC conduits in end bells.

   b. Terminate steel conduits in insulated bushings.

10. Unless otherwise shown, conduit penetrations through walls and through floors, shall be made each with couplings set flush with the faces of the concrete pour.

11. All conduits that may allow hazardous or corrosive gasses or water to enter any building, enclosure or equipment shall be completely sealed with fireproof conduit sealant.

H. Installation of Flexible Conduit

1. Liquid tight flexible steel conduit shall be used to connect wiring to motors, limit switches, bearing thermostats, instrumentation equipment and other devices that either may have to be removed for servicing or are subject to vibration that would cause rigid connections to fail.

2. Unless otherwise indicated, maximum lengths of flexible conduits shall be three (3') feet when connecting to motors and two (2') feet when connecting to other equipment.

3. Flexible conduit may not be used to eliminate conduit fittings, conduit bends or offsets.

4. Where liquid tight flex is installed, make-up terminal ends with liquid-tight flex connectors. In wet locations, install sealing gaskets on each threaded male connector.

5. Each flex connector shall be made-up tightly so that the minimum pull-out resistance is at least 150 lbs.

I. Expansion or Expansion/Deflection Fittings

1. Install expansion fitting on each conduit that rises from below-grade and proceeds along surface of structure.

2. Conduit runs made in concrete pours or surface-mounted runs that are attached to the structure, shall be equipped with an expansion/deflection fitting where they cross an expansion joint.

3. Surface mounted, exposed aluminum conduit runs installed out-of-doors shall be equipped each with expansion fitting where such runs are longer than twenty-five feet.

J. Testing, Cleaning and Adjustment

1. Repair rigid steel conduit utilizing a zinc rich paint.

2. Repair PVC coated rigid conduits using patching compound of the same material as the coating, provided by the manufacturer of the conduit; or a self-adhesive, highly conformable, cross-linked silicone composition strip, followed by a protective coating of vinyl tape. The total nominal thickness shall not be less than 40 mil.

3. Repair surfaces which will be inaccessible after installation prior to installation.

4. Fill openings in walls, floors, and ceilings and finish flush with surface.

5. Pull mandrel with diameter nominally ¼ inches smaller than the interior of the conduit, to remove obstructions.

6. Swab conduit by pulling a clean, tight-fitting rag through the conduit.

7. Install pull tapes. Pull tape for rigid nonmetallic conduit shall be nylon or polyethylene.

8. Tightly plug ends of conduit with tapered wood plugs or plastic inserts until wire is pulled.

9. Install pull-tapes in empty conduits. Identify each terminus as to location of other end and trade size of conduit. Use blank plastic waterproof write-on label and write information on each label with waterproof ink.

K. Raceways runs made in hazardous areas shall comply with Article 500 of NEC. The hazardous areas involved are as follows:

1. Wet well of Lift Station and dry pit of lift station: Class 1, Division 2, Groups C, D.

2. Clarifier/digester sump pump pit. Class 1, Division 2, Groups C, D.

3. Return activated sludge sump pump pit. Class 1, Division 2, Groups C, D.

3.02 CONDUIT BODIES AND BOXES

A. Conduit bodies such as "LB," "T," "GUAT," etc., shall be installed in exposed runs of conduit wherever indicated and where required to overcome obstructions and to provide pulling access to wiring. Covers for such fittings shall be accessible and unobstructed by the adjacent construction. GUA series pulling bodies rather than LB's and the like, shall be used for splicing purposes as well as pulling access.

B. Covers for all conduit bodies shall be installed with gasketed cast metal type where located in damp or wet locations. Where LB and related type conduit bodies are located in dry locations, install aluminum covers.

C. All conduit boxes installed whose inside volume is less than 100 cubic inches shall be cast metal type with gasketed cast metal cover, unless otherwise indicated.

D. All conduit boxes installed whose inside volume exceeds 100 cubic inches shall be sheet metal type except where gasketed cast metal type or fiberglass reinforced polyester are indicated.

3.03 RACEWAY SUPPORT

A. All raceway systems shall be adequately and safety supported. Loose, sloppy and inadequately supported raceways will not be acceptable. Supports shall be installed at intervals not greater - than those set forth under Article 300 of NEC, unless shorter intervals are otherwise indicated, or unless conditions require shorter intervals of supports.

B. Support all conduits within 3 feet of the conduit termination. Support all conduits at 90-degree bends and at vertical drops. Provide substantial vertical support for all conduit drops for stability and to minimize vibration.

C. Do not exceed maximum concentrated load recommended by the manufacturer on any support.

D. Surface mounted runs of conduit on concrete or masonry surfaces shall be supported off the surface by means of aluminum slotted channels and conduit clamps. Attach each slotted channel support to concrete surface by means of two (2) ¼" diameter stainless steel bolts into drilled expansion shields.

E. Conduit runs that are installed along metallic structures shall be supported by means of beam clamps and conduit hangers.

F. Single conduit runs that are installed along walls and ceilings shall be supported with conduit clamps and spacers.

G. Multiple conduit runs shall be supported with 1 " X 1 " channel and channel straps.

H. Below-grade conduits shall be supported with plastic saddles.

I. Field cut ends of hot-dipped galvanized channel shall be filed smooth and cold galvanized.

J. The following supporting methods are prohibited:

1. Using perforated strap hangers
2. Using the suspended ceiling grid to support raceways
3. Interfering with vapor barriers or insulation
4. Using concrete nails or power set anchors

END OF SECTION

SECTION 26 24 19

MOTOR CONTROL CENTER MODIFICATION

PART 1: GENERAL

1.1 EXISTING MCC - DESCRIPTION

A. Two existing 400 HP vertical turbine pump motors controller shall be upgraded from full voltage non reversible starter and soft starters to standalone clean power 18-pulse Variable Frequency Drives (VFDs). The existing two (2) MCC sections for the pumps No. 2 and No. 4 are part of two MCC lineups. The existing Pump No. 2 resides in 1,600A MCC-A while pump No. 4 resides in 1,200A MCC-B. These two MCC are independent of each other and are served by two separate feeds from the outdoor utility pad mounted transformers,

B. Pump No. 2 is currently controlled via soft starter installed on the back side of the existing MCC-A with a NEMA 6 full voltage non-reversible starter as a bypass that occupies entire MCC section. Pump existing control is located inside MCC starter section and must be preserved and unaltered. The existing soft starter for Pump No. 2 shall be phase out by removing the line side and load side wires while leaving the starter in place for spare parts for the soft starters that will continue to operate.

C. Pump No. 4 is located in MCC-B and is currently controlled only with a full voltage non-reversible starter. Pump existing control is located inside MCC starter section and must be preserved and unaltered.

D. The existing motor control centers are 480V three phase, three wire, 60 Hz by Square D.

1.2 SCOPE

A. Pump #2 soft start shall be disconnected, and wires between the MCC and the soft starter physically pulled out. The soft starter for Pump 2 will stay in place, and disconnected to be used for the spare parts.

B. Pump #2 VFD shall be at the east end of the soft start lineup. Cable connection between the MCC starter section and the VFD shall be through the MCC-A, on the bottom. Existing circuit breaker inside MCC-A starter section shall be preserved and connected to the line side of the VFD breaker through the existing Ground Fault Protection Loop below the breaker. The existing NEMA 6 contactor and overload relay shall be removed and delivered to Owner. In its place, a set of new mechanical lugs shall be installed as shown on the plans to allow for a splicing of the load side cable from the VFD and the existing pump cables at the bottom of the MCC section.

C. Pump #4 VFD shall be installed sideways at the east end of the MCC-A. Cable connection between the MCC starter section and the VFD shall be through the MCC-A, MCC-B and in the new conduits above suspended ceiling as shown on the plans. Existing circuit breaker inside MCC-B starter section shall be preserved and connected to the line side of the VFD breaker through the existing Ground Fault Protection Loop below the breaker. The existing NEMA 6 contactor shall be removed and delivered to Owner. In its place, a set of new mechanical lugs shall be installed as shown on the plans to allow for a splicing of the load side cable from the VFD and the existing pump cables at the bottom of the MCC section.

D. The existing hard wired pump control inside MCC pump sections shall not be altered. Instead, only master relay contacts that initiate the pump to start shall be rewired and redirected from the across line starter to the RUN input terminals on the new VFD. Also, the RUN status contacts, instead of coming to the Multilin Motor Manager from auxiliary contacts of the starter will come from output contacts of the new VFD.

E. The existing, door mounted Pump #1 motor circuit protector failed and needs to be replaced with the current version of the same model of the motor protective monitor which is Multilin Motor Manager 2 by GE, latest model revision.

1.3 SUBMITTAL AND SHOP DRAWINGS

A. Process catalog data submittals for the motor control centers

B. Process shop drawings for the following:

1. GE Multilin Motor Manager 2
2. Mechanical Lugs
3. Custom built mounting plate for the mechanical lugs attachment.

1.4 REGULATORY REQUIREMENTS

1. UL Listed 52TL - GE Multilin Motor Manager 2
2. UL 486B tested, AL9CU rated mechanical Lugs

1.5 EQUIPMENT FIELD SERVICE

A. Contractor shall provide presence of trained GE factory technician to check the wiring of the Multilin Motor Manager and set it up for the actual pump properties. Technician shall stay present during the pump startup and run to observe and check the proper functioning of the Multilin Motor Manager.

PART 2: PRODUCTS

2.1 GENERAL ELECTRIC MULTILIN MOTOR MANAGER 2

Furnish new GE Multilin Motor Manager 2, order number MMII-C-00-120. Before placing the order, the Contractor shall take the existing Multilin manager Serial and Model number and verify with GE support that the specified model and order number is compatible with the existing one.

2.2 MECHANICAL LUGS

Furnish triple sets of mechanical lugs to splice the new VFD load side cables to the existing pump cables at the bottom of the MCC sections. Mount lugs on a fiberglass insulator plate as shown on the plans.

Furnish Thomas&Betts Two-hole Mechanical Lugs, for four (4) conductor (#2- 600MCM), Model ASL60-42; UPC 78378613317, no equal

2.3 MECHANICAL LUGS MOUNTING PLATE

The proposed set of 3 mechanical lugs (2-hole, 4-conductor) shall be installed on an 1/8” standard fiberglass mounting plate with pair of Z shaped 14 gauge channels to provide minimum 3-inch free space between the insulating plate at the back panel of the MCC for line side VFD cable routing. This space created behind proposed mechanical lugs shall be used for a for passage of the line side set of conductors from the MCC circuit breaker to the new VFD.

PART 3: EXECUTION

3.1 MOTOR CONTROL CENTERS – STARTER CONTACTOR REMOVAL AND LUG INSTALLATION

A. Contractor must not relocate or alter the existing pump hard wired control that currently resides inside each pump MCC section. Only redirect the Pump Start/Stop master relay to start the VFD instead of the soft starter or constant speed starter. Also, replace the pump run status contact to come from the VFD output rather than from the constant speed starter as shown on the plans.

B. Installation shall be NEC compliant regardless the wire bending spaces inside MCC. Where wire bending space is not sufficient inside a single pump MCC section, the wires shall be extended horizontally on the floor and cables bent inside first available gutter space inside MCC at no additional cost to the Owner.

C. The existing NEMA Size 6 contactors shall be removed and delivered to the Owner in both MCC-A and MCC-B. The space occupied by the contactor shall be used to mount set of 2-hole 4-wire mechanical lugs on an insulating.plate (standard 1/8” thick fiberglass is specified)

D. Remove trim of each motor control center and tighten all bus bolts to torques recommended by the manufacturer. Spray dab of glyptol paint on each such bolt tightened.

E. Phase band each power cable at its termination. Label each control wire with numbered marking labels at each terminal. Neatly train and lace all gutter wiring with nylon tie wraps. Do not obstruct relays and other pan-mounted devices with load cables.

F. Bond ground bus in each mains section to hereinbefore specified flush floor grounding connector. Use #4/0 bonding jumper.

G. Install engraved laminated phenolic nameplate over each door of each cubicle to identify it, use 3/4" high black background nameplates. Also, install on outside front of each NEMA 3R enclosure a 1½" high micarta nameplate to identify the motor control center.

H. Install engraved micarta nameplates to identify each timer, delta current monitor, ground-fault relay, and other non-RPO door-mounted devices.

I. Install "DANGER 480V" voltage warning labels on front at top of each section.

J. Coordinate installation and start-up of motor control center with its manufacturer and cooperate with them in every regard to make the unit operate as intended.

3.2 MOTOR CONTROL CENTERS – MULTILIN MOTOR MANAGER REPLACEMENT FOR PUMP NO. 1

A. The existing Pump No. 1 Multilin monitor had failed and needs to be replaced as part of this project with a brand new Multilin pump monitor.

B. Contractor shall document/record each wiring termination on the existing pump monitor before any cable is disconnected.

C. Remove all existing cables inputs and outputs. Install the new Multilin unit on the MCC door and restore all wiring connection in/out the new pump controller.

D. Contractor shall provide a site visit by an authorized service technician to set-up and start the new Multilin Pump Monitor. Allow in the bid up to six (6) hours of technician time to setup and start new monitor and give training. After the pump station monitor is successfully started, service technician shall stay at the site for min. 2-hours to explain the motor monitor features and demonstrate monitor programming to the operators.

END OF SECTION

SECTION 26 29 23

PULSE WIDTH MODULATED (PWM)

VARIABLE FREQUENCY DRIVE CONTROLLERS

PART 1: GENERAL

1.01 SCOPE OF WORK

A. This Specification describes two (2) 400 HP, 460V, 3 phase Variable Frequency Drives (VFDs) in NEMA 1 enclosure that will be installed in Hailey Pump Station in City of Mesquite

B. Provide labor, equipment, supervision and materials for the installation, testing and start-up of the variable frequency drive (VFD).

C. Provide a factory trained technician to start-up each VFD. The technician shall be present through the duration of the field acceptance testing of the driven equipment. Start-up service shall include overtime charges, travel and living expenses and replacement parts.

D. Provide 4-hours of on-site training instructions on VFD operation for the Owner's personnel. The training shall be conducted by personnel employed by the VFD manufacturer, unless prior approval of alternate instructors has been granted by the Engineer.

1.02 BIDDING ALTERNATIVES

The General Contractor shall bid VFD package including any modification to the existing MCC lineup, if necessary. This specification section covers both VFD alternatives that are allowed in this project:

A. VFD Based Bid: Two (2) 400 HP, 460V, 3 phase,CPX9000, 18-pulse clean power drives in NEMA 1 enclosure by Eaton with circuit breaker and no bypass;

B. VFD Alternative: Equivalent 18-pulse clean power drives by Danfoss with circuit breaker and no bypass;

Contractor must bid Base Bid. The Alternate Bid is optional.

1.03 RELATED WORK

A. Electrical work is included in Division 26.

B. Instrumentation work is included in Division 25.

1.04 BIDDING SUBMITTALS

A. As part of the bidding package, equipment manufacturer shall submit:

1. The list of exceptions to the specification at the beginning of the Bid. Indicate all options, special features, ratings and deviations from the specifications.

2. Equipment outline drawings showing elevation, plan and interior views, front panel arrangement, dimensions, weight, shipping splits, conduit entrances.

3. Preliminary Harmonic Analysis based on the existing pad mounted, 750 kVA utility transformer ONCOR and 1,000 kW permanently installed generator given in this section, Paragraph 1.11.

4. Furnish in form of a table or a graph drive performance at partial and full load, specifically:

    a. Overall VFD efficiency from 40% load to 100% load in 10% increments

    b. Power Factor from 40% load to 100% load in 10% increments

    c. %of Current THDi from 40% load to 100% load in 10% increments

    Provide three tables or curves listed above for fully balanced power and separate three table or curves for 1% unbalanced power.

5. ISO 9001 certification and VFD standard compliance

6. Service company name, location and distance from Hailey Pump Station in Mesquite, TX, hours of operation.

1.05 SHOP DRAWING SUBMITTALS

A. After the VFD package is awarded, submit to the Engineer, in accordance with Section 01 33 00, shop drawings and product data as follows:

1. Equipment outline drawings showing elevation, plan and interior views, front panel arrangement, dimensions, weight, shipping splits, conduit entrances and anchor bolt pattern. Indicate all options, special features, ratings and deviations from the specifications.

2. Detailed power and control schematics including external connections. Show wire and terminal numbers and color coding.

3. Clearly identify wires to be wired to and from the VFD interface board as hidden

4. Harmonic analysis report in IEEE format based on the actual transformer data.

5. Detailed power and control wiring diagram, fully labeled.

6. Instruction and replacement parts books.

7. Certified shop test reports.

1.06 REFERENCE STANDARDS

A. NFPA 70 National Electrical Code

B. NEMA ICS7 - Industrial and Control Systems Adjustable Speed Drive

C. UL 508 – Industrial Control Equipment

D. UL 508C – Power Conversion Equipment

E. IEEE Standard 519 (latest revision) - "IEEE Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems."

F. Power capacitors shall comply with ANSI/IEEE Standard 18-1980 and NEMA CP1-1973.

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

1.07 QUALITY ASSURANCE

A. Drive shall be manufactured in ISO 9001 certified facility.

B. The VF Drive and all associated optional equipment shall be UL Listed according to UL 508C Power Conversion Equipment or UL 508A Industrial Control Panel. A UL label shall be attached inside each enclosure as verification.

C. The AC Drive shall be designed, constructed, and tested in accordance with UL, NEMA, IBC, ASCE/SEI 7, and NEC standards.

D. Variable frequency drives shall utilize a field proven design. The VFD manufacturer shall demonstrate at least ten (10) years of continuous field operating experience with equipment of similar size and design. Submit a customer/user list with verifiable telephone numbers, addresses and names of customer/user representative that have the VFDs of similar size installed in a wastewater treatment/ sewage lift station facility/

E. Every power converter shall be quality assurance tested with an AC induction motor under load conditions and subjected to a dielectric voltage-withstand test, with all enclosed devices mounted and wired, prior to shipment.

F. A factory authorized service and part's company shall be located within 100 miles of the project location. Provide the name and address of the factory authorized service and parts organization nearest to the project location at the time of the bid.

G. Quality assurance documentation shall be furnished to verify successful completion upon written request of the engineer.

1.08 SYSTEM DESCRIPTION

A. Two (2) 400HP VFDs specified in this section shall control speed of two existing 400 HP Vertical Turbine Pump motors. Normal mode of operation is in "Remote" when the VFD pump shall be called for by the existing RTU, based on the level in one of the existing Mesquite elevated tanks. At that time, the pump will start ramping up after the existing electric check valve cracks open. Pumps will operate on fixed speed adjustable by the operator who will be able to override the pump start/stop and speed remotely from Operations Center or from his mobile device. No PID or PI control is anticipated at this time. When the pump needs to stop, the RTU Call for the pump will de-energize and electric check valve will start closing. When the valve is almost closed, the limit switch on the valve shall trigger the VFD to start ramping down. The pump control shall mimic the control of two VFD controlled pumps at the existing Barnes Bridge Pump Station.

B. If the VFD is left in "Remote" while the existing MCC HOA is selected in "Hand", the above described start will be similar except that the valve opening shall be initiated not by the SCADA contact closure, but by manually pressing the Start push button on the MCC door. In similar fashion, the valve closure shall be initiated by pressing the Stop push button on the MCC door. The VFD start/stop will be the same as in AUTO control described above.

C. If the VFD is in "Local" while the MCC HOA is in OFF position the VFD will start from the VFD keypad and will be ramping up against the close valve. This is a rare mode of operation during the time of very low demand when 400HP pump and motor still need to be exercised. The pump will be accelerated for very short time on low speed just to provide the pump and motor shaft rotation and lubrication of the bearings, without pumping water into the City's system.

D. Refer to the Instrumentation and Control and HMI Systems specification section for the VFD control schematic diagrams and HMI presentation.

1.09 DELIVERY, STORAGE AND HANDLING

A. Package the equipment for maximum protection during delivery and storage.

B. Store the equipment indoors in a clean, dry, heated storage facility until ready for installation. Do not install the equipment in its final location until the facilities are permanently weather tight. Furnish, install and wire temporary electric space heaters in the equipment until the permanent heating equipment is operational. Protect the equipment at all times from exposure to moisture, chemicals, hydrogen sulfide and chlorine gas.

C. If required in the driven equipment specifications, the VFD manufacturer shall ship equipment to the driven equipment manufacturer's testing facility for use during the factory acceptance test.

1.10 HARMONICS STUDIES

A. Point of Common Coupling (PCC)

The PCC, by definition in Standard IEEE-519, 1992 is the closest point on the utility side where another customer is or can be supplied with the electricity.

For the purpose of this project the PCC shall be the primary side of the utility transformer. That is the point where compliance with the harmonic distortion requirements of IEEE-519, table 10-2 and 10-3 shall be verified. For the practical reasons, VFD suppliers may, as an alternate, measure the harmonics on the secondary side of the utility transformer and then re-calculate the THD on the primary side of the utility transformer.

For information purposes factory technician shall also measure THD at the load side of the VFD breaker with only one VFD running. However, measurement at the utility transformer shall govern regarding the IEEE-519 harmonics compliance.

B. Preliminary Harmonics Study in Bidding Package

1. Provide an electrical system harmonics study for City of Mesquite Hailey Pump Station. The goal of the study shall be to determine requirements for the drives, transformers and filters as required to comply with the harmonic distortion levels (current and voltage) allowed per this Section under the operating conditions specified.

2. The power source for preliminary harmonics analysis are as follows:

   a. Utility transformer: 1,000 kVA (MCC-A); 750 kVA (MCC-B)

   b. Typical standard transformer impedance: 5.75%

   c. Existing emergency generator size: 1,000 kW (1 each)

   d. Emergency generator sub-transient reactance: 0.15 P.U.

   e. Length of the incoming duct: transformer to Service Entrance ATS: 60 ft.

   f. Length of the feeder: Service Entrance ATS to MCC and VFD: 80 ft

   g. Size of the incoming duct cable: four (4) sets of 750 MCM XHHW-2 wire with 4/0 GND

3. Under normal operating conditions, harmonic currents introduced into the power system supply network from the variable frequency drives shall not exceed the distortion limits for a general system as defined in IEEE Standard 519, Tables 10-2 and 10-3 when measured at the point of common coupling. Normal operation is defined as follows:

a. Number of VFDs operating simultaneously on service for MCC-A (1,600A, one 1,000 kVA transformer): 1

b. Operating speed range: 40 to 100 percent rated speed

c. The total demand load (I_L) as defined in IEEE 519: 1,250A Amps

d. Number of VFDs operating simultaneously on service for MCC-B (1,200A, one 750 kVA transformer): 1

e. Operating speed range: 40 to 100 percent rated speed

f. The total demand load (I_L) as defined in IEEE 519: 900A Amps

4. Only the new VFD No. 2 may operate on the existing 1,000 kW emergency diesel generator during a major power outage. Under emergency operating conditions, harmonic currents introduced into the power system supply network from the variable frequency drives shall be within the distortion limits for a dedicated system as defined in IEEE Standard 519, when measured at the point of common coupling. For the purpose of VFD evaluation as part of the Bid package, assume 1,000 kW diesel genset with sub-transient reactance of 0.15 P.U. is assumed. Emergency operation is defined as follows:

   a. Existing generator size: 1,000 kW

   b. Typical sub-transient reactance: 0.15 P.U.

   c. Number of drives served: 1.

   d. Operating speed range: 40 to 100 percent rated speed.

   e. The total demand load (I_L) as defined in IEEE 519: 1,050 Amps.

5. The VFD assembly shall be designed to meet the IEEE 519 harmonics limits with up to 0.5% supply voltage unbalance. VFD manufacturer shall be responsible for any additional component that may be required to reduce the harmonic levels to below maximum values specified, at no additional cost to Owner.

6. Provide in the study estimation of the THD for individual drive run at PCC and at the VFD input terminal at full load.

C. Final Harmonics Analysis as Part of the VFD Submittal

1. The final harmonics study will be submitted before or at the time of the VFD submittal and will have all required actual utility short circuit data for the service location and any other missing relevant input as requested by the VFD manufacturer. Data shall be collected by the Contractor and submitted to VFD manufacturer during the first month of the project.

2. The format of the final harmonics study shall be identical to the preliminary study, just updated with the pump station site specific electrical data. The part of the study analyzing the harmonics while being on the emergency generator shall stay the same since the generator size will be unknown.

3. No VFD shop drawing files shall be released without Engineer's review and approval of the final harmonics study and proposed harmonic mitigation equipment by the manufacturer. This submittal shall verify compliance with the harmonics and line notching requirements specified herein, with information on the harmonics suppression system required to achieve the specified levels.

D. Study Format

The study shall contain as a minimum the following:

1. All input data and assumptions.

2. Explanation of method used to perform the study.

3. Explanation of study results with specific recommendations on filters and/or other measures that will be implemented to meet the specified limits.

4. All calculations and/or computer printouts used to arrive at the recommendations.

5. Individual drive harmonic content and the combined total drives harmonic content reflected in the system source supply voltage as a percent of the 60 Hz fundamental under actual load conditions at full load speed. Data shall be presented in tabular form.

6. The harmonic analysis shall include a system impedance diagram based on the electrical one line diagrams.

7. A detailed description of the tests, the procedures and supporting calculations required to substantiate the installed systems compliance with the specified THD limits.

   a. The description shall include information on the proposed test equipment and test conditions.

   b. The name and qualifications of the test firm shall also be included.

1.11 STUDY VERIFICATION WITH THE FIELD TEST

During the VFD 7-day startup, measured THD during individual pump run at PCC and at the VFD input terminals shall be compared against the computer program values from the study.

1.12 ACCEPTABLE VFD COMPONENTS FOR HARMONICS MITIGATION

A. It is up to VFD manufacturer to design harmonics mitigation components of the VFD assembly to meet the specified standard criteria.

B. The following are acceptable hardware alternatives as standalone options or in combination as determined by the VFD manufacturer to meet the specified THD requirements:

1. UL approved line side reactors (min 3%):

2. Phase shifting transformer as part of the 18-pulse VFD option

C. VFD DESIGN

The AC Drive manufacturer shall supply an 18-pulse VFD using a multiple bridge rectifier with a phase shifting transformer and pulse width modulation. The 18-pulse configuration shall result in a multiple pulse current waveform that approximates near sinusoidal input current waveform. The power section shall be insensitive to phase rotation of the AC line.

The output power section shall change fixed DC voltage to adjustable frequency AC voltage. This section shall use insulated gate bipolar transistors (IGBT) as required by the current rating of the motor.

1.13 OPERATING INSTRUCTION

A. After approval, during and after construction, operating manuals covering instruction and maintenance on each type of equipment shall be furnished in accordance with Section 01 78 23.

B. The instructions shall be bound and shall provide at least the following as a minimum:

1. A comprehensive index.

2. A complete "as-built" set of approved shop drawings.

3. A complete list of the equipment supplied, including serial numbers, ranges and pertinent data.

4. Full specifications on each item.

5. Updated system schematic drawings "as built", illustrating all components and electrical connections of the systems supplied under this Section.

6. Detailed service, maintenance and operation instructions for each item supplied.

7. A table listing of the "as left" drive set up parameters, timing relay settings and alarm and trip setpoints.

8. Special maintenance requirements particular to this system shall be clearly defined, along with special calibration and test procedures.

9. The operating instructions shall also incorporate a functional description of the entire system, with references to the systems schematic drawings and instructions.

10. Complete parts list with stock numbers, including spare parts.

1.14 LOAD

New VFDs shall be used to control submersible sewage pumps by Flygt. These pumps are identical in size. Pump motor relevant electrical properties are:

Size: 400 HP, vertical turbine pump motor. Motor is standard efficiency and is not inverter duty rated.

FLA: 477A

Voltage: 460 VAC

Locked rotor code: G

Phase: 3

RPM: 1185

Service factor: 1.15

Distance from VFD to pump motor: Less than 100 ft.

1.15 WARRANTY

A. In the base bid, provide a two (2) year minimum warranty on all parts and labor upon start-up and customer acceptance of the equipment.

PART 2: PRODUCTS

2.01 GENERAL

A. Drive shall be a variable torque, normal duty drive to control a centrifugal submersible sewage pump;

B. Drive shall be air-cooled via cooling fans. Intake fans at the bottom of the front doors and exhaust fans at the top of the front doors are preferred locations. **No intakes or exhaust grilles or fans will be allowed at the VFD enclosure sides**. Cooling of the VFDs must be arranged by the manufacturer to allow side by side VFD enclosure installation. No side air gaps between two adjacent enclosures shall be allowed.

C. Each VFD shall consist of an incoming circuit breaker, harmonic suppression component(s), input converter/DC bus/output inverter and control logic section. All components shall be integral to the VFD lineup, factory wired and tested as a complete system.

D. Each adjustable frequency drive controller shall be of sufficient capacity and shall provide a quality of output waveform for step-less motor control from 10% to 110% of the base speed. The adjustable frequency drives shall be suitable for variable torque applications.

E. The VFD Manufacturer shall perform any modifications to a standard product required to meet this specification.

2.02 PRE-APPROVED MANUFACTURERS

A. The general arrangement of the equipment is shown on the Drawings. All drives shall be furnished by the same manufacturer. Variable frequency drives shall be produced by one of the following manufacturers:

1. Eaton (base bid)

2. Danfoss (alternative bid)

2.03 VFD DIMENSIONS

A. Due to the very limited floor and room space at Hailey Pump Station, the maximum dimensions these drives can have are:

1. Height 92” max.

2. Width: 60” max.

3. Depth: 24” max.

2.04 RATING

A. Service Conditions

1.	Input power:	480 VAC, plus 10 percent, minus 10 percent, 3 Phase, 60 Hz.
2.	Displacement P.F.	min 95% through any load/speed range
3.	Torque/Overtorque	110% of nominal motor torque for 60 sec.
4.	Current (transient)	110% of nominal motor torque for 60 sec.
5.	Frequency Resolution	0.1 for 100 Hz (11 bit)
6.	Input frequency:	57 to 63 Hz.
7.	Ambient temperature:	0 to 40 degrees C.
8.	Elevation:	Up to 3300 feet above mean sea level.
9.	Relative humidity:	Up to 90 percent non-condensing.

B. Minimum drive efficiency: 96 percent or better at 100 percent speed and minimum 85 percent at 60 percent speed. Losses shall include all control power and cooling system losses associated with the drive. Filter losses shall be listed separately.

2.05 FEATURES

A. Voltage regulation: Plus or minus 1 percent of rated value, no load to full load.

B. Output frequency drift: No more than plus or minus 0.5 percent from setpoint.

C. Ride Through: The VFD system shall attempt to ride through power dips up to 20% of nominal. The duration of ride-through shall be inversely proportional to load. For outages greater than 20%, the drive shall stop the motor and issue a power loss alarm signal to a process controller, which may be forwarded to an external alarm signaling device.

D. Auto Reset/Run: For faults other than those caused by a loss of power or any other non-critical fault, the drive system shall provide a means to automatically clear the fault and resume operation

E. Run on Power Up: The VFD system shall provide circuitry to allow for remote restart of equipment after a power outage. Unless indicated in the contact drawings, faults due to power outages shall be remotely resettable. The VFD system shall indicate a loss of power to a process controller, which may be forwarded to an external alarm signaling device. Upon indication of power restoration the process controller will attempt to clear any faults and issue a run command, if desired.

F. Acceleration / Deceleration

1. Accel/Decel settings shall provide separate adjustments to allow either setting to be adjusted from 0 to 3600 seconds.

2. A second set of remotely selectable accel/decel settings shall be accessible through digital inputs.

G. Speed Profiles

1. Programming capability shall allow the user to produce speed profiles with linear acceleration/deceleration or "S Curve" profiles that provide changing accel/decel rates.

2. “S” Curve profiles shall be adjustable.

H. Communication: Modbus, via RS-485 network.

I. Process PID Control

1. The drive shall incorporate an internal process PI regulator with proportional and integral gain adjustments as well as error inversion and output clamping functions.

2. The feedback shall be configurable for normal or square root functions. If the feedback indicates that the process is moving away from the set-point, the regulator shall adjust the drive output until the feedback equals the reference.

3. Process control shall be capable of being enabled or disabled with a hardwire input. Transitioning in and out of process control shall be capable of being tuned for faster response by preloading the integrator.

4. Protection shall be provided for a loss of feedback or reference signal.

J. Drive sound level: 80 dBA (maximum) at 3-ft, test method A. This shall include noise made from the entire drive enclosure including filters, capacitors, fans, transformers, etc, and all other components associated with the enclosure. The VFD manufacturer shall provide sound attenuation equipment necessary.

K. Combined pump and motor sound level: 3 dBA above published average motor noise at 10-ft, test method A. Pump and motor manufacturer shall provide sound attenuation equipment necessary as dictated by the VFD manufacturer.

L. The VFD shall have four programmable “skip frequencies” with adjustable bandwidths to prevent the driven equipment from running at a mechanically resonant frequency.

M. Speed control shall be directly proportional to a 4-20 milliamperes (mA) or 0-10 Volt automatic speed command (reference) signal over approximately 40%-100% full speed. The 4-20 mA input circuit in the VFD shall be fully optically isolated.

2.06 PROTECTION

A. Provide adequate input line reactor protection to cover normal power system transients (3% impedance minimum) and harmonic reduction.

B. Programmable, electronic motor inverse time overload protection.

C. The VFD shall be protected from damage due to the following, without requiring an output contactor:

1. Single-phase fault or three-phase short circuit on VFD output terminals.

2. Failure to communicate with the inverter thyristor due to severe overload or other conditions.

3. Loss of input power due to opening of VFD input disconnect device or utility power failure during VFD operation.

4. Loss of one (1) phase of input power.

5. Motor regeneration due to backspin or loss of VFD input power.

D. The VFD shall be able to withstand the following fault conditions without damage to the power circuit components.

1. Failure to connect a motor to the VFD output.

2. Overvoltage and undervoltage.

3. Continuous ground fault or 3 phase short circuit of VFD output terminals.

4. Drive over temperature.

5. Control logic circuit malfunction.

6. Each VFD shall be provided with adequate input protection to cover normal power system transients.

7. VFD output open circuit that may occur during operation.

E. The VFD shall have auto frequency rollback capability during overload or overtemperature and conditions to minimize nuisance tripping.

F. An active, adjustable torque limit is recommended for the VFD. The VFD should be capable of operating continuously in torque limit to prevent nuisance overcurrent trips.

G. Control functions such as speed setpoint, start, stop, alarm, and status functions shall be transmitted as discrete I/O to the station PLC. The VFD shall be capable of communicating setup parameters for 4 diagnostics, trending information, and diagnostic log downloading over the specified communication network.

H. All I/O, discrete, and analog signals shall be wired to terminal blocks for Owner’s use.

2.07 CONSTRUCTION

A. General

1. The control logic section shall be fully digital. A power failure will not necessitate a re-load of any drive parameters or configurations. The controller shall be suitable for any standard NEMA Lock Rotor Code F or G squirrel cage induction motor having a service factor of 1.15. The inverter output shall be generated by insulated gate bipolar transistors (IGBT's). The VFD shall not create excessive power losses in the motor.

2. The VFDs shall utilize a digital pulse width modulated (PWM) design to convert the fixed AC input to a variable voltage, variable frequency AC output. Construction shall be modular, using plug-in type component mounting or keyed ribbon cable connections wherever possible to minimize downtime during repair.

3. The VFD operate satisfactorily when connected to a bus supplying other solid state power conversion equipment which may be causing up to 10 percent total harmonic voltage distortion and commutation notches up to 36,500 Volt microseconds, or when other VFD's are operating from the same bus. The drive shall include transient voltage suppression to allow reliable operation on a typical commercial power distribution system.

4. The VFD shall consist of a full-wave diode bridge converter to convert incoming fixed voltage/frequency to a fixed DC voltage. A DC link inductor shall be provided to smooth out converter ripples and to limit fault current throughput. The PWM strategy shall be of the IGBT type implemented through a microprocessor which generates a sine-coded output

voltage. The inverter/converter control shall be designed to minimize audible motor noise to a level at or near the motor noise that would be produced while operating on a pure 60 Hz sine wave.

5. The output shall be generated by power transistors which shall be controlled by identical, optically isolated base driver circuits. The VFD shall not induce excessive power losses in the motor. The worst case RMS motor line current measured at rated speed, torque and voltage shall not exceed 1.05 times the rated RMS motor current for pure sine-wave operation. The VFD shall have an output voltage regulator to maintain correct output Volt/Hertz despite incoming voltage variations. The VFD shall have a continuous output current rating equal to or greater than the motor full load nameplate current.

6. The drive can be located up to 300 feet from the motor without requiring special cabling or separate motor protection devices. If special cabling or separate motor protection devices are required, they shall be supplied by the VFD supplier at the VFD manufacturer's expense

B. Enclosure

All VFD components shall be factory mounted and wired in a NEMA 1 enclosure. A freestanding enclosure shall be provided, and it shall be suitable for mounting on a concrete housekeeping pad or directly on concrete floor. Enclosures have the following features:

1. 24" depth (preferred), front-accessible, standalone type suitable for installation back-to-back to a 20-inch deep motor control center section.

2. Constructed of not less than 14 gage steel with 16 gage steel doors in standardized units.

3. Bottom rails;

4. Bottom wiring space. Spaces shall line up with adjacent motor control center units to form convenient wiring raceway to the adjacent panels.

5. 7'-6" normal height above bottom rails

6. Metal print pocket inside the door

7. Shipping splits shall be located as required to get the equipment into room in which the unit is to be installed.

C. VFD Ventilation Fan Location

Fan for the VFD cooling shall be mounted in the upper half of the front VFD door and intake louvers at the bottom of the door. The air intake shall be design by the VFD manufacturer in such way that will allow drive to be mounted with no side or back clearance. The ventilation fan placement at the top of the enclosure will not be acceptable.

D. Structure

1. Doors shall have concealed hinges and three-point latching mechanism with lockable handle. Rear access shall not be required.

2. Incoming line power cables shall enter at the bottom of the cabinet (on the side). Outgoing load cables may exit at the side of the cabinet or on the top of the enclosure.

3. Each VFD shall have a service disconnect fused switch or breaker with the door mounted handle.

4. Provide the following safety features:

    a. Provision to padlock main disconnect handle in the OFF position and to apply lock-out, tag-out procedure.

    b. Mechanical interlock to prevent opening cabinet door with disconnect in the ON position, or moving disconnect to the ON position while the unit door is open.

    c. Mechanical or electrical interlocks on doors of auxiliary sections of multi-bay cabinets interlocked with the service disconnect.

    d. Barriers and warning signs on terminals that are energized with the power disconnect OFF.

5. Provide an equipment ground bus or lug connectors in each structure, suitable for connection to the copper grounding conductors shown on the Drawings.

6. Inputs and Outputs

    a. The Input / Output option modules shall consist of both analog and digital I/O.

    b. No jumpers or switches shall be required to configure digital inputs and outputs.

    c. All digital input and output functions shall be fully programmable.

    d. The control terminal blocks shall be rated for 120VAC.

    e. Inputs shall be optically isolated from the drive control logic.

    f. The control interface card shall provide input terminals for access to fixed drive functions that include start, stop, external fault, speed, and enable.

    g. The Input / Output option modules shall have the following features:

    H. Two (2) differentially isolated, 4-20 mA or 0-10V analog inputs, with interference filtering.

        (1) Analog inputs shall be user programmable. One input shall be dedicated to 4-20 mA wet well level signal to be used in AUTO backup control mode. The other AI shall be assigned to the potentiometer (0-10V DC) located by the pump and will be used in Hand mode only.

    i. Analog Outputs:

        (1) There shall be at least two (2) software assignable analog output with interference filtering. The analog outputs can be selected and assigned in the software. The analog output assignments shall be proportional to the following motor characteristics: frequency, current, power torque, voltage, and thermal state. The output signal shall be user-defined configurations: mA or V

    j. Digital Inputs

        (1) Provide at least six (6) software assignable logic inputs that shall be selected and assigned in the software. The logic input assignments shall consist of forward, reverse, jog, plus/minus speed (2 inputs required), setpoint memory, preset speeds (up to 8 inputs), auto/manual control, controlled stop, terminal or keypad control, output contactor (2 inputs required), motor switching, and fault reset.

k. Digital Outputs:

(1) Two (2) voltage-free Form C relay output contacts shall be provided. One of the contacts shall indicate AC Drive fault status. The other contact shall be user assignable.

l. Extension Module:

(1) Drive shall be furnished with at least one (1) plug in expansion module to accommodate all required inputs and outputs if the basic control board does not have sufficient number of I/Os to comply with these specifications.

(2) The module shall be fully isolated and housed in a finger-safe enclosure with pull-apart terminal strips. All of the inputs and outputs shall be user assignable in the software as previously defined.

m. Network Module:

The VFD shall be equipped for Modbus protocol communication via RS-485 network. The VFD manufacturer shall provide system integrator with latest and up-to-date VFD register map that he can use to map the VFD registers to the HMI screen as selected by the Owner or Engineer. The VFD manufacturer shall provide full and unlimited phone support to the system integrator until he is able to map all requested VFD register data to HMI screen and successfully provide the VFD remote control via Modbus Network.

E. Control Wiring

1. Wiring: 600 Volt, stranded copper, 105 degree C color coded insulation, minimum size No. 14 AWG (120 VAC control power only).

2. Identification and termination: Crimp type wire lugs with sleeve type markers at each termination point. Provide numbered terminal blocks for external connections.

3. Control power: Provide a 120 VAC, control power transformer fused on the primary and secondary for cooling fans, motor space heaters and external control circuits. Control circuits shall be isolated from power circuits.

4. Controls shall, as a minimum, perform the control logic indicated on the Contract Drawings and as specified herein.

F. Operator Interface

1. Provide a door-mounted, plain English, digital keypad/display, capable of controlling the drive and setting drive parameters. The digital display shall normally display:

a. Speed demand in percent;

b. Output current in amperes;

c. Frequency in Hz;

d. Control mode - manual or automatic;

e. Total 3 phase kW;

f. Output voltage.

2. The digital keypad shall allow operators to enter exact numerical settings in English engineering units. A user menu shall be provided as a guide to parameter settings. Coded messages on keypad will not be acceptable. Parameters are to be factory set in EEPROM and resettable in the field. Parameters shall be password protected. The EEPROM stored variables shall be transferable to new and spare boards.

3. The keypad/display module shall have a key switch to control operation of the keypad. The key shall be removable in either the "Enabled" or "Disabled" positions. The keypad module shall contain a "self-test" software program that can be activated to verify proper keypad operation. The keypad display shall contain a full alphanumeric character set.

4. The following keypad functionality shall be provided as the minimum:

5. LED lights for Run and Fail;

   Local/ Remote or Hand/Auto selector key;

   Alphanumeric backlit screen;

   Arrow “Up” and “Down” keys for speed control or menu selection;

   Arrow “Left” and “Right” keys for menu selection;

   ENTER button to memorize menu parameters;

   Escape button.

6. The following 22 mm controls and indicators shall be provided, either separately or as part of the keypad/display:

   a. FAULT RESET push button

   b. Pull to stop, Maintain type E-stop

   c. Five digit, non-reset, elapsed time meter. Marking and Identification

7. Provide 2-in by 5-in, nominal, engraved lamicoid master nameplates on each VFD fastened with stainless steel screws or rivets. Nameplates shall be white with black core, 3/8-in high lettering and shall indicate equipment designation as shown on the Drawings.

8. Provide legend plates or 1-in by 3-in engraved nameplates with 1/4-in lettering for identification of pilot devices and meters.

9. Provide permanent warning signs as follows:

   a. "Danger-High Voltage-Keep Out" on all cabinet doors.

   b. "Warning-Hazard of Electric Shock - Disconnect power before opening or working on this unit" on main power disconnect.

2.08 OPERATIONS AND FEATURES

A. Make provisions for field adjustment of the following parameters through the keypad/display:

   1. Current limit and boost.

   2. Voltage (Minimum/Maximum, Volts/Hz.)

   3. Speed profile (Minimum/Maximum speed, On/Off delay, Entry/Exit speeds).

4. Independently adjustable acceleration and deceleration rates.

5. Auto restart delay.

6. Inverse time overload (current, time and speed), I2T.

7. Undervoltage trip level.

B. Make provisions to accept a remote dry contact closure to start and stop the drive(s) with the drive control system in the AUTO mode.

C. Make provisions to accept a 4-20 mA DC input signal for remote speed control. Input shall be isolated at the drive and active with the drive control system in the AUTO mode. Zero and span adjustability shall be provided.

D. Provide a 4-20 mA DC isolated output signal proportional to speed for remote speed indication. The signal shall have a minimum of 750 ohm load capability.

E. Furnish Modbus 485 network card inside each VFD.

F. Provide the following short circuit and input protective features:

1. High speed current limiting input fuses and line reactors.

2. Solid state instantaneous overcurrent trip.

a. Variable Torque - 225 percent RMS

b. Constant Torque - 265 percent RMS

3. Undervoltage protection with automatic restart (65 percent of rated voltage).

4. Phase sequence lockout.

5. Phase loss lockout.

6. Overvoltage trip (130 percent of drive rated voltage).

7. Ground fault, either running or at start.

G. Provide the following internal protective features:

1. Transient surge protection using MOVs

2. Semi-conductor overtemperature and overcurrent protection.

3. Current limit, inverse time type.

4. DC bus fuse protection and discharge circuit.

5. DC bus overvoltage trip.

H. Provide the following output protective features:

1. Inverse time motor overload protection.

2. Static overspeed protection.

3. Stall protection on overload with inverse time overcurrent trip.

4. Protection against opening or shorting of motor leads.

5. Pre-alarm warning and shutdown on motor overtemperature.

6. Critical speed avoidance circuit (4 zones).

2.09 DIAGNOSTIC AND FAULT CAPABILITY

A. The following conditions shall cause an orderly drive shutdown and lockout.

1. Incorrect phase sequence.

2. Blown input fuse or single phasing of supply.

3. Control power supply failure.

4. Instantaneous overcurrent.

5. Sustained overload or motor overtemperature.

6. Semi-conductor overtemperature.

B. Provide complete built-in diagnostic and test capability to enable maintenance personnel to rapidly and accurately identify the cause of equipment failure. Diagnostic features shall include, but not be limited to the following:

1. Fault annunciator with alphanumeric or coded display.

2. Communication port

C. Provide neon or LED indicators on control cards and power modules to identify transistor and diode failures, blown fuses and control failures.

1. A "FAULT LOG" shall be accessible line by line on the keypad display. The “FAULT LOG” shall record, store, display and print upon demand, the following for a minimum of the last fifty (50) most recent events:

a. VFD mode of operation

b. Date and time of day

c. Type of fault

d. Reset mode (Auto/Manual). All faults and events shall be stored and displayed in English, not fault codes Single source responsibility, availability of service and access to

2. A "HISTORIC LOG" shall record, store, display, and print upon demand, the following control variables at 2.7 msec (2700 times per second) intervals for the 50 intervals immediately preceding a fault trip. As a minimum, the following control variables shall be recorded:

a. VFD mode of operation

b. Speed demand

c. VFD output frequency

d. Demand (output) Amps

e. Feedback (motor) Amps

f. VFD output volts

g. Type of fault

h. SCADA enable

2.10 DIAGNOSTIC FEATURES AND FAULT HANDLING

Each VFD shall include a comprehensive microprocessor based digital diagnostic system, which monitors its own control functions and displays faults and operating conditions. Microprocessor systems must be products of the same Manufacturer as the VFD (to assure spare parts availability)

2.11 SURFACE PREPARATION AND SHOP COATINGS

A. All non-current carrying metal parts of the equipment cabinet shall be cleaned of all weld spatter and other foreign material and given a heat cured, phosphatized chemical pre-treatment to inhibit rust.

B. Indoor equipment shall be finish painted with one coat of manufacturers standard electrocoated, heat cured enamel.

C. Unpainted non-current carrying parts shall receive a protective zinc plating to prevent corrosion. **Printed circuit boards shall be coated with a protective conformal epoxy**.

PART 3: EXECUTION

3.01 INSTALLATION

A. The equipment shall be leveled and anchored directly to the finished floor. Provide hardware and metal shims for installation. Grout and caulk all voids beneath the equipment base. Anchor bolts shall be 1/2-in galvanized steel.

B. Install the equipment in accordance with the manufacturer's instructions.

C. Remove temporary lifting angles, lugs and shipping braces. Touch-up damaged paint finishes.

D. Make wiring interconnections between shipping splits.

3.02 SHOP TEST

A. Provide in accordance with Section 01 45 23.

B. Perform shop test on each unit prior to shipping. Test will consist of simulating the expected load to be driven, by operating the load through the speed ranges specified for the driven equipment over a minimum or 2 hours.

C. Provide a factory control and alarm test on each drive unit by simulating each control signal and each alarm function to verify proper and correct drive unit action.

D. Each VFD shall be given complete factory test including simulating operating of all control and shut down functions. All printed circuit boards shall be tested at 50 degrees C for 50 hours. Certified test reports shall be provided after the tests have been completed.

E. Provide above stated tests in addition to any standard factory tests performed.

F. The trap shall be tested for proper operation before leaving the factory. Testing shall include full power operation at rated voltage and current and an overload check. The test waveform shall

be provided by an actual non-linear load to ensure that the filter and protection monitor function properly under real operating conditions.

3.03 FIELD TESTING

A. Make the following minimum test and checks before the manufacturer's representative is called in for testing and adjustment:

1. Verify that all connections are completed in accordance with shop drawings.

2. Verify supply voltage and phase sequence are correct.

3. Check mechanical interlocks for proper operation.

4. Test ground connections for continuity and resistance.

5. Adjust unit compartment doors.

6. Check control circuit interlocking and continuity.

B. The manufacturer’s service technician shall perform start-up and adjustment of the drive(s).

C. In the event of an equipment fault, or unit vibration notify the Engineer and Owner immediately. After the cause of the fault has been identified and corrected, a joint inspection of the equipment shall be conducted by the Contractor, the Engineer and Owner and the equipment manufacturers factory service technician. Repair or replace the equipment as directed by the Engineer.

D. Harmonics testing shall be completed on each installed drive individually. While drive is running THD measurements shall be taken at PCC at utility transformer and at each VFD input terminals. PCC results at the utility transformer shall govern regarding the IEEE 519 THD compliance.

E. Measured results shall be compared against the final THD study results at the PCC and down the line at the VFD input terminals. At the time of testing plant inflow may not allow running the multiple drives for verification of the TDD. IF the actual measured harmonics values at PCC and at the drive are confirming the results from the study, VFD supplier will be allowed to simulate TDD by software program and run it with 4 pumps. Program result may be used to estimate TDD with four (4) pump running if multiple pump run cannot be started due to the low inflow condition.

F. Complete harmonics measurements during the seven day pump acceptance test. Provide labor and test equipment for the field harmonics analysis. Test equipment shall be capable of displaying voltage and current waveforms and shall calculate the total harmonic distortion (TDH) of these waveforms. The equipment shall also be capable of harmonic spectrum analysis of the voltage and current waveforms from the fundamental frequency to the 50th order harmonic. Provide a hard copy of the test results from no load to full load at 10 Hz increments for each of the different combinations of drives and power sources as specified.

G. If the drives do not meet the specified performance levels, the filters shall be reconfigured or additional filter devices shall be added as required at no additional cost to the Owner. The tests shall then be run again until the specified performance is obtained.

H. The operation of the motors and driven equipment shall be inspected as a part of this test procedure to ensure that no problems with this equipment are created due to the drives. Any problems such as overheating, excessive current, excessive motor noise, vibration, etc., attributable to the drives shall be corrected under this Section at no additional cost to the

Owner. Voltage surges at motor terminals shall be within acceptable limits of the motor manufacturer.

I. If, in the opinion of the Engineer, a driven motor produces an excessive amount of objectionable noise or pure tone (noise dominated by one particular frequency), the VFD manufacturer shall conduct sound tests to determine the frequency range of the objectionable noise, and shall make corrections to the drives such that the noise is reduced to the level as specified in Paragraph 2.01 above.

3.04 ACCEPTANCE TEST DURATION

Pump seven day acceptance period will also be the acceptance test for the VFD that controls the pump. During that time, the pump shall be set to be the lead pump all the time. Operator shall continue to monitor the pump and VFD diagnostic after the initial startup test is completed by the VFD and pump technicians. IF after seven days pump and VFD run with no technical issues, the acceptance can be recommended and the next unit pair can be tested.

3.05 ADJUSTMENT

A. Make all VFD internal adjustments and all adjustments necessary for manual and automatic operation of the entire system of driven equipment.

3.06 CLEANING

A. Remove all rubbish and debris from inside and around the equipment. Remove dirt, dust, or concrete spatter from the interior and exterior of the equipment using brushes, vacuum cleaner, or clean, lint-free rags. Do not use compressed air.

B. Replace all cabinet ventilation filters upon commencement of the Contract warranty period.

END OF SECTION