PLANS AND SPECIFICATIONS FOR

CITY OF LE ROY
WATER SYSTEM IMPROVEMENTS

FEBRUARY 2021

PREPARED BY:

CHASTAIN & ASSOCIATES LLC
CONSULTING ENGINEERS
SERVICE | SOLUTIONS | COMMITMENT ™

LICENSED PROFESSIONAL ENGINEER
Brian C. Giltner
062-055223
STATE OF ILLINOIS

signature date
November 30, 2021
license expires

MARK A. BINGHAM
66480
REGISTERED PROFESSIONAL ENGINEER
OF ILLINOIS

by
date Feb. 11, 2021
expires Nov. 30, 2021

CITY OF LE ROY, ILLINOIS
WATER SYSTEM IMPROVEMENTS

CITY OFFICIALS

Steven Dean, Mayor

CITY COUNCIL

Kelly Lay	Matthew Steffen
Brad Poindexter	Rick Kline
Kyle Merkle	Dawn Hanafin
Ron Legner	Greg Steffen

Samantha Walley ..... City Administrator
Vicki Moreland ..... City Clerk
Perry Mayer ..... Water Superintendent

CITY OF LE ROY, ILLINOIS
WATER SYSTEM IMPROVEMENTS

INDEX

ADVERTISEMENT FOR BIDS

City of Le Roy
207 S. East St.
Le Roy, IL 61752

Separate sealed bids for the **WATER SYSTEM IMPROVEMENTS** project will be received at the **Le Roy City Hall, 207 S. East Street, Le Roy, IL 61752** until **3:00 p.m.** local time**, March 24, 2021,** and then at said office such bids will be publicly opened and read aloud.

The Contract Documents, including plans and specifications, may be examined at the following locations:

1. Chastain & Associates LLC, 5 N. Country Club Road, Decatur, IL 62521
2. Le Roy City Hall at 207 S. East Street, Le Roy, IL 61752

Digital copies of the Plans, Specifications and Bid Forms are available in pdf format from the Engineer at no cost by emailing jmarler@chastainengineers.com . A hard copy of the bid documents may be obtained from Chastain & Associates LLC, 5 N. Country Club Rd., Decatur, IL 62521, with a non-refundable payment of **$20.00** for each set. No refund will be made for the plans, specifications, or proposal forms returned.

The work includes: New water treatment plant pressure filters along with associated piping, valves and meters. This project includes new flow meters, electrical and controls upgrades along with telemetry modifications at the water plant, two active wells and two water towers.

Each bid must be accompanied by cash, a certified check, bank draft, or a bid bond, duly executed by the bidder as principal and having as surety thereon a surety company approved by the Owner, in the amount of 5% of the bid. Such cash, checks or bid bonds will be returned to all except the three lowest bidders within three days after the opening of bids, and the remaining cash, checks or bid bonds will be returned promptly after the Owner and the accepted bidder have executed the contract, or, if no award has been made within 45 days after the date of opening of bids, upon demand of the bidder any time thereafter, so long as he/she had not been notified of the acceptance of his/her bid.

The successful bidder will be required to furnish a satisfactory performance-payment bond in the full amount of the bid or proposal. No bid shall be withdrawn after the opening of bids without the consent of the said Owner for a period of 45 days after the scheduled time of closing bids.

The general prevailing rate of wages in the locality for each craft or type of worker or mechanic needed to execute the contract or perform such work, also the general prevailing rate for legal holiday and overtime work, as ascertained by the public body or by the Department of Labor shall be paid for each craft or type of worker needed to execute the contract or to perform such work.

A copy of the most recent Illinois Department of Labor Prevailing Wages for McLean County available at the time the Bid Documents were prepared is included therein.

The **City of Le Roy, Illinois**, reserves the right to reject any or all bids and waive any informalities in bidding.

Steven Dean
Mayor, City of Le Roy

INSTRUCTIONS TO BIDDERS

For Construction of: WATER SYSTEM IMPROVEMENTS

Owner: **CITY OF LE ROY**

1. GENERAL

1.1 The proposed improvements shall be constructed and completed in accordance with the maps, plans, and specifications prepared for and relating to the construction of such improvements.

1.2 The Contract Documents, including plans and specifications, are on file at the office of **Chastain & Associates LLC, 5 N. Country Club Road, Decatur, Illinois 62521** and **City Hall, 207 S. East Street, Le Roy, Illinois 61752**.

2. SCOPE

2.1 The proposed improvements herein specified and described consist generally of the following work:

New water treatment plant pressure filters along with associated piping, valves and meters. This project includes new flow meters, electrical and controls upgrades along with telemetry modifications at the water plant, two active wells and two water towers.

3. APPROXIMATE QUANTITIES

3.1 No complete detailed listing of approximate quantities is included in the Contract Documents except as the various items of work are identified in the Contractor's Proposal.

3.2 The Contractor shall determine for himself the actual quantities involved and shall bid accordingly.

4. DEPOSIT FOR PLANS

4.1 Hard copy prints of the Contract Documents, including plans and specifications, may be obtained upon a payment of a non-refundable $20.00 deposit with Chastain & Associates LLC, 5 N. Country Club Road, Decatur, Illinois 62521. Electronic plans in PDF format will be available with no deposit required. No refund will be made for the plans, specifications, or proposal forms returned.

5. PROPOSALS

5.1 Sealed proposals will be received in accordance with the official Advertisement for Bids.

The proposal consists of the following documents:

a) Contractor’s Proposal (includes Non-Collusion Affidavit & Bidder Certification in Compliance with the Illinois Criminal Code of 1961)

b) Proposal Guaranty (Bid Bond)

6.2 Proposals must be made on the accompanying blank forms. One extra detached copy of the Contractor's Proposal is included with the Specifications for convenience in preparation and submission of the Bid. The proposals shall be sealed in an envelope bearing only the printed endorsement "Proposals for **WATER SYSTEM IMPROVEMENTS**". In the case of proposals to be sent by mail, said envelope shall be placed in an outer, or mailing envelope, and endorsed "This envelope contains a sealed bid to be read at **3:00 p.m. local time, March 24, 2021”**.

6.3 All bids must be accompanied by cash, a certified check, a bank draft on a responsible solvent bank, or a bid bond, executed by the bidder as principal and having as surety thereon a surety company approved by the Owner, payable to the **City of Le Roy, Illinois**, in an amount not less than 5% of the total amount of the bid, the same to be refunded or returned to the bidder upon the faithful performance of the conditions of the Proposal to the satisfaction of the said Owner. Bid Bonds will not be returned.

6.4 The person, firm or corporation to whom the contract may be awarded will be required to execute the Agreement and Performance-Payment Bond with sureties within the time specified herein, unless otherwise provided for by law; form of said agreement and bond is hereto attached, and in case of failure or neglect to do so, he or they will be considered as having abandoned it, and the above mentioned deposit shall thereupon be forfeited to the Owner and collected as provided by law; and thereupon the work will be readvertised.

6.5 No bid will be considered unless the party offering it shall furnish evidence satisfactory to the Owner that he has necessary facilities, ability and pecuniary resources to fulfill the conditions of the Contract. The low bidder or any other bidder may be required to submit financial statements.

6.6 All bids must be made for materials furnished in the work complete, and no proposal will be made or considered on any part of the work not complete in place, nor on materials except in completed work, unless specifically otherwise provided for in the detailed specifications.

6.7 The Bidder's attention is directed to the contract requirement that the work shall be commenced within **ten (10)** calendar days following written notice to the Contractor to proceed and shall be completed within **300 Days**.

6.8 Permission will not be given for the withdrawal of any bid or proposal for a period of **45** days after the opening thereof, excepting that any bidder may withdraw his bid personally or by telegraphic or written request at any time prior to the closing time for the receipt of bids.

7. ITEMIZED BIDS

7.1 Each bid or proposal shall be itemized in its component parts as set out on the Contractor's Proposal to be submitted at the date of receiving bids.

8. BIDDER'S DUTIES

8.1 Bidders will examine the plans and specifications for the work, and also the project site, and judge for themselves all the circumstances affecting the cost and nature of the work. They must also examine the maps, plans, profiles, details and specifications for the doing of said work, on file in office of Owner.

8.2 Bidders shall inform themselves fully of the conditions relating to construction and labor under which the work will be performed. The Contractor must employ, insofar as possible, such methods and means in carrying out the work as will not cause any interruptions or any interference with any other Contractor. Bidders are required to inform themselves fully of the conditions relating to prevailing and predetermined labor rates and the applicable laws relating thereto, and shall be governed thereby. Before submitting a proposal, the bidders should visit the site(s) of the proposed work, verify all site conditions above ground and underground, and the conditions under which said work must be conducted. Submission of a proposal implies that the bidder is fully aware of all such conditions. No claim for additional compensation will be considered or paid on account of the Bidder's neglect or failure to be so informed.

8.3 If any person contemplating submitting a bid for the proposed contract is in doubt as to the true meaning of any part of plans, specifications, or other contract documents, he may submit to the Owner a written request for an interpretation thereof. The person submitting the request will be responsible for its prompt delivery. Any interpretation of the documents will be made only by addendum duly issued and a copy of such addendum will be mailed or delivered to each person receiving a set of such documents. The Owner will not be responsible for any other explanation or interpretation of the Contract Documents.

8.4 The Contract Documents contain the provisions required for the construction of the Project. Information obtained from an officer, agent, or employee of the Owner or any other person shall not affect the risks or obligations assumed by the Contractor or relieve him from fulfilling any of the conditions of the contract.

9. DELINQUENT BIDDERS

9.1 No contract will be awarded to any person, firm or corporation that has been delinquent or unfaithful in any former contract with this Owner or who is a defaulter as surety or otherwise upon any obligation to the said Owner.

10. EXECUTION OF DOCUMENTS

10.1 The Bidder, in signing his bid on the whole or on any portion of the work, shall conform to the following requirements:

Bids which are not signed by individuals making them should have attached thereto a power of attorney evidencing authority to sign the bid in the name of the person for whom it is signed.

Bids which are signed for a partnership should be signed by all of the partners or by an attorney-in-fact. If signed by an attorney-in-fact, there should be attached to the bid a power of attorney, executed by the partners, evidencing authority to sign the bid.

Bids which are signed for a corporation, should have the correct corporate name thereof and the signature of the President or other authorized officer of the corporation manually written below the corporate name following the word "By _____."

If such a bid is manually signed by an official other than the President of the corporation, a certified copy of a resolution of the board of directors evidencing the authority of such official to sign the bid should be attached to it. Such bid should also bear the attesting signature of the secretary of the corporation and the impression of the corporate seal.

The Contract shall be deemed as having been awarded when formal notice of award shall have been duly served upon the intended awardee (i.e., the bidder to whom the Owner contemplates awarding the contract) by some officer or agent of the Owner duly authorized to give such notice.

11. TELEGRAPHIC OR WRITTEN MODIFICATION OF BID

11.1 Any Bidder may modify his Bid by telegraphic or written communication at any time prior to the scheduled closing time for receipt of Bids, provided such communication is received by the Owner prior to the closing time. The telegraphic or written communication should not reveal the Bid price; it should, however, state the addition or subtraction or other modification so that the final prices or terms will not be known by the Owner until the sealed Bid is opened.

12. FILING BIDS

12.1 After the bids are opened and read aloud, they shall be placed on file in the office of the **City Clerk**.

13. BASIS OF AWARD

13.1 Proposals shall be submitted for the work as shown on the Contractor's Proposal, all furnished and installed in strict conformance with the specifications therefor. No proposal will be considered except upon completed work, as specified. Except in cases where the OWNER exercises the right to reject any or all proposals, the Contract will be awarded by the OWNER on the following basis:

As a single contract to the lowest responsive and responsible bidder.

14. COUNTERPART OF DOCUMENTS

14.1 The number of counterparts of contract and bond required to be executed is as follows:

(a) Two original counterparts of the Agreement and of the Performance and Payment Bonds will be required to be executed.

(b) Additional conformed sets of the complete Contract Documents including conformed sets of plans, will be executed, as may be required for distribution.

15. RETURN OF BID DEPOSITS

15.1 The bid deposit of all except the three lowest bidders will be returned within three days after the opening of bids. The bid deposit of the three lowest bidders will be returned within 48 hours after the contract and required bonds have been finally approved by the Owner. Bid bonds will not be returned.

16. RIGHT TO REJECT BIDS

16.1 The Owner reserves the right to reject any and all bids as authorized by law or to waive any informalities in bidding.

17. SUPPLEMENTAL INSTRUCTIONS

17.1 Each bidder shall submit a complete proposal on the entire work set up for contract award as established in Article 13, BASIS OF AWARD, in these instructions. Where such schedules are included in the Contractor's Proposal, he shall also submit proposals on the:

"Supplemental Schedule of Unit Prices for Fixing the Cost Basis of Changes."

17.2 A Performance-Payment Bond in the amount of 100 percent of the Contract price, with a corporate surety approved by the Owner, will be required for the faithful performance of the Contract.

17.3 Attorneys-in-fact who sign Bid Bonds or Performance Payment Bonds must file with each bond a certified and effective dated copy of their power of attorney.

17.4 All applicable laws, ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the Contract throughout including the Act regulating wages in Illinois (820 ILCS 130/1 et. seq.) and the Illinois Preference Act (30 ILCS 570/1 et. seq.) and the Illinois Human Rights Act (775 ILCS 5/1-101 et. seq.).

CITY OF LE ROY, ILLINOIS
Steven Dean, Mayor

RETURN WITH BID

BIDDER'S PROOF OF RESPONSIBILITY

This Questionnaire shall be provided with each Contractor's Proposal with the contents thereof to be considered confidential.

If the Owner is not satisfied with the sufficiency of the answers to this Questionnaire and financial statement, it may reject the bid or disregard the same, or require additional information.

STATEMENT OF BIDDER'S QUALIFICATIONS

Name of Bidder_____

Bidder's Address _____

When Organized? _____

Where Incorporated?_____

How many years have you been engaged in the Contracting business under the present firm name?
_____

Contracts on hand (attach list of present contracts, including a schedule as to estimated completion date and gross amount of each contract).

General character of work performed by your firm_____

_____.

Have you ever failed to complete any work awarded to you? Yes _____ No _____

Have you ever defaulted on a Contract? Yes _____ No _____
If so, attach statement showing where and why.

Have any previous Contracts resulted in litigation? Yes _____ No _____
If so, attach statement showing where, why, who, and summary of outcomes for each.

Attach list of the more important contracts completed by your firm, including kind of work and approximate cost. As available, list shall include at least the last five IEPA State Revolving Loan Funded Projects completed by your firm with owner reference and contact information provided.

Attach list of your major equipment.

Attach a statement of your experience in the construction or work similar in importance to this project.

Attach statement of background and experience of the principal members of your personnel, including the officers.

Credit available. Furnish written evidence, preferably from banks.

RETURN WITH BID

Financial Statement

1. TOTAL ASSETS $_____
2. TOTAL LIABILITIES $_____
3. NET WORTH $_____

Additional information may be submitted if desired.

Dated this _____ day of _____, 20____.

Name of Organization _____

By _____

Title _____

STATE OF _____)
) SS
COUNTY OF _____)

_____ , being duly sworn, says that he is _____ of

and that the answers to the foregoing questions and all statements contained therein are true and

correct.

Signed

_____

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

_____
Notary Public

RETURN WITH BID

CONTRACTOR'S PROPOSAL

TO THE MAYOR AND CITY COUNCIL OF THE CITY OF LE ROY:

Proposal of _____

_____

_____

The proposed improvement is officially known as:

WATER SYSTEM IMPROVEMENTS

The plans and specifications for the proposed improvement are those prepared by Chastain & Associates, LLC, 5 N. Country Club Road, Decatur, Illinois, 62521.

The undersigned declares that he has carefully examined all contract documents and that he has inspected in detail the sites of the proposed work, and that he has familiarized himself with all legal conditions affecting the contract and the detailed requirements of construction and understands that in making this proposal he waives all right to plead any misunderstanding regarding same.

The undersigned further understands and agrees that if this proposal is accepted he is to furnish and provide all necessary machinery, tools, apparatus and other means of construction, and to do all of the work and to furnish all of the material specified in the contract in the manner and at the time therein prescribed, and in accordance with the requirements therein set forth.

The undersigned certifies, by the submission of this Bid, and in the case of a joint Bid, each party thereto certifies as to his own organization, that in connection with the Bid:

a. The prices in the bid have been arrived at independently, without consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor; and

b. Unless otherwise required by law, the prices which have been quoted in the bid have not knowingly been disclosed by the BIDDER, prior to opening, directly or indirectly to any other BIDDER or to any competitor; and

c. No attempt has been made or will be made by the BIDDER to induce any other person or firm to submit or not to submit a bid for the purpose of restricting competition; and

d. The undersigned is the person in the BIDDER'S organization responsible for the decision as to the prices being bid and that he has not participated, and will not participate, in any action contrary to paragraphs a. through c. above; or

e. The undersigned is not the person in the BIDDER'S organization responsible for the decision as to the prices being bid, but that he has been authorized to act as agent for the persons responsible for such decision in certifying that such persons have not participated, and will not participate, in any action contrary to paragraphs a. through c. above, and as their agent shall so certify. He shall also certify that he has not participated, and will not participate, in any action contrary to paragraphs a. through c. above.

The Contractor shall complete all the work required by the agreement within the time specified.

Accompanying this proposal is a BANK DRAFT, BANK CASHIER'S CHECK, or CERTIFIED CHECK made payable to the City of Le Roy, in the amount of five (5) percent of the total Bid, or BID BOND.

RETURN WITH BID

The amount of the check or draft accompanying this proposal is _____

_____ ($_____).

The undersigned submits herewith his schedule of prices covering the work to be performed under this contract; he understands that he must show in the schedule the unit prices for which he proposes to perform each item of work, that the extensions must be made by him, and that if not so done, his proposal may be rejected as irregular.

Bidder acknowledges receipt of the following Addenda:

No. _____ Dated _____

No. _____ Dated _____

SCHEDULE OF PRICES

The following shall apply to preparation of the SCHEDULE OF PRICES:

1. Each pay item should have a unit price and a total price.

2. The unit price shall govern if no total price is shown or if there is a discrepancy between the product of the unit price multiplied by the quantity.

3. All items shall be completed and a bid will be declared unacceptable if neither a unit price nor a total price is shown.

4. Supplemental prices are included occasionally to establish unit prices. If supplemental items are included, they must indicate the respective unit price or the bid will be declared unacceptable. Supplemental items are not included in the total bid price.

RETURN WITH BID

BID SCHEDULE					
CITY OF LE ROY - WATER SYSTEM IMPROVEMENTS					
	DESCRIPTION	**UNIT**	**QTY**	**UNIT PRICE**	**TOTAL**
1	Bond, Insurance, and Mobilization	LS	1		
2	New Filtration Vessel Equipment Package Shop Drawing Approval	EA	5		
3	Delivered to Site New Filtration Vessel with Valves, Valve Operators, mag meter, fittings, media	EA	5		
4	Phase 1- Demolition of Existing Pump Temporary Modifications for Vessel Install	LS	1		
5	Phase 1- Relocate Air Compressor for Temporary Use	LS	1		
6	Phase 1- Install New Filtration Vessel with Valves, Valve Operators, mag meter, fittings, media, painting, testing, and operation complete in place	EA	2		
7	Phase 1- Install Interior Header Piping, valves, sample taps, fittings, and appurtenances for Vessels	LS	1		
8	Phase 1- Replace Existing Pump Removed for Temporary Modification	LS	1		
9	Phase 1- Rehabilitate Softener Vessel with valve, valve operator, mag meter, exterior painting, testing, complete ready for operation (Existing Media to Remain)	EA	4		
10	Equipment electrical and install for Phase 1 New electrical equipment panels, including all valve operators and control, and other conductor feeds for Phase 1 Operation	LS	1		
11	Telemetry and Controls Phase 1- Water Treatment Plant Operational with Two Filters, Four Softeners, Chemical Feeds, Aerator, Wells, and Level Control	LS	1		
12	Demolition of Existing Micro Filters, CIP, Backwash Tank, and appurtenances	LS	1		
13	Existing Open Trench Concrete Modifications	LS	1		
14	Phase 2- Install New Filtration Vessel with Valves, Valve Operators, mag meter, fittings, media, painting	EA	3		

15	Phase 2- Install Interior Header Piping for Vessels	LS	1		
16	Equipment electrical and install for Phase 2- New electrical equipment panels, including all valve operators and control, and other conductor feeds for Phase 2 Operation	LS	1		
17	Telemetry and Controls Phase 2- Water Treatment Plant Operational with Three Additional Filters Complete in Operation	LS	1		
18	Epoxy Floor Repair at Trench and Any Damaged Area				
19	Well #6 Mag Meter Pit Install	LS	1		
20	Well Site #6 Electrical, VFD, and Controls Equipment Install with new Radio	LS	1		
21	Well #8 Mag Meter Pit Install	LS	1		
22	Well Site #8 Electrical, VFD, and Controls Equipment Install with new Radio	LS	1		
23	North Water Tower Electrical and Radio Install	LS	1		
24	South Water Tower Electrical and Radio Install	LS	1		
25	Bypass Valve Replacement with Electric operated valve	LS	1		
			TOTAL BID :	**$**	

RETURN WITH BID

BIDDER CERTIFICATION

In Compliance with Article 33 E to the
"Illinois Criminal Code of 1961"

I, _____, do hereby certify that:

1. I am _____ of the _____
   Position Firm

   and have authority to execute this certification on behalf of the firm;

2. This firm is not barred from bidding on this contract as a result of a violation of either Section 33E-3, Bid-rigging, or Section 33E-4, Bid Rotating, as set forth in Article 33E to the "Illinois Criminal Code of 1961."

Name of Firm _____

Signature _____

Title _____

Date _____

Corporate Seal (where appropriate)

On this _____ day of _____, 20_____, before me appeared (Name) _____, to me personally known, who, being duly sworn, did execute the foregoing affidavit, and did state that he or she was properly authorized by (Name of Firm) _____ to execute the affidavit and did so as his or her free act and deed.

Notary Public _____

Commission Expires _____

RETURN WITH BID

NON-COLLUSION AFFIDAVIT

STATE OF _____)
) ss
COUNTY OF _____)

_____, being first duly sworn, deposes and says that they are _____ (sole owner, partner, president, secretary, etc.) of _____, the party making the foregoing bid; that such bid is not made in the interest of or on behalf of any undisclosed person, partnership, company, association, organization or corporation; that such bid is genuine and not collusive or sham; that said bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that said bidder has not in any manner, directly or indirectly, sought by agreement, communication or conference with anyone to fix the bid price of said bidder or of any other bidder, or to fix any overhead, profit or cost element of such bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract or anyone interested in the proposed contract; that all statements contained in such bid are true; and, further, that said bidder has not, directly or indirectly, submitted their bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid and will not pay any fee in connection therewith to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof, or to any other individual except to such person or persons as have a partnership or other financial interest with said bidder in their general business.

Signed: _____

Title: _____

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

_____
Notary Public

*The Owner reserves the right, before any award of contract is made, to require of any bidder to whom it may make an award of the Contract, a duly executed non-collusion affidavit in the form designated above.

RETURN WITH BID

(If An Individual)
Signature of Bidder _____ (SEAL)

Business Address _____

_____

(If a Co-Partnership)

Firm Name _____ (SEAL)

By: _____ (SEAL)

Business Address _____

_____

Names of All
Members of Firm _____

_____

(If a Corporation)

Corporate Name _____ (SEAL)

By: _____
President

Business Address _____

_____

Names _____
Of President
Officers

_____
Secretary

_____
Treasurer

Attest: _____
Secretary

AGREEMENT

THIS AGREEMENT, Made the _____ **day** of _____**,** A.D. **20____**, by and between _____ hereinafter called the "**Contractor**," and the **CITY OF LE ROY**, Illinois, County of McLean, State of Illinois, hereinafter called the "**Owner**,"

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

ARTICLE I – SCOPE OF WORK - The Contractor shall perform everything required to be performed and shall provide and furnish all labor, materials, equipment, necessary tools, and all services required to perform and complete in a workmanlike manner all the work required in connection with the construction of the **WATER SYSTEM IMPROVEMENTS** of the Owner, all in strict accordance with the Contract Documents herein mentioned, prepared by Chastain & Associates, LLC, acting for the Owner and in these contract documents referred to as the Engineer, such documents being hereby made a part of the Contract, including the following Addenda:

Addendum No.	Dated
_____	_____
_____	_____

ARTICLE II – THE CONTRACT PRICE - The Owner shall pay to the Contractor for performance of this contract, subject to any additions or deductions provided therein, in current funds, the contract price computed as follows:

For items 1 through 5, at the lump sums, unit prices, or both as set forth by bid price in the Contractor's Proposal, attached hereto and hereby made a part of this Contract.

ARTICLE III – UNIT PRICES FOR CHANGES - The following unit prices will apply, if required, in the event of additions to or deductions from the work to be performed under this contract.

For Item 6 the payment will be on a time and material basis with the allowance to be provided as set forth by bid price in the Contractor's Proposal, attached hereto and hereby made a part of this Contract.

ARTICLE IV – PAYMENTS

1. APPLICATIONS FOR PAYMENTS

Upon the first day of each month following the execution of the Contract, or such other date as may be mutually agreeable to the parties of this Contract, the Contractor shall submit to the Engineer, on forms provided by the Owner, an itemized application for payment to subcontractors, supported by receipts, vouchers, or other documents showing payments for materials, labor, and such other evidence as is required by the Engineer. The Engineer will check and verify Contractor's estimate of the amount of work done and of the value of the approved material and equipment items to be used in the completed project which have been delivered at the site or incorporated in the work in accordance with the Contract.

The first estimate shall be of the quantity and value of work done, including the materials and equipment furnished by the Contractor since commencing work. Succeeding estimates, EXCEPT THE FINAL ONE, shall be of the quantity and value of the work done, including approved materials and equipment items furnished by the Contractor, useful in the construction, and suitably stored at the site of the construction, since the last previous estimate.

Where partial payments are to be made on the value of work done, the Contractor, before first application for payment, shall submit to the Engineer a schedule of values of the various parts of the work, including quantities, and so divided as to facilitate payments to himself and his subcontractors; and executed in such form as agreed upon between the Engineer and the Contractor. Upon approval by the Engineer, this schedule shall be used as a basis for certificates for payment. The Contractor shall submit a statement based on the approved schedule with each application for payment.

If and when partial payments are to be made on account of materials not incorporated in the work but delivered and suitably stored on the site, or at other locations approved by Engineer, such payments shall be contingent upon submission by Contractor of invoices, contracts, or such other evidence that Contractor has purchased, and agrees to pay for such materials, equipment, and other items, including applicable insurance, which evidence shall protect Owner's eventual interest in such materials and equipment.

2. CERTIFICATES FOR PAYMENT

Upon application by Contractor for payment, within seven days the Engineer shall issue to the Owner, with a copy to the Contractor, a certificate for payment for such amount as he decides is properly due, or else state in writing his reasons for withholding said certificate.

The Owner shall pay to the Contractor the amounts endorsed by such certificates for payment within 90 days of the date of approval for payment by the Owner of said certificates. Certificates for payment will not be issued more frequently than once per month.

3. PAYMENTS

On the basis of certificate for payment, Owner shall make partial payment to Contractor of 90 percent of the amount earned during the preceding pay period, 10 percent being retained by Owner to assure faithful performance of the Contract until final completion and acceptance of all work covered by the Contract Documents.

Upon completion of the first 50 percent of the dollar value of the work of the Contract, including proper material and equipment which has been delivered to and properly stored at the site, the sums withheld to assure faithful performance of the Contract may, at the discretion of the Owner, be reduced to 5 percent of the dollar value of the work for work subsequently performed, or to an amount not less than 5 percent of the total contract price.

Where a contract is divided into several sections or divisions of work; and providing that one or more sections or divisions of work are completed, and their completion is not dependent upon completion of the still uncompleted sections or divisions of work; and providing also that the operation and use has been accomplished by Owner for the completed sections or divisions of work; payment of all or a portion of the 10 percent retainer due on the completed sections or divisions of work may be made, subject to approval by the Owner and the Engineer.

4. WITHHOLDING PAYMENTS

The Engineer may withhold or, on account of subsequently discovered evidence, void the whole or any part of any certificate for payment to the extent required to protect the Owner from loss for any of the following reasons:

A) Claims filed or evidence indicating probable filing of claims.

A reasonable doubt that the Contract can be completed for the then unpaid balance.

Damage to another contractor.

In addition to payment retained by Owner under preceding provisions of the General Conditions, Owner reserves the right to withhold a sufficient amount of any payment otherwise due the Contractor to cover (1) payments that may be earned or due for just claims for labor or materials furnished in and about the performance of the work on the project under this Contract; (2) for defective work not corrected; and (3) for failure of Contractor to make proper payments to his subcontractors. Owner shall disburse and shall have the right to act as agent for Contractor in disbursing such funds as have been withheld pursuant to this paragraph to the party or parties who are entitled to payment therefrom. The Owner shall render a proper accounting to the Contractor for all said funds disbursed in his behalf.

When grounds for withholding are removed, payments shall be made for amounts withheld on account of same.

5. FINAL PAYMENT ESTIMATE

The final payment estimate shall be based upon a detailed estimate of the materials and equipment furnished and installed in the completed project according to the provisions of the Contract Documents. Final payment will be made to the Contractor for any amount remaining due upon the final inspection, testing and formal acceptance of the work by the Owner and the Engineer within thirty days after the final completion and acceptance of the work.

All settlements, defects or damages in any portion of the improvements, occurring before the formal acceptance of the work by the Owner, shall be repaired and made good at the Contractor's expense before the final payment is made.

Neither final payment nor any part of the retained amount shall become due until Contractor delivers to Owner a complete release of all liens arising from this Contract, or receipts in full in lieu thereof, and if required in either case, an affidavit that so far as he has knowledge or information, the releases and receipts include all labor, materials and equipment for which a lien could be filed. Contractor may in case any subcontractor refuses to furnish a release or receipt in full, furnish a bond satisfactory to Owner to indemnify him against any lien. If any lien remains unsatisfied after all payments are made, Contractor shall refund to Owner all moneys that the latter may be compelled to pay in discharging said lien(s), including all costs and reasonable attorneys' fees.

No certificate issued nor payment made to Contractor, nor entire use or occupancy of the work or any part thereof by Owner implies acceptance of any work or materials not in accordance with requirements of the Contract Documents. Making final payment implies a waiver of all claims by Owner except those arising from unsettled liens, faulty or defective work appearing after final inspection and acceptance, failure of the work to meet requirements of the Contract Documents or from terms of any guarantees or maintenance bond required by the Contract Documents. Acceptance of final payment constitutes a waiver of all claims by Contractor excepting those previously made, in writing, and not yet settled.

ARTICLE V – TIME OF COMPLETION - Work under this contract shall commence within ten (10) days after a written **Notice to Proceed** from the Owner to the Contractor, who shall diligently prosecute and complete all work under this contract within **300 Calendar Days**. The date of completion of the work determined as provided herein shall be hereinafter referred to as the "Contract Completion Date".

ARTICLE VI – LIQUIDATED DAMAGES - It is hereby fully understood and agreed that the date of beginning and the time of completion as specified in the Contract Documents are ESSENTIAL CONDITIONS of this Contract. It is further agreed that for each and every calendar day that elapses between the Contract Completion Date and the date on which the work covered by this contract is actually completed, including the removal of all plant and obstructions from the site of such work, the Contractor shall pay to the Owner as liquidated damages, and not as a penalty, the sum of **$250.00 per day**. The total amount so payable by the Contractor as liquidated damages may be deducted from any moneys due or payable to the Contractor by the Owner or so much thereof as is not so deducted shall be chargeable to and will be payable promptly by such Contractor and his Surety, or either of them, to the Owner.

ARTICLE VII – COMPONENT PARTS OF THE CONTRACT – The Contract Documents consist of the following component parts, all of which are as fully a part of this contract as if herein set out verbatim or, if not attached, as if hereto attached.

1. This instrument
2. Contractor's Proposal
3. Addenda
4. Special Provisions
5. Technical Specifications
6. Complete Project Manual
7. Standard Specifications for Road & Bridge Construction
8. Standard Specifications for Water and Sewer Construction in Illinois
9. Recommended Standards for Water Works
10. Contractor's Performance-Payment Bond
11. Notice of Award
12. Notice to Proceed
13. Shop and Working Drawings submitted by the Contractor, when approved by the Owner or Engineer.

In the event that any provision in any of the foregoing component parts of this Contract conflicts with any provision in any other of the component parts, the provision in the component part first enumerated shall govern over any other component part which follows it numerically, except as may be otherwise specifically stated.

ARTICLE VIII – WAGES OF EMPLOYEES ON PUBLIC WORKS – Contractor agrees to fully comply with the provisions of an act entitled regulating wages in Illinois (820 ILCS 130/1, et. seq.)

ARTICLE IX – HUMAN RIGHTS ACT – Contractor agrees to fully comply with the provisions of the Human Rights Act of the State of Illinois, (775 ILCS 5/1-101, et. seq.)

IN WITNESS THEREOF, the parties hereto have caused this instrument to be executed in two (2) original counterparts the day and year first above written.

(SEAL)

Contractor

ATTEST

SIGN: _____

PRINT: _____

TITLE: _____

SIGN: _____

PRINT: _____

TITLE: _____

(SEAL)

CITY OF LE ROY, ILLINOIS

Owner

ATTEST

SIGN: _____

PRINT: Vicki Moreland

TITLE: City Clerk

SIGN: _____

PRINT: Steven Dean

TITLE: Mayor

INSTRUCTIONS FOR EXECUTING AGREEMENT

The Contractor in executing the Agreement shall follow the following requirements:

The Contractor and the Owner shall sign the Contract Documents in not less than duplicate.

If the Contractor is a corporation, the following certification shall be executed:

I, _____, certify that I am the _____ Secretary of the corporation named as Contractor hereinabove, that _____ who signed the foregoing agreement on behalf of the Contractor was then _____ of said Corporation; that said agreement was duly signed for and in behalf of said Corporation by authority of its governing body, and is within the scope of its corporate powers.

If the agreement is signed by the secretary of the Corporation, the above certificate shall be executed by some other officer of the corporation, under the corporate seal. In lieu of the foregoing certificate there may be attached to the agreement copies of so much of the corporate records as will show the official character and authority of the officers signing, duly certified by the secretary or assistant secretary under the corporate seal to be true copies.

If the Contractor is a partnership, each partner shall sign the agreement, or, if the agreement be not signed by each partner there shall be attached to the agreement a duly authenticated power of attorney evidencing the signer's (signers') authority to sign such an agreement for and in behalf of the partnership.

If the Contractor is an individual, the trade name (if the Contractor be operating under a trade name) shall be indicated in the agreement and the agreement shall be signed by such individual. If signed by one other than the Contractor there shall be attached to the agreement a duly authenticated power of attorney evidencing the signer's authority to execute such agreement for and in behalf of the Contractor.

The full name and business address of the Contractor shall be inserted and the agreement shall be signed with his official signature. The name of the signing party or parties shall be typewritten or printed under all signatures to the agreement.

The contract shall be deemed as having been awarded when formal notice of award shall have been duly served upon the intended awardee (i.e., the bidder with whom the Owner contemplates entering into a contract) by some officer or agent of the Owner duly authorized to give such notice.

CONTRACT PERFORMANCE PAYMENT BOND

THIS INSTRUMENT WITNESS, That we _____ Principal, and _____, a corporation organized and existing under and by virtue of the laws of the State of _____, and regularly authorized to do business in the State of Illinois, as Surety, are held and firmly bound unto the **CITY OF LE ROY, ILLINOIS** hereinafter called the "Owner" in accordance with a contract hereinafter referred to, in the penal sum of _____ ($_____) lawful money of the United States, well and truly to be paid unto the said Owner for the payment of which we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Sealed with our seals and dated this _____ day of _____, A.D., 20____.

WHEREAS, the said Principal has entered into a written contract with the Owner for the construction of said work as designated as **WATER SYSTEM IMPROVEMENTS** located at **Le Roy**, in the State of Illinois, in conformity with the Contract Documents prepared by Chastain & Associates, LLC of Decatur, Illinois, which Contract Documents are hereby referred to and made a part hereof the same to all intents and purposes as if written at length herein, in which contract the said Principal has contracted to perform the work specified in said contract in accordance with the terms thereof:

NOW, THEREFORE, THE CONDITIONS OF THIS OBLIGATION IS SUCH that if the Principal shall faithfully perform the contract on his (its) part, and satisfy all claims and demands incurred by the Principal in the performance of said contract, and shall fully indemnify and save harmless the Owner from all costs and damages which the Owner may suffer by reason of the failure of the Principal to do so, and shall fully reimburse and repay to the Owner all costs, damages and expenses, including the payment of attorney fees and the related cost of collection, which the Owner may incur in making good any default by the Principal, including any default based upon the failure of the Principal to fulfill his obligation to furnish maintenance, repairs or replacements for any period of time after the work is completed if provided for in said contract, and shall promptly make payment to all persons supplying labor or material for use in the prosecution of the work of the performance of the contract whether by subcontract or otherwise, and shall pay all valid claims and demands whatsoever, and shall defend, indemnify and hold harmless the Owner and its agents against loss or expense by reason of any liability imposed by law upon the Owner for damage because of bodily injuries, including death at any time resulting therefrom, accidentally sustained by any person or persons, damage to property, including loss or use thereof, arising out of or in consequence of the performance of this work whether such injuries to person or persons, including death at any time resulting therefrom, damage to property are due or claim to be due to the negligence of the Owner, the Principal, their employees or agents or anyone else, including all valid claims for damages and compensation under the provisions of the Prevailing Wage Act, the Health and Safety Act, the Workmen's Occupational Diseases Act, the Workmen's Compensation Acts of the State of Illinois now in force as provided for in such contract, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

The Owner may sue on this bond, and any person furnishing material or performing labor, either as an individual or as a Subcontractor shall have the right to sue on this bond in the name of the Owner for his use and benefit, all in accordance with the provisions of an Act entitled, "An Act in Relation to Bonds of Contractors Entering Into Contracts for Public Construction," approved June 20, 1931, the provisions of said Act being hereby made a part of this bond as though fully set forth herein.

It is hereby stipulated and agreed that any suit based upon any default of the Principal in fulfilling his obligation to furnish maintenance, repairs or replacements for any period of time after the work is completed, if provided for in the contract, may be brought at any time up to one year after the expiration of the time specified in the contract during which the Contractor has agreed to furnish such maintenance or make such repairs or replacements.

The said Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

ILLINOIS REGISTERED AGENT	_____ (SEAL)
Name: _____	By_____
Address: _____	_____ (SEAL)
_____	By_____

NOTICE OF AWARD

To: _____

_____

_____

PROJECT Description: **WATER SYSTEM IMPROVEMENTS**

The **OWNER** has considered the **BID** submitted by you for the above-described **WORK** in response to its Advertisement for Bids dated _____, 20____ and Instructions to Bidders.

You are hereby notified that your **BID** has been accepted for items in the amount of $_____ at a meeting of the City Council on _____, 20____.

You are required by the Instructions to Bidders to execute the **AGREEMENT** and furnish the required **CONTRACT PERFORMANCE-PAYMENT BOND** and certificates of insurance within ten calendar days from the date of this Notice to you.

If you fail to execute said **AGREEMENT** and to furnish said **BONDS** within ten (10) calendar days from the date of this Notice, said **OWNER** will be entitled to consider all your rights arising out of the **OWNER'S** acceptance of your **BID** as abandoned and as a forfeiture of your **BID BOND**. The **OWNER** will be entitled to such other rights as may be granted by law.

You are required to return an acknowledged copy of this **NOTICE OF AWARD** to the **OWNER**.

Dated this the _____ day of _____, 20____.

_____
Owner

By: _____

Title: _____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged by _____, this the _____ day of _____, 20____.

By: _____

Title: _____

NOTICE TO PROCEED

To: _____ Date: _____

_____ Project: **WATER SYSTEM IMPROVEMENTS**

_____ _____

In accordance with the Agreement dated _____, 20___, **you are hereby notified** to commence **WORK** on or before _____, 20___, and you are to complete the **WORK** by within **300 Calendar Days**. You are required to return an acknowledged copy of this **NOTICE TO PROCEED** to the OWNER.

_____
Owner

By: _____

Title: _____

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged by _____, this the _____ day of _____, 20____.

By: _____

Title: _____

CHANGE ORDER

Order No.: _____

Date: _____

Agreement Date: _____

NAME OF PROJECT: WATER SYSTEM IMPROVEMENTS

OWNER: CITY OF LE ROY, IL

CONTRACTOR: _____

The following changes are hereby made to the **CONTRACT DOCUMENTS**:

JUSTIFICATION:

CHANGE TO CONTRACT PRICE:

Original **CONTRACT PRICE**: $_____

Current **CONTRACT PRICE** adjusted by previous **CHANGE ORDER**: $_____

The **CONTRACT PRICE** due to this **CHANGE ORDER** will be increased by: $_____

The new **CONTRACT PRICE** including this **CHANGE ORDER** will be: $_____

CHANGE TO CONTRACT TIME:

The **CONTRACT TIME** will be (increased or decreased) by _____ working days.

APPROVALS REQUIRED:

Recommended by: Chastain & Associates, LLC By: _____

Approved by Owner: City of Le Roy By: _____

Approved by Contractor: _____ By: _____

A FACSIMILE OR PHOTOSTATIC COPY OF THIS DOCUMENT SHALL BE CONSIDERED AS EFFECTIVE AS THE ORIGINAL.

CERTIFIED PAYROLL REQUIREMENTS

Public Act 94-0515

Effective August 10, 2005 contractors and subcontractors on public works projects must submit **certified payrolls** on a monthly basis to the City Clerk of Le Roy, Illinois, along with a statement affirming that such records are true and accurate, that the wages paid to each worker are not less than the required prevailing rate and that the contractor is aware that filling records he/she knows to be false is a Class B misdemeanor.

The **certified payroll** records must include the project name and for every worker:

- ✓ Name
- ✓ Address
- ✓ Telephone number
- ✓ Social security number
- ✓ Job classification
- ✓ Hourly wages paid in each period
- ✓ Number of hours worked each day
- ✓ Starting and ending time off each workday

I, _____, certify that the attached certified payrolls are true and accurate certified payrolls that include all of the above reference information. I also certify that the wages paid to each worker are not less that the required prevailing wage rate and that the undersigned is aware that filling records he/she knows to be false is a Class B misdemeanor.

_____ _____

Title Date

FINAL WAIVER OF LIEN

STATE OF _____)
) ss.
COUNTY OF _____)

To All Whom It May Concern:

Whereas the undersigned _____ [has] [had] been employed by _____ to furnish [labor] [materials] [labor and materials] for the _____ work at the premises commonly known as **WATER SYSTEM IMPROVEMENTS**, of which the **CITY OF LE ROY** is the owner;

Now, therefore, the undersigned, for and in consideration of $_____ and other good and valuable consideration, the receipt whereof is hereby acknowledged, does hereby waive and release any and all liens or claims or rights of lien under the statutes of the State of Illinois relating to mechanics liens on the above-described premises and improvements thereon and on the money or other considerations due or to become due from the owner on account of labor, services, material, fixtures, apparatus, or machinery and forms or forms work heretofore furnished or that may be furnished at any time hereafter by the undersigned for the above-described premises.

Dated at _____, Illinois, this _____ day of _____, 20_____.

_____
[Waiving Party]

By: _____

CONTRACTOR'S AFFIDAVIT

STATE OF _____)
) ss.
COUNTY OF _____)

To All Whom It May Concern:

The undersigned, first being duly sworn, deposes and says:

1. That [he] [she] is [position title] of _____, the contractor employed by _____ for the _____ work at the premises commonly known as **WATER SYSTEM IMPROVEMENTS**, and owned by the **CITY OF LE ROY**.

2. That the total amount of the contract is $_____, on which [he] [she] has received payment of $_____.

3. That the following statement includes the names of all parties who have furnished or who have been contracted with by the affiant to furnish material or labor for the improvement and the amounts furnished by, contracted for, paid, due, and to become due each, and that the items mentioned include all labor and material required to complete the work according to plans and specifications:

Name & Address	Labor/Material Supplied	Contract Price	Amount Paid	Current Payment	Balance Due
Total Labor and Material To Complete					

All material (except as above listed) has been or will be furnished from [my] [our] own stock and has been paid for in full.

4. That there are no other contracts for the work outstanding, and that there is nothing due or to become due to any person for material, labor, or other work of any kind done or to be done on or in connection with the work other than as above stated; that all waivers are true, correct, and genuine and delivered unconditionally; and that there is no claim, either legal or equitable, to defeat the validity of the waivers.

_____
[Contractor]

By: _____
[Title]

Subscribed and sworn to before me this

_____ day of _____, 20____.

_____
Notary Public

[NOTE: All waivers must state the actual amount paid, and the affidavit must be completely filled out, signed, and sworn to before a notary public. Waivers from all material suppliers and subcontractors (labor and material) must be furnished.]

SPECIAL CONDITIONS

SC-1. NOTICE

1.01 These Special Conditions supplement the Standard Specifications for Road and Bridge Construction adopted April 1, 2016; the latest edition of the Standard Specifications for Water and Sewer Main Construction in Illinois, the Recommended Standards for Water Works, and the Manual of Test Procedures of Materials in effect on the date of advertisement for bids; and the Supplemental Specifications and Recurring Special Conditions indicated on the Check Sheet included herein which apply to and govern the construction of the Water System Improvements project, and in case of conflict with any part, or parts, of said specifications, these Special Conditions shall take precedence and shall govern.

1.02 The Standard Specifications for Road and Bridge Construction will be referred to hereafter as the "IDOT Standard Specifications".

1.03 The Standard Specifications for Water and Sewer Main Construction in Illinois will be referred to hereafter as the "Water & Sewer Standard Specifications".

1.04 The Water & Sewer Standard Specifications shall take precedence over the IDOT Standard Specifications unless otherwise indicated.

1.05 All aggregate gradations refer to standard IDOT gradations unless noted otherwise.

1.06 Method of measurement and payment for quantities shall be as noted in this specification and as noted on the drawings. The measurement and payment for quantities noted in the Water & Sewer Standard Specifications does not apply.

SC-2. DIFFICULTIES ENCOUNTERED

2.01 All bidders for the work under this contract are required, before submitting proposals, to examine the site of the work and adjacent premises and the various means of approach to the site, and to make all necessary investigations in order to inform themselves thoroughly as to the character and magnitude of all work involved in the complete execution of this contract and as to the facilities for delivering, handling and installing the construction equipment and the conditions and difficulties that will be encountered in the performance of the work specified herein. No pleas of ignorance of conditions that exist or that may hereafter exist or of difficulties that will be encountered in the execution of the work hereunder as a result of failure to make necessary examinations and investigations, will be accepted as a sufficient excuse for any failure or omission on the part of the Contractor to fulfill in the requirements of this contract, or will be accepted as a basis for any claim whatsoever for extra compensation.

SC-3. BOND, INSURANCE, AND MOBILIZATION

3.01 Mobilization will be as described in Section 671 of IDOT Standard Specifications.

3.02 Payment: Will be lump sum BOND, INSURANCE, AND MOBILIZATION. It will also include the costs for bonds and insurance.

SC-4. MAINTAINING PLANT OPERATION

4.01 The contractor will be responsible for ensuring the plant stays operational throughout the duration of the project. Contractor is responsible for all means and methods of maintaining water flows, maintaining capacities as warranted. The contractor may use temporary filter system. The use of temporary filters is solely the contractor's responsibility and shall be treated as part of the means and methods of construction. Temporary filter set-ups, sequences, pump selection, equipment supply, etc., shall be provided, installed and maintained as necessary by the contractor. Neither the engineer, nor the owner will "approve" any of the equipment, means or methods; however, the engineer and owner reserve the right to notify the contractor of inadequate means and methods and require the contractor to comply with the owner's requirements for bypass pumping and time outages for customers.

4.02 Payment: The cost of maintaining plant operation and temporary filters (if used) shall be considered incidental to the contract and no additional compensation will be allowed.

SC-5. DISPOSAL OF MATERIAL

5.01 All material, stone and concrete removed during construction of this improvement shall be disposed of by the Contractor in accordance with local and state laws. The cost of disposing of material shall be considered incidental to the contract and no additional compensation will be allowed.

SC-6. GREENSAND PLUS PRESSURE VESSEL EQUIPMENT

6.01 Refer to Technical Specification Section 15400 for pressure filter requirements.

6.02 Refer to Technical Specification Section 15400 and manufacturer's instructions for pressure filter installation.

6.03 The water treatment plant must stay operational during construction. This will require two filters to be installed then the three remaining will be installed once the first two are fully functioning.

6.04 See payment schedule for items related to Greensand Plus Pressure Vessel Equipment.

SC-7. INTERIOR PIPING AND TEMPORARY PUMP MODIFICATIONS FOR VESSEL INSTALL

7.01 This will include all the necessary work (including materials) to keep the plant fully functional but at the same time allow for the installation of the new pressure filters.

7.02 The Design Drawings show the configuration for the different phases of installation for the new pressure filters.

7.03 Payment: Will be lumps sum INTERIOR PIPING AND TEMPORARY PUMP MODIFICATIONS FOR VESSEL INSTALL. It will also include the costs miscellaneous items required to make this a fully functioning system.

SC-8. INTERIOR PIPING, FLOW METERS, AND VALVES FOR NEW FILTERS

8.01 Schedule 80 PVC pipe and fittings shall meet the requirements of Section 30-4.04 of the Water & Sewer Standard Specifications for pressure rated pipes and fittings.

8.02 New valves shall have electric operators that will connect to new plant control system. The Motorized butterfly valves shall be furnished for each vessel to allow the treatment train to operate through its cycles automatically. Motorized butterfly valves shall be Bray Series 30-392 with Electric Actuator 70-081 or equal. Motorized butterfly valves shall be equipped with manual override handwheels, feedback potentiometer for continuous position indication, travel limit stop switches, and heater.

8.03 Pipes supports are shown on the design drawings. The contactor can use an alternate pipe support but the contractor must have it designed and sealed by a structural engineer.

SC-9. EXISTING FILTER AND PIPING DEMOLITION

9.01 This will include the proper removal and disposal of existing piping and micro filters.

9.02 Payment: Will be lump sum EXISTING FILTER AND PIPING DEMOLITION. It will also include the costs of miscellaneous items.

SC-10. ELECTRICAL, SCADA, TELEMETRY, AND CONTROLS UPGRADES

10.01 The new filters and valves shall be integrated with the existing system. It will continue to control operation and monitoring of the key plant systems and the water plant will continue to operate automatically for normal day to day operations. The simplified control sequence is as follows: The water level in the north 250,000-gallon elevated storage tank controls the

on/off operation of the High Service Pumps. Filtration, softening, and chemical feed systems initiate automatically when the clear well drops to the setpoint as the high service pumps draw water level down. Wells come on/off as aerator level drops during plant run.

SC-11. SOFTENER VALVES AND OPERATORS

11.01 Install new Butterfly valve with new electric actuators. 120Vac, watertight, Open/Close operation only, manual override, mounting hardware, stem adapters and miscellaneous work to make this a fully functioning system.

11.02 Payment: Will be lump sum SOFTENER VALVES AND OPERATORS. It will also include the costs miscellaneous items required to make this a fully functioning system.

SC-12. EPOXY FLOOR REPAIR

12.01 All areas of the existing floor that are damaged during construction and for new concrete placed inside the building will be coated with an epoxy floor coating that is of similar color and texture as the existing.

12.02 New floor coating must be compatible with the existing floor coating.

12.03 Payment: Will be lump sum EPOXY FLOOR REPAIR. It will also include the costs miscellaneous items required to make this a fully functioning system

SC-13. EXISTING OPEN TRENCH MODIFICATION

13.01 The existing open trench will have the grating removed and all piping removed. The trench will be filled with concrete (see drawings) and finished flush with the existing floor.

13.02 The finished exposed surface shall be steel troweled.

13.03 Concrete must cure a minimum of 14 days prior sitting equipment supports or loads on it.

13.04 See special provision for Epoxy Floor Repair for the finish to be applied to this concrete repair.

13.05 Payment: Will be lump sum EXISTING OPEN TRENCH MODIFICATION. It will also include the costs miscellaneous items required to make this a fully functioning system.

SC-14. FACTORY START-UP SERVICES

15.01 Factory Start-Up services shall be provided during the completion of the installation and during the initial start-up of the new water plant. The contractor shall furnish the services of a manufacturer's factory service person for final inspection and start-up of all electrical and mechanical equipment furnished by the manufacturer and to instruct owner and contractor's personnel in proper operation and maintenance procedures. See Technical Specifications for duration and timing of training.

END OF SPECIAL CONDITIONS

SPECIAL PROVISIONS

The following Special Provisions supplement the "Standard Specifications for Water and Sewer Construction in Illinois", Adopted 2014, the latest edition of the "Recommended Standards for Water Works, 2018 and govern the construction of WATER SYSTEM IMPROVEMENTS, and in case of conflict with any part, or parts, of said Specifications, the said Special Provisions shall take precedence and shall govern.

SP-1 DESCRIPTION OF PROJECT

16.01 The work under this Contract shall consist of the Water System Improvements within the City of Le Roy by one of the following by the construction of one of following alternatives:

New water treatment plant pressure filters along with associated piping, valves and meters. This project includes new flow meters, electrical and controls upgrades along with telemetry modifications at the water plant, two active wells and two water towers.

SP-2 INSURANCE

2.01 Without limiting its liability under this Contract, the Contractor shall procure and maintain, at his expense during the life of this Contract, insurance of the types and in the minimum amounts stated below:

A) Workmen's Compensation insurance in full compliance with the Workmen's Compensation Act and Employer's Liability coverage in the amount of not less than as defined by Illinois State Statutes with the following Employers Liability limits.

$100,000 Each Accident Bodily Injury by Accident
$100,000 Each Employee Bodily Injury by Disease
$500,000 Policy Limit Bodily Injury by Disease

B) Commercial General Liability including explosion (x), collapse (c) and underground (u) property damage liability, and blanket contractual liability covering the liability assumed by the Contractor under this agreement with limits of not less than:

$1,000,000 General Aggregate Limit (other than products-completed operations)
$1,000,000 Products-Completed Operations Aggregate Limit
$1,000,000 Personal Injury and Advertising Injury Limit*
$1,000,000 Per Occurrence Limit*
$50,000 Fire/Explosion/Water Damage Limit**
$5,000 Medical Expense Limit** (any one person)

* Subject to the applicable "aggregate limit"
** Subject to the "occurrence limit"

C) Automobile Liability Insurance covering owned, non-owned and hired automobiles with limits not less than:

Bodily injury and Property Damage Liability
Combined Single Limit of $1,000,000

D) Umbrella Excess Liability coverage with a minimum per occurrence limit of $2,000,000 in excess of the above Employers Liability, Automobile Liability and Commercial General Liability policies.

E) Owners Protective Liability policy naming the City of Le Roy with a minimum combined single limit of $1,000,000 shall be issued.

2.02 All policies shall be written on an OCCURRENCE policy form unless prior written approval is received by the Contractor from the Owner to use a CLAIMS MADE policy form.

2.03 The insurance coverages set forth in Paragraphs B), C), and D) above shall name the City of Le Roy, and Chastain & Associates LLC as additional insureds.

2.04 The Contractor shall also take out and maintain at his expense during the life of this Contract, Builder's Risk Insurance satisfactory to the City of Le Roy, which shall protect the City of Le Roy, all subcontractors, material suppliers and the City of Le Roy, the City of Le Roy's agents and the Engineer as their interest may appear, for loss to materials and equipment stored at the site, materials and temporary structures excluding contractor's construction equipment. The Builder's Risk policy shall insure against loss by perils on an "All Risk" basis including theft. Such policy shall be in a provisional amount equal to the total contract price, or such other amount as shall be satisfactory to the City of Le Roy and a duplicate policy thereof shall be provided to the City of Le Roy through the Engineer. The Builder's Risk Insurance, as specified herein, shall be a primary coverage in relation to any other policies which the City of Le Roy may maintain on its property, including the property covered by this Contract, and the policy shall include a suitable endorsement to this effect. The deductible shall not exceed $2,500 and the deductible amount shall be the responsibility of the Contractor. Coverage provided by the Contractor shall be limited and defined by the actual terms and conditions of the policy.

2.05 Insurance required in this section shall be written by an insurance company or companies satisfactory to the City of Le Roy. Before commencing any work hereunder, certificates evidencing the maintenance of worker's compensation, general liability and automobile liability and umbrella liability shall be furnished to the City of Le Roy and shall contain substantially the following cancellation provision:

"The insurance evidenced by this certificate will not be canceled or materially reduced except after 30 days from receipt by the City of Le Roy and the Engineer of written notice thereof."

"The Worker's Compensation insurance evidenced by this certification is valid in the State of Illinois."

2.06 Any subcontractor of the Contractor shall be required to procure and maintain during the life of the subcontract, insurance the same as required of the Contractor hereunder and to comply with the provisions of this article, except that the full Owner's Protective Coverage shall be provided by the General Contractor.

NOTICE: THIS CONTRACT WILL NOT BE AWARDED UNTIL THE CONTRACTOR HAS PROVIDED THE OWNER WITH EVIDENCE OF INSURABILITY.

SP-3 PREVAILING WAGE RATE

3.01 Pursuant to the Prevailing Wage Act, 820 ILCS 130/1 et. seq. If the rates are revised during the pendency of the Contract, the Contractor must pay the revised labor rate. No change orders will be approved to cover the cost of revised labor rates.

SP-4 JOINT UTILITY LOCATING INFORMATION FOR EXCAVATORS

4.01 Pursuant contractor's attention is directed to the fact that there exists within the State of Illinois a Joint Utility Locating Information for Excavators (J.U.L.I.E.) System. All utility companies, municipalities having gas mains and a number of others are a part of this system. Instead of notifying each individual utility owner that he/she will be working within the area, it will only be necessary to call the number of the Joint Utility Information for Excavators System, which is 1-800-892-0123. They will notify all utility companies involved that their respective utility should be located. A minimum of 48 hours advance notice is required and the political name of the township where the work is located along with other location information such as land section and quarter section.

SP-5 RECORDING OF EXISTING CONDITIONS

5.01 The Contractor shall provide DVD video recordings of existing facilities along the route or area of all construction prior to the start of work, including delivery of materials and equipment. The recordings shall be adequate to serve as a basis for comparison in determining whether the terms of the Specifications with respect to replacements, restoration and/or preservation of existing surfaces have been complied with. One set of copies of the video recordings shall be given to the Engineer for his files prior to the initiation of construction activities.

5.02 This work will not be paid for separately, but shall be considered incidental to the Contract.

SP-6 DUST CONTROL AND CLEANING OF WORK AREAS

6.01 The Contractor shall be responsible for control of dust and dirt occasioned by the construction work. Bidders are advised that all affected work areas are to be kept clean.

6.02 The cost of all work required to keep the work areas clean shall be included in the contract pay items given in the proposal; and no additional compensation will be allowed.

SP-7 ALTERATIONS, CANCELLATIONS, EXTENSIONS, DEDUCTIONS AND EXTRA WORK

7.01 All contractors shall include the unit price and extension amount provided on the bid proposal form as a part of their Bid. The funds established in this item shall only be used by the City of Le Roy in the event alterations, cancellations, extensions, deductions, or extra work on the project is required. As with all other pay items the contractor(s) will only receive what has be approved during construction and the remaining balance will not be paid to the contractor(s).

7.02 All alterations, cancellations, extensions, deductions, or extra work will be completed and paid for in accordance with Section 104.02 of the IDOT Standard Specifications for Road and Bridge Construction.

SP-8 FINAL WAIVER OF LIEN

8.01 The Contractor and all affected subcontractors and suppliers shall submit final waivers of lien releasing the City of Le Roy prior to release of final payment.

8.02 An acceptable final waiver of lien form is included in the Contract Documents.

SP-9 GUARANTY-WARRANTY

9.01 Contractor guarantees all work performed and all materials and equipment furnished and installed under this Contract against defects in materials and workmanship for a period of one year from date of final payment approval by the Owner.

9.02 This guaranty shall be in addition to and not in lieu of any warranties or guaranties, expressed or implied by manufacturers, suppliers, or subcontractors.

9.03 The Contractor agrees that he will at his expense, and without extra cost to the Owner, remove, repair, or replace all defective materials, equipment, apparatus and work, and pay for all damages resulting from defects.

9.04 Nothing in this Article implies that the guaranty applies to or covers work which has been abused or neglected by the Owner.

9.05 Warranties by manufacturers or suppliers shall name the Owner. Warranty documents shall be delivered to the Owner by the Contractor.

9.06 The guaranty-warranty time limits do not imply any limitations of the Contractor's liability for defects for less than the legal limit of liability in accordance with the law of the place of construction.

EXHIBIT A

McLean County Prevailing Wage Rates posted on 2/10/2021

						Overtime								
Trade Title	**Rg**	**Type**	**C**	**Base**	**Foreman**	**M-F**	**Sa**	**Su**	**Hol**	**H/W**	**Pension**	**Vac**	**Trng**	**Other Ins**
ASBESTOS ABT-GEN	All	BLD		32.01	33.26	1.5	1.5	2.0	2.0	8.50	16.13	0.00	0.80	
ASBESTOS ABT-GEN	All	HWY		34.43	35.93	1.5	1.5	2.0	2.0	8.50	17.11	0.00	0.80	
ASBESTOS ABT-MEC	All	BLD		32.96	35.60	1.5	1.5	2.0	2.0	14.07	12.30	0.00	0.77	
BOILERMAKER	All	BLD		41.00	44.00	1.5	1.5	2.0	2.0	7.07	20.57	0.00	1.24	
BRICK MASON	All	BLD		32.55	34.05	1.5	1.5	2.0	2.0	10.85	15.55	0.00	0.85	
CARPENTER	All	BLD		33.57	35.82	1.5	1.5	2.0	2.0	8.90	19.50	0.00	0.70	
CARPENTER	All	HWY		36.16	38.41	1.5	1.5	2.0	2.0	8.90	20.50	0.00	0.67	
CEMENT MASON	All	BLD		33.55	34.80	1.5	1.5	2.0	2.0	7.25	17.09	0.00	0.64	
CEMENT MASON	All	HWY		34.63	36.88	1.5	1.5	2.0	2.0	7.25	17.54	0.00	0.66	
CERAMIC TILE FINISHER	All	BLD		33.46		1.5	1.5	2.0	2.0	10.85	12.10	0.00	0.84	
ELECTRIC PWR EQMT OP	All	ALL		47.70	56.60	1.5	1.5	2.0	2.0	7.93	13.36	0.00	0.72	
ELECTRIC PWR GRNDMAN	All	ALL		32.41	56.60	1.5	1.5	2.0	2.0	7.47	9.07	0.00	0.48	
ELECTRIC PWR LINEMAN	All	ALL		53.09	56.60	1.5	1.5	2.0	2.0	8.09	14.86	0.00	0.80	
ELECTRIC PWR TRK DRV	All	ALL		34.02	56.60	1.5	1.5	2.0	2.0	7.52	9.53	0.00	0.51	
ELECTRICIAN	E	BLD		42.48	45.03	1.5	1.5	2.0	2.0	7.25	10.42	0.00	0.64	
ELECTRICIAN	W	BLD		40.25	44.28	1.5	1.5	2.0	2.0	7.37	12.13	0.00	1.00	
ELECTRONIC SYSTEM TECH	E	BLD		32.28	34.28	1.5	1.5	2.0	2.0	7.25	10.32	0.00	0.40	
ELECTRONIC SYSTEM TECH	W	BLD		34.47	36.47	1.5	1.5	2.0	2.0	7.25	9.33	0.00	0.40	
ELEVATOR CONSTRUCTOR	All	BLD		49.32	55.49	2.0	2.0	2.0	2.0	15.87	19.31	3.95	0.64	
FENCE ERECTOR	E	ALL		34.34	36.24	1.5	1.5	2.0	2.0	11.59	13.02	0.00	1.11	
GLAZIER	All	BLD		36.16	38.16	1.5	1.5	1.5	2.0	12.67	9.74	0.00	1.25	
HEAT/FROST INSULATOR	All	BLD		43.95	46.59	1.5	1.5	2.0	2.0	14.07	13.76	0.00	0.77	
IRON WORKER	E	ALL		34.34	36.24	1.5	1.5	2.0	2.0	11.59	13.02	0.00	1.11	
IRON WORKER	W	BLD		33.06	34.96	1.5	1.5	2.0	2.0	11.51	17.87	0.00	0.84	
IRON WORKER	W	HWY		38.66	40.66	1.5	1.5	2.0	2.0	11.51	17.87	0.00	0.99	
LABORER	All	BLD		31.01	32.26	1.5	1.5	2.0	2.0	8.50	16.13	0.00	0.80	
LABORER	All	HWY		33.43	34.93	1.5	1.5	2.0	2.0	8.50	17.11	0.00	0.80	
LABORER, SKILLED	All	BLD		31.01	32.26	1.5	1.5	2.0	2.0	8.50	16.13	0.00	0.80	
LABORER, SKILLED	All	HWY		33.43	34.93	1.5	1.5	2.0	2.0	8.50	17.11	0.00	0.80	
LATHER	All	BLD		33.57	35.82	1.5	1.5	2.0	2.0	8.90	19.50	0.00	0.70	
MACHINERY MOVER	W	HWY		38.66	40.66	1.5	1.5	2.0	2.0	11.51	17.87	0.00	0.99	

MACHINIST	All	BLD		49.68	52.18	1.5	1.5	2.0	2.0	7.93	8.95	1.85	1.47	
MARBLE FINISHER	All	BLD		33.46		1.5	1.5	2.0	2.0	10.85	12.10	0.00	0.84	
MARBLE MASON	All	BLD		36.70	37.95	1.5	1.5	2.0	2.0	10.85	12.10	0.00	0.86	
MILLWRIGHT	All	BLD		33.06	35.31	1.5	1.5	2.0	2.0	8.90	20.44	0.00	0.70	
MILLWRIGHT	All	HWY		36.40	38.65	1.5	1.5	2.0	2.0	8.90	20.85	0.00	0.67	
OPERATING ENGINEER	All	BLD	1	42.05	45.05	1.5	1.5	2.0	2.0	10.50	21.25	0.00	3.60	
OPERATING ENGINEER	All	BLD	2	38.93	45.05	1.5	1.5	2.0	2.0	10.50	21.25	0.00	3.60	
OPERATING ENGINEER	All	BLD	3	33.78	45.05	1.5	1.5	2.0	2.0	10.50	21.25	0.00	3.60	
OPERATING ENGINEER	All	HWY	1	42.05	45.05	1.5	1.5	2.0	2.0	10.50	21.25	0.00	3.60	
OPERATING ENGINEER	All	HWY	2	38.93	45.05	1.5	1.5	2.0	2.0	10.50	21.25	0.00	3.60	
OPERATING ENGINEER	All	HWY	3	33.78	45.05	1.5	1.5	2.0	2.0	10.50	21.25	0.00	3.60	
PAINTER	All	ALL		37.67	39.67	1.5	1.5	1.5	2.0	17.02	5.56	0.00	1.35	
PAINTER - SIGNS	All	BLD		40.74	45.75	1.5	1.5	2.0	2.0	3.04	3.90	0.00	0.00	
PILEDRIVER	All	BLD		34.57	36.82	1.5	1.5	2.0	2.0	8.90	19.50	0.00	0.70	
PILEDRIVER	All	HWY		36.16	38.41	1.5	1.5	2.0	2.0	8.90	20.50	0.00	0.67	
PIPEFITTER	All	BLD		43.85	48.24	1.5	1.5	2.0	2.0	7.75	14.20	0.00	1.70	
PLASTERER	All	BLD		30.30	32.30	1.5	1.5	2.0	2.0	9.00	20.98	0.00	0.90	
PLUMBER	All	BLD		43.85	48.24	1.5	1.5	2.0	2.0	7.75	14.20	0.00	1.70	
ROOFER	All	BLD		32.00	35.20	1.5	1.5	2.0	2.0	9.50	10.79	0.00	0.30	
SHEETMETAL WORKER	All	BLD		34.74	36.48	1.5	1.5	2.0	2.0	10.22	18.30	0.00	1.02	
SIGN HANGER	W	HWY		38.66	40.66	1.5	1.5	2.0	2.0	11.51	17.87	0.00	0.99	
SPRINKLER FITTER	All	BLD		41.97	44.72	1.5	1.5	2.0	2.0	10.23	14.02	0.00	0.52	
STEEL ERECTOR	W	HWY		38.66	40.66	1.5	1.5	2.0	2.0	11.51	17.87	0.00	0.99	
TERRAZZO FINISHER	All	BLD		33.46		1.5	1.5	2.0	2.0	10.85	12.10	0.00	0.84	
TERRAZZO MASON	All	BLD		36.70	37.95	1.5	1.5	2.0	2.0	10.85	12.10	0.00	0.86	
TILE MASON	All	BLD		36.70	37.95	1.5	1.5	2.0	2.0	10.85	12.10	0.00	0.86	
TRUCK DRIVER	All	O&C	1	31.14	34.54	1.5	1.5	2.0	2.0	13.52	6.62	0.00	0.25	
TRUCK DRIVER	All	O&C	2	31.60	34.54	1.5	1.5	2.0	2.0	13.52	6.62	0.00	0.25	
TRUCK DRIVER	All	O&C	3	31.82	34.54	1.5	1.5	2.0	2.0	13.52	6.62	0.00	0.25	
TRUCK DRIVER	All	O&C	4	32.11	34.54	1.5	1.5	2.0	2.0	13.52	6.62	0.00	0.25	
TRUCK DRIVER	All	O&C	5	32.97	34.54	1.5	1.5	2.0	2.0	13.52	6.62	0.00	0.25	
TRUCK DRIVER	N	ALL	1	39.92	40.47	1.5	1.5	2.0	2.0	10.05	11.93	0.00	0.15	
TRUCK DRIVER	N	ALL	2	40.07	40.47	1.5	1.5	2.0	2.0	10.05	11.93	0.00	0.15	
TRUCK DRIVER	N	ALL	3	40.27	40.47	1.5	1.5	2.0	2.0	10.05	11.93	0.00	0.15	
TRUCK DRIVER	N	ALL	4	40.47	40.47	1.5	1.5	2.0	2.0	10.05	11.93	0.00	0.15	
TRUCK DRIVER	S	ALL	1	38.93	43.17	1.5	1.5	2.0	2.0	13.52	6.62	0.00	0.25	

TRUCK DRIVER	S	ALL	2	39.50	43.17	1.5	1.5	2.0	2.0	13.52	6.62	0.00	0.25	
TRUCK DRIVER	S	ALL	3	39.77	43.17	1.5	1.5	2.0	2.0	13.52	6.62	0.00	0.25	
TRUCK DRIVER	S	ALL	4	40.14	43.17	1.5	1.5	2.0	2.0	13.52	6.62	0.00	0.25	
TRUCK DRIVER	S	ALL	5	41.21	43.17	1.5	1.5	2.0	2.0	13.52	6.62	0.00	0.25	

Legend

Rg Region
Type Trade Type - All,Highway,Building,Floating,Oil & Chip,Rivers
C Class
Base Base Wage Rate
OT M-F Unless otherwise noted, OT pay is required for any hour greater than 8 worked each day, Mon through Fri. The number listed is the multiple of the base wage.
OT Sa Overtime pay required for every hour worked on Saturdays
OT Su Overtime pay required for every hour worked on Sundays
OT Hol Overtime pay required for every hour worked on Holidays
H/W Health/Welfare benefit
Vac Vacation
Trng Training
Other Ins Employer hourly cost for any other type(s) of insurance provided for benefit of worker.

Explanations MCLEAN COUNTY

ELECTRICIAN (EAST) – Townships of Cropsey, Anchor, Cheneys Grove, and Ballflower

ELECTRICIAN (WEST) – The entirety of McLean County except for the portions defined as the East region.

ELECTRONIC SYSTEMS TECHINICIAN (EAST) – Townships of Cropsey, Anchor, Cheneys Grove, and Ballflower

ELECTRONIC SYSTEMS TECHINICIAN (WEST) – The entirety of McLean County except for the portions defined as the East region.

FENCE ERECTOR - See Ironworkers.

IRONWORKERS (EAST) - That part of the county East of a diagonal line from Heyworth to a point half way between Chenoa and Weston.

TEAMSTERS (NORTH) - North of a straight line starting on the west side where Route 24 crosses McClean County line in a southeasterly direction to the most south-southwestern corner of Livingston County.

The following list is considered as those days for which holiday rates of wages for work performed apply: New Years Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, Christmas Day and Veterans Day in some classifications/counties. Generally, any of these holidays which fall on a Sunday is celebrated on the following Monday. This then makes work performed on that Monday payable at the appropriate overtime rate for holiday pay. Common practice in a given local may alter certain days of celebration. If in doubt, please check with IDOL.

Oil and chip resealing (O&C) means the application of road oils and liquid asphalt to coat an existing road surface, followed by application of aggregate chips or gravel to coated surface, and subsequent rolling of material to seal the surface.

EXPLANATION OF CLASSES

ASBESTOS - GENERAL - removal of asbestos material/mold and hazardous materials from any place in a building, including mechanical systems where those mechanical systems are to be removed. This includes the removal of asbestos materials/mold and hazardous materials from ductwork or pipes in a building when the building is to be demolished at the time or at some close future date. ASBESTOS - MECHANICAL - removal of asbestos material from mechanical systems, such as pipes, ducts, and boilers, where the mechanical systems are to remain.

CERAMIC TILE FINISHER, MARBLE FINISHER, TERRAZZO FINISHER

Assisting, helping or supporting the tile, marble and terrazzo mechanic by performing their historic and traditional work assignments required to complete the proper installation of the work covered by said crafts. The term "Ceramic" is used for naming the classification only and is in no way a limitation of the product handled. Ceramic takes into consideration most hard tiles.

ELECTRONIC SYSTEMS TECHNICIAN

Installation, service and maintenance of low-voltage systems which utilizes the transmission and/or transference of voice, sound, vision, or digital for commercial, education, security and entertainment purposes for the following: TV monitoring and surveillance, background/foreground music, intercom and telephone interconnect, field programming, inventory control systems, microwave transmission, multi-media, multiplex, radio page, school, intercom and sound burglar alarms and low voltage master clock systems.

Excluded from this classification are energy management systems, life safety systems, supervisory controls and data acquisition systems not intrinsic with the above listed systems, fire alarm systems, nurse call systems and raceways exceeding fifteen feet in length.

LABORER, SKILLED - BUILDING

The skilled laborer building (BLD) classification shall encompass the following types of work, irrespective of the site of the work: tending of carpenters in unloading, handling, stockpiling and distribution operations, also other building crafts, mixing, handling, and conveying of all materials used by masons, plasterers and other building construction crafts, whether done by hand or by any process. The drying of plastering when done by salamander heat, and the cleaning and clearing of all debris. All work pertaining to and in preparation of asbestos abatement and removal. The building of scaffolding and staging for masons and plasterers. The excavations for buildings and all other construction, digging, of trenches, piers, foundations and holes, digging, lagging, sheeting, cribbing, bracing and propping of foundations, holes, caissons, cofferdams, and dikes, the setting of all guidelines for machine or hand excavation and subgrading. The mixing, handling, conveying, pouring, vibrating, gunniting and otherwise applying of concrete, whether by hand or other method of concrete for any walls, foundations, floors, or for other construction concrete sealant men. The wrecking, stripping, dismantling, and handling of concrete forms and false work, and the building of centers for fireproofing purposes. Boring machine, gas, electric or air in preparation for shoving pipe, telephone cable, and so forth, under highways, roads, streets and alleys. All hand and power operating cross cut saws when used for clearing. All work in compressed air construction. All work on acetylene burners in salvaging. The blocking and tamping of concrete. The laying of sewer tile and conduit, and pre-cast materials. The assembling and dismantling of all jacks and sectional scaffolding, including elevator construction and running of slip form jacks. The work of drill running and blasting, including wagon drills. The wrecking, stripping, dismantling, cleaning, moving and oiling of forms. The cutting off of concrete piles. The loading, unloading, handling and carrying to place of installation of all rods, (and materials for use in reinforcing) concrete and the hoisting of same and all signaling where hoist is used in this type of construction coming under the jurisdiction of the Laborers' Union. And, all other labor work not awarded to any other craft. Mortar mixers, kettlemen and carrier of hot stuff, tool crib men, watchmen (Laborer), firemen or salamander tenders, flagmen, deck hands, installation and maintenance of temporary gas-fired heating units, gravel box men, dumpmen and spotters, fencing Laborers, cleaning lumber, pit men, material checkers, dispatchers, unloading explosives, asphalt plant laborers, writer of scale tickets, fireproofing laborers, janitors, asbestos abatement and removal laborers,

handling of materials treated with oil, creosote, chloride, asphalt, and/or foreign material harmful to skin or clothing, Laborers with de-watering systems, gunnite nozzle men, laborers tending masons with hot material or where foreign materials are used, Laborers handling masterplate or similar materials, laser beam operator, concrete burning machine operator, material selector men working with firebrick or combustible material, dynamite men, track laborers, cement handlers, chloride handlers, the unloading and laborers with steel workers and re-bars, concrete workers (wet), luteman, asphalt raker, curb asphalt machine operator, ready mix scalemen, permanent, portable or temporary plant drilling machine operator, plaster tenders, underpinning and shoring of buildings, fire watch, signaling of all power equipment, to include trucks excavating equipment, etc., tree topper or trimmer when in connection to construction, tunnel helpers in free air, batch dumpers, kettle and tar men, tank cleaners, plastic installers, scaffold workers, motorized buggies or motorized unit used for wet concrete or handling of building materials, sewer workers, rod and chain men, vibrator operators, mortar mixer operator, cement silica, clay, fly ash, lime and plasters, handlers (bulk or bag), cofferdam workers, on concrete paving, placing, cutting and tying of reinforcing, deck hand, dredge hand and shore laborers, bankmen on floating plant, asphalt workers with machine & layers, grade checker, power tools, caisson workers, lead man on sewer work, welders, cutters, burners and torch men, chain saw operators, paving breaker, jackhammer and drill operator, layout man and/or drainage tile layer, steel form setters -- street and highway, air tamping hammerman, signal man on crane, concrete saw operator, screen man on asphalt pavers, front end man on chip spreader, multiple concrete duct -- lead man.

LABORER, SKILLED - HIGHWAY

The skilled laborer heavy and highway (HWY) classification shall encompass the following types of work, irrespective of the site of the work: handling of materials treated with oil, creosote, asphalt and/or any foreign materials harmful to skin or clothing, track laborers, chloride handlers, the unloading and loading with steel workers and re-bars, concrete workers (wet), tunnel helpers in free air, batch dumpers, mason tenders, kettle and tar men, plastic installers, scaffold workers, motorized buggies or motorized unit used for wet concrete or handling of building materials, laborers with de-watering systems, sewer workers plus depth, rod and chainmen, vibrator operators, mortar mixer operators, cement silica, clay, fly ash, lime and plasters, handlers (bulk or bag), cofferdam workers plus depth, on concrete paving, placing, cutting and tying or reinforcing, deck hand, dredge hand shore laborers, bankmen on floating plant, asphalt workers with machine, and layers, grade checker, power tools, stripping of all concrete forms excluding paving forms, dumpmen and spotters, when necessary, caisson workers plus depth, gunnite nozzle men, welders, cutters, burners and torchmen, chain saw operators, paving breaker, jackhammer and drill operators, layout man and/or drainage tile layer, steel form setters - street and highway, air tamping hammerman, signal man on crane, concrete saw operator, screedman on asphalt pavers, front end man on chip spreader, multiple concrete duct, luteman, asphalt raker, curb asphalt machine operator, ready mix scalemen (portable or temporary plant), laser beam operator, concrete burning machine operator, and coring machine operator.

TRUCK DRIVER - BUILDING, HEAVY AND HIGHWAY CONSTRUCTION - SOUTH

Class 1. Drivers on 2 axle trucks hauling less than 9 ton. Air compressor and welding machines and brooms, including those pulled by separate units, truck driver helpers, warehouse employees, mechanic helpers, greasers and tiremen, pickup trucks when hauling materials, tools, or workers to and from and on-the-job site, and fork lifts up to 6,000 lb. capacity.

Class 2. Two or three axle trucks hauling more than 9 ton but hauling less than 16 ton. A-frame winch trucks, hydrolift trucks, vactor trucks or similar equipment when used for transportation purposes. Fork lifts over 6,000 lb. capacity, winch trucks, four axle combination units, and ticket writers.

Class 3. Two, three or four axle trucks hauling 16 ton or more. Drivers on water pulls, articulated dump trucks, mechanics and working forepersons, and dispatchers. Five axle or more combination units.

Class 4. Low Boy and Oil Distributors.

Class 5. Drivers who require special protective clothing while employed on hazardous waste work.

TRUCK DRIVER - BUILDING, HEAVY AND HIGHWAY CONSTRUCTION - NORTH

Class 1. Two or three Axle Trucks. A-frame Truck when used for transportation purposes; Air Compressors and Welding Machines, including those pulled by cars, pick-up trucks and tractors; Ambulances; Batch Gate Lockers; Batch Hopperman; Car and Truck Washers; Carry-alls; Fork Lifts and Hoisters; Helpers; Mechanics Helpers and Greasers; Oil Distributors 2-man operation; Pavement Breakers; Pole Trailer, up to 40 feet; Power Mower Tractors; Self-propelled Chip Spreader; Skipman; Slurry Trucks, 2-man operation; Slurry Truck Conveyor Operation, 2 or 3 man; Teamsters; Unskilled dumpman; and Truck Drivers hauling warning lights, barricades, and portable toilets on the job site.

Class 2. Four axle trucks; Dump Crets and Adgetors under 7 yards; Dumpsters, Track Trucks, Euclids, Hug Bottom Dump Turnapulls or Turnatrailers when pulling other than self-loading equipment or similar equipment under 16 cubic yards; Mixer Trucks under 7 yeards; Ready-mix Plant Hopper Operator, and Winch Trucks, 2 Axles.

Class 3. Five axle trucks; Dump Crets and Adgetors 7 yards and over; Dumpsters, Track Trucks, Euclids, Hug Bottom Dump Turnatrailers or turnapulls when pulling other than self-loading equipment or similar equipment over 16 cubic yards; Explosives and/or Fission Material Trucks; Mixer Trucks 7 yards or over; Mobile Cranes while in transit; Oil Distributors, 1-man operation; Pole Trailer, over 40 feet; Pole and Expandable Trailers hauling material over 50 feet long; Slurry trucks, 1-man operation; Winch trucks, 3 axles or more; Mechanic--Truck Welder and Truck Painter.

Class 4. Six axle trucks; Dual-purpose vehicles, such as mounted crane trucks with hoist and accessories; Foreman; Master Mechanic; Self-loading equipment like P.B. and trucks with scoops on the front. TRUCK DRIVER - OIL AND CHIP RESEALING ONLY.

This shall encompass laborers, workers and mechanics who drive contractor or subcontractor owned, leased, or hired pickup, dump, service, or oil distributor trucks. The work includes transporting materials and equipment (including but not limited to, oils, aggregate supplies, parts, machinery and tools) to or from the job site; distributing oil or liquid asphalt and aggregate; stock piling material when in connection with the actual oil and chip contract. The Truck Driver (Oil & Chip Resealing) wage classification does not include supplier delivered materials.

OPERATING ENGINEERS - BUILDING

Class 1. Cranes; Overhead Cranes; Gradall; All Cherry Pickers; Mechanics; Central Concrete Mixing Plant Operator; Road Pavers (27E - Dual Drum - Tri Batchers); Blacktop Plant Operators and Plant Engineers; 3 Drum Hoist; Derricks; Hydro Cranes; Shovels; Skimmer Scoops; Koehring Scooper; Drag Lines; Backhoe; Derrick Boats; Pile Drivers and Skid Rigs; Clamshells; Locomotive Cranes; Dredge (all types) Motor Patrol; Power Blades - Dumore - Elevating and similar types; Tower Cranes (Crawler-Mobile) and Stationary; Crane-type Backfiller; Drott Yumbo and similar types considered as Cranes; Caisson Rigs; Dozer; Tournadozer; Work Boats; Ross Carrier; Helicopter; Tournapulls - all and similar types; Scoops (all sizes); Pushcats; Endloaders (all types); Asphalt Surfacing Machine; Slip Form Paver; Rock Crusher; Heavy Equipment Greaser; CMI, CMI Belt Placer, Auto Grade & 3 Track and similar types; Side Booms; Multiple Unit Earth Movers; Creter Crane; Trench Machine; Pump-crete-Belt Crete-Squeeze Cretes-Screw-type Pumps and Gypsum; Bulker & Pump - Operator will clean; Formless Finishing Machine; Flaherty Spreader or similar types; Screed Man on Laydown Machine; Wheel Tractors (industrial or Farm-type w/Dozer-Hoe-Endloader or other attachments); F.W.D. & Similar Types; Vermeer Concrete Saw.

Class 2. Dinkeys; Power Launches; PH One-pass Soil Cement Machine (and similar types); Pugmill with Pump; Backfillers; Euclid Loader; Forklifts; Jeeps w/Ditching Machine or other attachments; Tuneluger; Automatic Cement and Gravel Batching Plants; Mobile Drills (Soil Testing) and similar types; Gurries and Similar Types; (1) and (2) Drum Hoists (Buck Hoist and Similar Types); Chicago Boom; Boring Machine & Pipe Jacking Machine; Hydro Boom; Dewatering System; Straw Blower; Hydro Seeder; Assistant Heavy Equipment Greaser on Spread; Tractors (Track type) without Power Unit pulling Rollers; Rollers on Asphalt -- Brick Macadem; Concrete Breakers; Concrete Spreaders; Mule Pulling Rollers; Center Stripper; Cement Finishing Machines & CMI Texture & Reel Curing Machines; Cement Finishing Machine; Barber Green or similar loaders; Vibro Tamper (All similar types) Self-propelled; Winch or Boom Truck; Mechanical Bull Floats; Mixers over 3 Bag to 27E; Tractor pulling Power Blade or Elevating

Grader; Porter Rex Rail; Clary Screed; Truck Type Hoptoe Oilers; Fireman; Spray Machine on Paving; Curb Machines; Truck Crane Oilers; Oil Distributor; Truck-Mounted Saws.

Class 3. Air Compressor; Power Subgrader; Straight Tractor; Trac Air without attachments; Herman Nelson Heater, Dravo, Warner, Silent Glo, and similar types; Roller: Five (5) Ton and under on Earth or Gravel; Form Grader; Crawler Crane & Skid Rig Oilers; Freight Elevators - permanently installed; Pump; Light Plant; Generator; Conveyor (1) or (2) - Operator will clean; Welding Machine; Mixer (3) Bag and Under (Standard Capacity with skip); Bulk Cement Plant; Oiler on Central Concrete Mixing Plant.

OPERATING ENGINEERS - HEAVY AND HIGHWAY CONSTRUCTION

CLASS 1. Cranes; Hydro Cranes; Shovels; Crane Type Backfiller; Tower, Mobile, Crawler, & Stationary Cranes; Derricks; Hoists (3 Drum); Draglines; Drott Yumbo & Similar Types considered as Cranes; 360 Degree Swing Excavator (Shears, Grapples, Movacs, etc.); Back Hoe; Derrick Boats; Pile Driver and Skid Rigs; Clam Shell; Locomotive - Cranes; Road Pavers - Single Drum - Dual Drum - Tri Batcher; Motor Patrols & Power Blades - Dumore - Elevating & Similar Types; Mechanics; Central Concrete Mixing Plant Operator; Asphalt Batch Plant Operators and Plant Engineers; Gradall; Caisson Rigs; Skimmer Scoop - Koering Scooper; Dredges (all types); Hoptoe; All Cherry Pickers; Work Boat; Ross Carrier; Helicopter; Dozer; Tournadozer; Tournapulls - all and similar types; Operation of Concrete and all Recycle Machines; Multiple Unit Earth Movers; Scoops (all sizes); Pushcats; Endloaders (all types); Asphalt Surfacing Machine; Slip Form Paver; Rock Crusher; Operation of Material Crusher, Screening Plants, and Tunnel Boring Machine; Heavy Equipment Greaser (top greaser on spread); CMI, Auto Grade, CMI Belt Placer & 3 Track and Similar Types; Side Booms; Asphalt Heater & Planer Combination (used to plane streets); Wheel Tractors (with Dozer, Hoe or Endloader Attachments); CAT Earthwork Compactors and Similar Types; Blaw Knox Spreader and Similar Types; Trench Machines; Pump Crete - Belt Crete - Squeeze Crete - Screw Type Pumps and Gypsum (operator will clean); Creter Crane; Operation of Concrete Pump Truck; Formless Finishing Machines; Flaherty Spreader or Similar Types; Screed Man on Laydown Machine; Vermeer Concrete Saw; Operation of Laser Screed; Span Saw; Dredge Leverman; Dredge Engineer; Lull or Similar Type; Hydro-Boom Truck; Operation of Guard Rail Machine; and Starting Engineer on Pipeline or Construction (11 or more pieces) including: Air Compressor (Trailer Mounted), All Forced Air Heaters (regardless of Size), Water Pumps (Greater than 4-1/2" or Total Discharge Over 4-1/2"), Light Plants, Generators (Trailer Mounted - Excluding Decontamination Trailer), Welding Machines (Any Size or Mode of Power), Conveyor, Mixer (any size), Stud Welder, Power Pac, etc, and Ground Heater (Trailer Mounted).

CLASS 2. Bulker & Pump; Power Launches; Boring Machine & Pipe Jacking Machine; Dinkeys; Operation of Carts, Powered Haul Unit for a Boring Machine; P & H One Pass Soil Cement Machines and Similar Types; Wheel Tractors (Industry or Farm Type - Other); Back Fillers; Euclid Loader; Fork Lifts; Jeep w/Ditching Machine or Other Attachments; Tunneluger; Automatic Cement & Gravel Batching Plants; Mobile Drills - Soil Testing and Similar Types; Pugmill with Pump; All (1) and (2) Drum Hoists; Dewatering System; Straw Blower; Hydro-Seeder; Bump Grinders (self-propelled); Assistant Heavy Equipment Greaser; Apsco Spreader; Tractors (Track-Type) without Power Units Pulling Rollers; Rollers on Asphalt - Brick or Macadam; Concrete Breakers; Concrete Spreaders; Cement Strippers; Cement Finishing Machines & CMI Texture & Reel Curing Machines; Vibro-Tampers (All Similar Types Self-Propelled); Mechanical Bull Floats; Self-Propelled Concrete Saws; Truck Mounted Power Saws; Operation of Curb Cutters; Mixers - Over Three (3) Bags; Winch and Boom Trucks; Tractor Pulling Power Blade or Elevating Grader; Porter Rex Rail; Clary Screed; Mule Pulling Rollers; Pugmill without Pump; Barber Greene or Similar Loaders; Track Type Tractor w/Power Unit attached (minimum); Fireman; Spray Machine on Paving; Curb Machines; Paved Ditch Machine; Power Broom; Self-Propelled Sweepers; Self-Propelled Conveyors; Power Subgrader; Oil Distributor; Straight Tractor; Truck Crane Oiler; Truck Type Oilers; Directional Boring Machine; Horizontal Directional Drill; Articulating End Dump Vehicles; Starting Engineer on Pipeline or Construction (6 -10 pieces) including: Air Compressor (Trailer Mounted), All Forced Air Heaters (regardless of Size), Water Pumps (Greater than 4-1/2" or Total Discharge Over 4-1/2"), Light Plants, Generators (Trailer Mounted - Excluding Decontamination Trailer), Welding Machines (Any Size or Mode of Power), Conveyor, Mixer (any size), Stud Welder, Power Pac, etc., and Ground Heater (Trailer Mounted).

CLASS 3. Straight Framed Truck Mounted Vac Unit (separately powered); Trac Air Machine (without attachments); Rollers - Five Ton and Under on Earth and Gravel; Form Graders; Bulk Cement Plant; Oilers; and Starting Engineer on Pipeline or Construction (3

- 5 pieces) including: Air Compressor (Trailer Mounted), All Forced Air Heaters (regardless of Size), Water Pumps (Greater than 4-1/2" or Total Discharge Over 4-1/2"), Light Plants, Generators (Trailer Mounted - Excluding Decontamination Trailer), Welding Machines (Any Size or Mode of Power), Conveyor, Mixer (any size), Stud Welder, Power Pac, etc., and Ground Heater (Trailer Mounted).

Other Classifications of Work:

For definitions of classifications not otherwise set out, the Department generally has on file such definitions which are available. If a task to be performed is not subject to one of the classifications of pay set out, the Department will upon being contacted state which neighboring county has such a classification and provide such rate, such rate being deemed to exist by reference in this document. If no neighboring county rate applies to the task, the Department shall undertake a special determination, such special determination being then deemed to have existed under this determination. If a project requires these, or any classification not listed, please contact IDOL at 217-782-1710 for wage rates or clarifications.

LANDSCAPING

Landscaping work falls under the existing classifications for laborer, operating engineer and truck driver. The work performed by landscape plantsman and landscape laborer is covered by the existing classification of laborer. The work performed by landscape operators (regardless of equipment used or its size) is covered by the classifications of operating engineer. The work performed by landscape truck drivers (regardless of size of truck driven) is covered by the classifications of truck driver.

TECHNICAL SPECIFICATIONS

SECTION 0211030 SITE PREPARATION

1. NOTICE

1.01 The General Conditions, Special Conditions, and all other herein bound and accompanying documents are part of these specifications and of the Contract. Submission of proposal implies that the bidder is fully conversant with all requirements of all above-mentioned documents.

2. SCOPE

2.01 The work covered by this section consists of furnishing all plant, labor, equipment, tools, services and materials, and in performing all operations required to complete the Site Preparation work, in strict accordance with this section of the specifications and applicable drawings and subject to the terms and conditions of the Contract.

3. SHOP DRAWINGS

3.01 Before commencing work, submit complete shop drawings and illustrations for work in this section for Engineer's approval. Refer to General Conditions for detailed information regarding shop drawings requirements.

4. CONDITION OF PREMISES

4.01 The Contractor shall accept the premises as they exist at the award of the contract and shall carry out the work as specified. The Owner assumes no responsibility for the conditions of the premises, nor continuation in conditions existing after site preparation has begun.

4.02 The Contractor shall assume the risk regarding damage or loss to structures or properties which are to remain, and which are damaged as a result of the site preparation operations.

5. SITE PREPARATIONS

5.01 The Contractor shall remove materials, structures, and equipment as shown on the drawings and specified herein.

5.02 Materials shall be removed or demolished in a manner that will cause the least disturbance to surrounding materials that are to remain.

5.03 Removal of steel structures shall be done in a manner that will leave adjacent steel members undamaged for proposed new work. All bolted, riveted, or welded joints shall be carefully removed by hand tools to leave remaining members undamaged.

6. UTILITY LINES

6.01 The Contractor shall locate all existing utilities or drains and protect same from damage in areas of work. Where drains or utilities are uncovered by the work, and are not shown on plans, Contractor shall plainly mark said utilities and notify the Engineer immediately. In no event shall said utilities be recovered without concurrence of the Engineer.

7. PROTECTION

7.01 The Contractor shall protect all adjacent areas, surfaces, and materials not included in the Site Preparation work from damage.

7.02 The Contractor shall provide shoring, bracing or protection as necessary to prevent damage or settlement to adjacent surfaces which are to remain.

A) The Contractor shall assume all liability for damage to adjacent surfaces or material resulting from Site Preparation work.

B) The Contractor shall notify the Engineer in event settlement or damage is apparent in materials that are to remain or if such materials or surfaces are endangered. He shall provide additional protection as required. Failure to notify the Engineer of damage, settlement or impending danger to existing materials or surfaces to remain, in no way relieves the Contractor of liability.

7.03 The Contractor shall repair at his expense any damage or settlement of materials to remain that are caused by Site Preparation work.

7.04 The Contractor shall fill all areaways, vaults, and voids as required on the plans, to levels as required with materials as indicated on the drawings, and compact all fill areas in accordance to specifications for Excavation, Backfilling and Grading.

8. DEBRIS

8.01 The Contractor shall remove all rubble, debris, scrap and demolition materials leaving site clear and ready for new work. See drawings for areas to be cleared.

A) Where noted on drawings, remove all loose materials regardless of whether materials are caused by this site preparation contract or by prior work.

B) Entire work area to be left broom clean so new work can be started.

8.02 Removal of materials requires that said materials be completely removed from the Owner's property unless otherwise noted on the drawings or directed by the Engineer.

9. BASIS OF PAYMENT

9.01 This work shall include the material, equipment, and labor as described within the section and throughout the project. This work shall not be paid for separately, rather as included with the applicable items.

SECTION 09080 PAINTING

1. NOTICE

1.01 The General Conditions, Special Conditions, and all other herein bound and accompanying documents are part of these specifications and of the Contract. Submission of proposal implies that the bidder is fully conversant with all requirements of all above mentioned documents.

2. SCOPE

2.01 The work covered by this section consists of furnishing all materials, accessories, equipment, tools, transportation, and performing all operations incidental to the execution and completion of all painting and finishing in accordance with this section of the specifications and applicable drawings and subject to the terms and conditions of the Contract.

3. SHOP DRAWINGS

3.01 Before commencing work, submit complete shop drawings and illustrations for work in this section for Engineer's approval. Refer to General Conditions for detailed information regarding shop drawings requirements.

4. BASIS OF BID

4.01 All paint colors will be selected by the Engineer or Owner. The Contractor shall base his bid on ceilings of a color different than walls, and maximum of two wall colors per room or area. Strong colors may be selected for doors, piping, equipment, and feature areas. Exterior colors shall be limited to two.

5. MATERIALS

5.01 The Contractor shall use one paint manufacturer throughout unless otherwise approved by the Engineer.

5.02 The term "paint" as used herein, includes emulsions, enamels, paints, stains, varnishes, sealers and other coatings, whether used as prime, intermediate, or finish coats.

5.03 The paints and the paint products named in this specification are products of Tnemec Co., Inc., North Kansas City, Missouri, Induron Coatings, Birmingham, Alabama and the Sherwin-Williams Company, Cleveland, OH. The products of other manufacturers, comparable in quality and generic type to those specified, will be acceptable if the Contractor submits with his Proposal satisfactory data on past performance, composition, directions for use, and other information required, for approval by the Engineer.

5.04 If mechanical equipment is factory painted with the paint of a manufacturer different than the one selected for the finish coats, the surface shall be primed and painted with the paint of the manufacturer selected for the finish coats.

5.05 All materials used in the work except oils, thinners and driers, shall be of the brands and qualities specified and shall be delivered to the job in their original containers with labels intact and seals unbroken. Labels shall show name of manufacturer, type of paint, formulation, color of paint, and instructions for reducing.

5.06 All cleaners, thinners, driers and other additives and surface pretreatment materials delivered to the job shall only be those approved for use by the manufacturer of the paints.

5.07 No materials other than those specified or approved shall be delivered to the project site. All unapproved materials shall be removed from the project site.

6. STORAGE AND MIXING

6.01 All due care shall be taken to keep fire hazards to a minimum. An approved hand fire extinguisher shall be provided and maintained in readiness near each paint storage and mixing area. No oily waste, rags, or painting equipment shall be left scattered throughout the premises at night or on non-working days.

6.02 Mixing on the job shall be done only where required by the paint manufacturer's instructions for variations in different applications. Colors shall be thoroughly and evenly tinted exhibiting no streaks or separation of color.

6.03 No paint shall be reduced or have faster drying induced by the addition of any product designed for such a purpose, except as recommended by the paint manufacturer. Do not incorporate in the paint any thinners or solvents used by cleaning brushes or other equipment.

6.04 Protect all floors and walls of work areas against damage and leave storage areas clean and in equivalent condition for spaces required in the Project.

7. SURFACE PREPARATION

7.01 The Contractor shall inspect all surfaces and adjoining work on which painting work is in any way dependent and shall report to the Engineer in writing any existing unsatisfactory conditions. No work shall be started until the unsatisfactory conditions are remedied.

7.02 The commencement of surface preparation and painting shall constitute the acceptance of existing conditions and any defects appearing in the painting work thereafter shall be the responsibility of the Contractor and shall be made good to the satisfaction of the Engineer at no additional cost to the Owner.

7.03 All surfaces shall be prepared in accordance with the paint manufacturer's instructions for the paint system required and as specified herein. Surfaces shall be smooth, dry, free from dust, grit, oil, grease, or any material which will adversely affect adhesion or appearance of applied coating.

7.04 Surfaces that have been cleaned, pretreated, and/or otherwise prepared for painting shall be given a coat of the specified first-coat material as soon as practicable after such preparation has been completed, but in any event prior to any deterioration of the prepared surface.

7.05 Hardware, accessories, plates, fixtures, and similar items in contact with painted surfaces shall be removed, masked, or otherwise protected prior to surface preparation and painting operations. Such removal shall be done by workmen skilled in the trades involved and upon completion of painting properly replaced by same. Exposed nails and other ferrous metal on surfaces to be painted shall be spot-primed with Tnemec 37H-77 Chem-Prime or Sherwin-Williams Kem Bond HS Universal Primer.

7.06 Surface Preparation Systems

A) SP-C1 – Cleaning

Remove all dirt, dust, form oil, curing compounds, grease stains, or efflorescence from concrete and masonry surfaces and roughen as required to provide good adhesion of paints. If washing of the surface of masonry is required, use trisodium phosphate solution followed by a clean water rinse. Fill all minor holes to produce uniform surface textures.

B) SP-C2 - Sweep Blasting (Vertical Surfaces)

Concrete surfaces must be clean, dry and free of old existing coatings. Cure new concrete a minimum of 28 days. Structural cracks and defects should be properly filled and sealed.

Concrete shall be cleaned and etched by sweep sandblasting so that the surface is grainy to the touch. All dust or foreign matter shall be removed by vacuuming.

C) SP-C3 - Acid Etching (Horizontal Surfaces)

Concrete surfaces must be clean and dry. Cure new concrete a minimum of 28 days.

Remove all dirt, dust, grease, oil and other contaminants, from surface.

Etch concrete surface with 15 to 20 percent muriatic acid. Thoroughly coat the concrete with solution applied with a mop or brush. When foaming stops, thoroughly rinse with clean water to remove soluble salts.

After etching, the surface should be “grainy” to the touch. If not, repeat the treatment.

Permit surface to thoroughly dry a minimum of 72 hours before painting.

D) SP-M1 - Solvent Cleaning

Non-ferrous surfaces that require paint shall be solvent cleaned and inhibited with an approved passivator prior to application of pretreatments or primers.

E) SP-P1 - Drywall

Fill all minor surface irregularities with spackling compound and sand to a smooth level surface prior to applying finish. Care shall be exercised to avoid raising nap on the paper.

F) SP-P2 - Plaster

Rake cracks, scratches, and abrasions deeply. Soak with water and fill with patching plaster or spackling compound. Treat with aqueous solution of zinc sulphate, 4 lbs. to 1 gallon of water. Add to solution enough phenolphthalein to act as a color warning of alkali. Allow to dry for 3 days. Remove loose crystals before finishing.

G) SP-S1 - Power Tool Cleaning

All oil and grease should be removed from surface prior to power cleaning.

The surface should be power cleaned, removing all loose mill scale, loose rust, loose paint and other detrimental foreign matter by any of the methods outlined in the Steel Structures Painting Council Specifications SP-11, latest revision. A surface profile of 1.0 mils is required. Feather out shoulders at the edges of chipped or abraded places to prevent flaws from showing through finish coats.

The clean surface should be primed as soon as possible and before any resting of the surface occurs. (Within 12 hours maximum).

H) SP-S2 - Commercial Blast Cleaning

All oil and grease should be removed from the surface prior to blast cleaning.

The surface should be blast cleaned to a Commercial Finish, removing dirt, rust-scale and foreign matter by any of the methods outlined in Steel Structures Painting Council Specifications SP-6, latest revision.

Blasting shall be done with centrifugal wheel or compressed air blast nozzles using either steel grit or flint silica sand. Abrasive should provide 0.75 mil maximum profile with a maximum depth of 1.5 mils. Steel Grit #G-80 or flint silica sand 20-50 mesh is recommended to obtain proper profile depth. Remove all dust and sand by vacuuming.

The blast cleaned surface should be primed as soon as possible and before any rusting of the surface occurs (within 12 hours maximum).

I) SP-S3 - Near White Blast Cleaning

The steel surface must be dry and clean in accordance with the following requirements.

Remove all grease, oils and contaminants with rags soaked in toluol or xylol. Discard rags and solvents frequently.

After oil and surface contaminants have been removed, and before sandblasting, all weld spatter must be removed. All rough welds and sharp edges must be ground to give a smooth rounded contour.

The surface should be blast cleaned to a Near White Metal finish, removing nearly all mill scale, rust, rust-scale, paint or foreign matter by any of the recommended methods outlined in the Steel Structures Painting Council Specification SP-10, latest revision.

Blasting shall be done with centrifugal wheel or compressed air blast nozzles using either steel grit or flint silica sand. Abrasive should provide 0.75 mil maximum profile with a maximum depth of 1.5 mils. Steel Grit #G-80 or flint silica sand 20-50 mesh is recommended to obtain proper profile depth. Remove all dust and sand by vacuuming.

The blast cleaned surface should be primed before any rust bloom forms.

J) SP-S4 – Pickling

All mill scale, rust and foreign matter shall be removed by the pickling method outlined in the Steel Structures Painting Council Specification SP-8.

The clean surface should be primed as soon as possible and before any rusting of the surface occurs.

K) SP-W1 – Wood

Sandpaper to a smooth even surface and then vacuum or dust off. Treat all knots and sap spots with mineral spirits and when dry touch up with an approved sealer. Subsequent to priming and staining, thoroughly fill nail and other holes and cracks with plastic wood filler for transparent finished wood and putty for painted wood. Unless otherwise authorized, painting shall proceed only when the moisture content of the wood is below 12 percent.

L) SP-G1 – Galvanized Steel

Brush-Off Blast Cleaning of Coated and Uncoated
Galvanized Steel, Stainless Steels, and Non-Ferrous Metals

Remove all soluble and insoluble contaminants and corrosion. Sweep (Abrasive) Blasting per SSPC SP-16 to achieve a uniform anchor profile (1.0 - 2.0 mils).

8. APPLICATION

8.01 Provide necessary protection for completed work and adjoining surfaces. Provide temporary closures as required to prevent dust circulation from adjacent areas of the building where other work is in progress or schedule the painting work to be done when other work in neighboring areas is not being performed. Keep new work protected at all times. Where it is necessary for the performance of painting to remove existing protection of work of others, such protection shall be fully replaced.

8.02 All work shall be performed by skilled personnel regularly engaged in this type of work. Surfaces shall be left free from drops, ridges, waves, laps and brush marks. Edges of paint adjoining other colors or materials shall be sharp, true and without overlapping.

8.03 Paint shall not be applied in temperatures below 50 degrees F. or above 90 degrees F., nor at any time when the temperature cannot be controlled and is likely to be greater or less than the limits specified herein. No exterior painting shall be done during threatening or inclement weather or under other conditions which are unsuitable for obtaining good results.

8.04 Prime or seal coats of paint shall not be applied to wood in areas where cement, mortar or plaster is in the process of application or drying.

8.05 The rate of application of paint shall not exceed the average rate of coverage recommended by paint manufacturer for the type of surface involved, less 10 percent allowance for losses, unless manufacturer's printed specifications state that the recommended rate includes normal expected losses. The minimum dry film thickness per coat shall not be less than thickness set forth under Article 9.8-10 PAINT SYSTEMS in this section of the specifications. Deficiencies shall be corrected by additional coat(s) of paint.

8.06 Each coat shall be uniform in coverage and color. Each coat shall not perceptibly vary in color unless otherwise permitted by the Engineer. Number of coats shall be as specified or as required for the acceptance of the finish as approved by the Engineer. Each coat shall be carefully examined and faulty material, poor workmanship, holidays, damaged areas and other imperfections shall be touched up prior to applying succeeding coats. Comply with paint manufacturer's recommendations for drying time between coats.

8.07 Bottoms, sides and edges of doors shall receive same finish as faces of doors. If refitting of doors is done prior to final acceptance, the Contractor shall refinish all edges at no extra cost to the Owner.

8.08 Except where otherwise noted on the drawings, incidental niches, recesses, passages, closets, etc., shall be finished to match similar or adjacent spaces whether such spaces are specifically mentioned or not. Access doors, panels, convectors, grilles and similar items shall be painted the same color as adjacent work, except where same as of non-ferrous metal or where otherwise indicated on drawings or directed by the Engineer.

8.09 Prime-coated butts, or other prime-coated hardware shall be painted or grained to match adjacent work to which they are attached.

8.10 In the event that the finished surfaces do not conform to the approved samples, Contractor shall do complete refinishing of such entire unit areas or sections as necessary in order to eliminate visible laps or other indications of repairs.

9. CLEANING

9.01 At completion of the painting work, Contractor shall clean off all paint spots and other paint materials from surfaces where they are not intended to be. He shall remove from the premises all rubbish and accumulated material and shall leave the work in clean, orderly condition, acceptable to the Engineer.

10. PAINT SYSTEMS

10.01 General

A) All work to receive paint shall be painted in accordance with one of the following paint systems as designated in the Painting Schedule.

B) The products specified herein shall be as manufactured by the Tnemec Company, Inc., North Kansas City, Missouri, Sherwin-Williams Company, Cleveland, OH or Induron Coatings, Birmingham, Alabama.

10.02 System

System No. 1 - Interior & Exterior Ferrous Metal - Non-Submerged - Gloss

Surface preparation:	SP-S1, SP-S2.

TNEMEC

Shop primer:	One coat Tnemec Series 69-1255 Beige Hi-Build Epoxoline II at 3.0 dry mils.
Field touch-up:	Tnemec Series 69-1255 Beige Hi-Build Epoxoline II.
Intermediate:	Tnemec Series 69-color Hi-Build Epoxoline II at 3.0 dry mils.
Finish:	Tnemec Series 74-color Endura-Shield at 2.0 dry mils.
Total thickness (dry):	8.0 mils.

SHERWIN WILLIAMS

Shop primer:	One coat S-W Macropoxy 646 at 3.0 dry mils.
Field touch-up:	S-W Macropoxy 646 (Semi-gloss) Mil White.
Intermediate:	S-W Macropoxy 646 (Semi-gloss)Mil White at 3.0 dry mils.
Finish:	S-W Acrlon 218 S/G at 3.0 dry mils.
Total thickness (dry):	9.0 mils.

INDURON

Shop primer:	One coat Induron Induramastic 85 at 3.0 dry mils.
Field touch-up:	Induron Induramastic 85 Tan.
Intermediate:	Induron Induramastic 85 Tan or Off-White at 3.0 dry mils
Finish:	Induron 6600 Indurathane Plus at 2.0 dry mils.

System No. 2 - Same as No. 1 - Semi-Gloss

Surface preparation:	SP-S1, SP-S2.

TNEMEC

Shop primer:	One coat Tnemec Series 69-1255 Beige Hi-Build Epoxoline II at 3.0 dry mils.
Field touch-up:	Tnemec Series 69-1255 Beige Hi-Build Epoxoline II.
Intermediate:	Tnemec Series 69-color Hi-Build Epoxoline II at 3.0 dry mils.
Finish:	Tnemec Series 75-color Endura-Shield at 2.0 dry mils.
Total thickness (dry):	8.0 mils.

SHERWIN WILLIAMS

Shop primer:	One coat S-W Macropoxy 646 at 3.0 dry mils.
Field touch-up:	S-W Macropoxy 646 (Semi-gloss) Mil White.
Intermediate:	S-W Macropoxy 646 (Semi-gloss)Mil White at 3.0 dry mils.
Finish:	S-W Acrlon 218 S/G at 3.0 dry mils.
Total thickness (dry):	9.0 mils.

INDURON

Shop primer:	Induron Induramastic 85 Tan at 3.0 dry mils.
Field touch-up:	Induron Induramastic 85 Tan.
Intermediate:	Induron Induramastic 85 Tan or Off White at 3.0 dry mils.
Finish:	Induron 6600 Indurethane SG at 2.0 dry mils.
Total thickness (dry):	8.0 mils.

System No. 3 - Sewage

Surface preparation: SP-S3.

TNEMEC

Shop primer:	One coat Tnemec Series 69-1255 Beige Hi-Build Epoxoline II at 5.0 dry mils.
Field touch-up:	Series 69-1255 Beige Hi-Build Epoxoline II.
Finish:	Two coats of Tnemec 69-color Hi-Build Epoxoline II at 5.0 dry mils per coat.
Total thickness (dry):	15.0 mils.

SHERWIN WILLIAMS

Shop primer:	One coat S-W Dura-plate Multi-purpose epoxy at 5.0 dry mils.
Field touch-up:	S-W Dura-plate Multi-purpose epoxy.
Finish:	Two coats of S-W Dura-plate Multi-purpose epoxy at 5.0 dry mils per coat.
Total thickness (dry):	15.0 mils.

INDURON

Shop primer:	Induron Induramastic 85 Tan at 5.0 dry mils.
Field touch-up:	Induron Induramastic 85 Tan.
Finish:	Two coats of Induron Perma-Clean II at 5.0 dry mils per coat.
Total thickness (dry):	15.0 mils.

System No. 4 - Submerged Ferrous, High Moisture, Colors - Satin

Surface preparation: SP-S3.

TNEMEC

Shop primer:	One coat Tnemec Series 69-1255 Beige Hi-Build Epoxoline II at 4.0 dry mils.
Field touch-up:	Tnemec Series 69-1255 Beige Hi-Build Epoxoline II.
Finish:	Two coats of Tnemec Series 69-color at 4.0 dry mils per coat.
Total thickness (dry):	12 mils.

SHERWIN WILLIAMS

Shop primer:	One coat S-W Macropoxy 646 PW (Semi-gloss) Mil White at 4.0 dry mils.
Field touch-up:	S-W Macropoxy 646 PW (Semi-gloss) Mil White.

Finish:	Two coats of S-W Macropoxy 646 PW (Semi-gloss) Mil White at 4.0 dry mils per coat.
Total thickness (dry):	12 mils.

INDURON

Shop primer:	One coat Induron Induramastic 85 Tan at 4.0 dry mils.
Field touch-up:	Induron Induramastic 85 Tan.
Finish:	Two coats of Induron Perma-Clean II at 4.0 dry mils per coat.
Total thickness (dry):	12 mils.

System No. 5 - Interior or Submerged Concrete - Satin Finish

Surface preparation:	SP-C2.

TNEMEC

Prime Coat:	Tnemec Series 69-1255 Beige applied at a **wet** film thickness of 6.0 mils.
Finish:	Two coats of Tnemec Series 69-color Hi-Build Epoxoline II applied at a **wet** film thickness of 6.0 mils.
Total thickness:	**Wet** 18.0 mils Dry 12 mils

SHERWIN WILLIAMS

Prime Coat:	S-W Macropoxy 646 PW (Semi-gloss) Mil White applied at a **wet** film thickness of 6.0 mils.
Finish:	Two coats of S-W macropoxy 646 PW(Semi-gloss) applied at a **wet** film thickness of 6.0 mils.
Total thickness:	**Wet** 18.0 mils Dry 12 mils

INDURON

Prime Coat:	Induron Induramastic 85 Tan applied at a **wet** film thickness of 6.0 mils.
Finish:	Two coats of Induron Perma-Clean II applied at a **wet** film thickness of 6.0 mils.
Total thickness:	**Wet** 18.0 mils Dry 12 mils

System No. 6 - Interior Concrete Block - Satin

Surface preparation:	SP-C1, SP-C2.

TNEMEC

Block filler:	One coat Tnemec Series 130-6602 Off White Envirofill at a spreading rate of 85-115 square feet per gallon for dense CMU and 60-80 square feet per gallon for lightweight CMU.
Finish:	Two coats of Tnemec Series 69-color Hi-Build Epoxoline II at 3.0 dry mils.

SHERWIN WILLIAMS

Block filler:	One coat S-W Kem Cati-Coat HS Epoxy Filler/Sealer at a spreading rate of 85-115 square feet per gallon for dense CMU and 60-80 square feet per gallon for lightweight CMU.

Finish:	Two coats of S-W Macropoxy 646 (Semi-gloss) Mil White at 3.0 dry mils per coat.

INDURON

Block filler:	One coat Induron Polyfill at a spreading rate of 85-115 square feet per gallon for dense CMU and 60-80 square feet per gallon for lightweight CMU.
Finish:	Two coats of Induron Perma-Clean II at 3.0 dry mils.

System No. 7 - Same as No. 6 - Smoother

Surface preparation:	SP-C1, SP-C2.

TNEMEC

Block filler:	One coat Tnemec Series 130-6602 Off White Envirofill at a spreading rate of 85-115 square feet per gallon for dense CMU and 60-80 square feet per gallon for lightweight CMU.
Finish:	Three coats of Tnemec Series 69-color Hi-Build Epoxoline II at 3.0 dry mils per coat.

SHERWIN WILLIAMS

Block filler:	One coat S-W Kem Cati-Coat HS Epoxy Filler/Sealer at a spreading rate of 85-115 square feet per gallon for dense CMU and 60-80 square feet per gallon for lightweight CMU.
Finish:	Three coats of S-W Macropoxy 646 (Semi-gloss) Mil White at 3.0 dry mils per coat.

INDURON

Block filler:	One coat Induron Polyfill at a spreading rate of 85-115 square feet per gallon for dense CMU and 60-80 square feet per gallon for lightweight CMU.
Finish:	Three coats of Induron Perma-Clean II at 3.0 dry mils per coat.

System No. 8 - Interior Concrete & Block Decorative - Flat

Surface preparation:	SP-C1, SP-C2.

TNEMEC

Block filler:	Tnemec Series 130-6602 Off White Envirofill.
Finish:	Two coats of Tnemec Series 6-color Tneme-Cryl at 2.0 dry mils.

SHERWIN WILLIAMS

Block filler:	S-W Heavy Duty Block Filler.
Finish:	Two coats of S-W DTM Acrylic Primer/Finish at 2.5 dry mils.

INDURON

Block filler:	Induron AC220 Acrylic Block Filler.
Finish:	Two coats of Induron Aquanaut II Low Sheen Intermediate at 2.0 dry mils.

System No. 9 - Interior Masonry & Block - Smooth, Decorative & Flat

Surface preparation:	SP-C1, SP-C2.
TNEMEC	
Block filler:	Tnemec Series 130-6602 Off White Envirofill applied at a spreading rate of 85-115 square feet per gallon for dense CMU and 60-80 square feet per gallon for lightweight CMU.
Finish:	Two coats Tnemec Series 6 Theme-Cryl applied at 2.0 dry mils.
SHERWIN WILLIAMS	
Block filler:	S-W Heavy Duty Block Filler applied at a spreading rate of 85-115 square feet per gallon for dense CMU and 60-80 square feet per gallon for lightweight CMU.
Finish:	Two coats of S-W DTM Acrylic Primer/Finish applied at 2.5 dry mils.
INDURON	
Block filler:	Induron AC220 Acrylic Block Filler applied at a spreading rate of 85-115 square feet per gallon for dense CMU and 60-80 square feet per gallon for lightweight CMU.
Finish:	Two coats Induron Aquanaut II Low Sheen Intermediate applied at 2.0 dry mils.

System No. 10 - Interior Plaster & Drywall - Flat

Surface preparation:	SP-P1, SP-P2.
TNEMEC	
Primer:	One coat Tnemec Series 51-792 PVA Sealer at 1.5 dry mils.
Finish:	Two coats Tnemec Series 6-color Tneme-Cryl at 2.0 dry mils.
Total thickness (dry):	5.5 mils.
SHERWIN WILLIAMS	
Primer:	One coat S-W ProMar 200 Zero Voc Interior Latex Primer at 1.0 dry mils.
Finish:	Two coats of S-W DTM Acrylic Primer/Finish at 2.5 dry mils.
Total thickness (dry):	6.0 mils
INDURON	
Primer:	One coat Induron AC 402 Acrylic Masonry Sealer at 1.5 dry mils.
Finish:	Two coats Induron Aquanaut II Low Sheen Intermediate at 2.0 dry mils.
Total thickness (dry):	5.5 mils.

System No. 11 - Exterior Concrete - Flat

Surface preparation:	SP-C1.

TNEMEC

Finish:	Two coats Tnemec Series 180 W.B. Tneme Crete applied at a dry film thickness of 4.0 mils to 8.0 mils per coat.
Total thickness:	8.0 - 16.0 mils.

SHERWIN WILLIAMS

Finish:	Two coats S-W Loxon XP A24W1451 applied at a dry film thickness of 6.4 to 8.3 mils per coat dft.
Total thickness:	12.8 - 16.6 mils.

INDURON

Finish:	Two coats Induron AC403 Acrylic Elastomeric applied at a dry film thickness of 4.0 mils to 8.0 mils per coat.
Total thickness:	8.0 - 16.0 mils.

System No. 12 - Exterior Masonry - Flat

Surface preparation: SP-C1.

TNEMEC

Finish:	Two coats Tnemec Series 180 W.B. Tneme-Crete at 8.0 - 10.0 mils per coat.
Total thickness (dry):	16.0 - 20.0 mils.

SHERWIN WILLIAMS

Finish:	Two coats S-W Loxon XP A24W1451 applied at 8.0 - 10.0 mils dft per coat.
Total thickness (dry):	16.0 - 20.0 mils dft.

INDURON

Finish:	Two coats Induron AC403 Acrylic Elastomeric at 8.0 - 10.0 mils per coat.
Total thickness (dry):	16.0 - 20.0 mils.

System No. 13 - Exterior Wood - Gloss

Surface preparation: SP-W1.

TNEMEC

Primer:	One coat Tnemec Series 36 Undercoater at 2.5 dry mils.
Finish:	Two coats Tnemec Series 2H Hi-Build Tneme Gloss at 1.5 mils per coat.
Total thickness:	5.5 dry mils.

SHERWIN WILLIAMS

Primer:	One coat S-W Exterior Latex Wood Primer at 1.4 dry mils.
Finish:	Two coats S-W Resilience Exterior Latex Gloss at 1.6 mils per coat.
Total thickness:	4.6 dry mils.

INDURON

Primer:	One coat Induron AC301 Exterior Wood Primer at 2.5 dry mils.
Finish:	Two coats Induron Armorlux 2500 at 1.5 mils per coat.
Total thickness:	5.5 dry mils

System No. 14 - Exterior Wood - Semi-Gloss

Surface preparation: SP-W1.

TNEMEC

Primer:	One coat Tnemec Series 36 Undercoater at 2.5 dry mils.
Finish:	Two coats Tnemec Series 7 Tneme-Cryl SG at 2.0 mils per coat.
Total thickness:	6.5 dry mils.

SHERWIN WILLIAMS

Primer:	One coat S-W Exterior Latex Wood Primer at 1.4 dry mils.
Finish:	Two coats S-W DTM Acrylic SG at 2.5 mils per coat.
Total thickness:	6.4 dry mils.

INDURON

Primer:	One coat Induron AC301 Exterior Wood Primer at 2.5 dry mils.
Finish:	Two coats Induron Aquanaut II Acrylic Enamel at 2.0 mils per coat.
Total thickness:	6.5 dry mils.

System No. 15 - Interior Wood - Gloss

Surface preparation: SP-W1.

TNEMEC

Primer:	One coat Tnemec Series 36 Undercoater at 2.5 dry mils.
Finish:	Two coats Tnemec Series 2H Hi-Build Tneme-Gloss at 1.5 mils per coat.
Total thickness:	5.5 dry mils.

SHERWIN WILLIAMS

Primer:	One coat S-W Exterior Latex Wood Primer at 1.4 dry mils.
Finish:	Two coats S-W DTM Acrylic Gloss at 2.5 mils per coat.
Total thickness:	6.4 dry mils.

INDURON

Primer:	One coat Induron AC301 Exterior Wood Primer at 2.5 dry mils.
Finish:	Two coats Induron Armorlux 2500 at 1.5 mils per coat.
Total thickness:	5.5 dry mils.

System No. 16 - Interior Wood - Semi-Gloss

Surface preparation:	SP-W1.

TNEMEC

Primer:	One coat Tnemec Series 36 Undercoater at 2.5 dry mils.
Finish:	Two coats Tnemec Series 7 Tneme-Cryl SG at 2.0 dry mils per coat.
Total thickness:	6.5 dry mils.

SHERWIN WILLIAMS

Primer:	One coat S-W Premium Wall & Wood Primer(B28W811) 1.8 dry mils.
Finish:	Two coats S-W DTM Acrylic SG at 2.5 dry mils per coat.
Total thickness:	6.8 dry mils.

INDURON

Primer:	One coat Induron AC301 Exterior Wood Primer at 2.5 dry mils.
Finish:	Two coats Aquanaut II Acrylic Enamel at 2.0 dry mils per coat.
Total thickness:	6.5 dry mils.

System No. 17 - Prepare Galvanized Steel

Surface preparation:	Non-immersion - Solvent Cleaning to remove soluble contaminants (rust, white rust, etc.) by Hand or Power Tool Cleaning or Brush Off Blast Cleaning. Immersion Service and High Humidity areas - Brush Off Blast cleaning.

TNEMEC

Primer:	Tnemec Series 69-1255 Beige Hi-Build Epoxoline II.
Finish:	As designated for System No. 1, 2, 3, 4, 5 or 6.

SHERWIN WILLIAMS

Primer:	S-W Macropoxy 646 Mil White..
Finish:	As designated for System No. 1, 2, 3, 4, 5 or 6.

INDURON

Primer:	Induron Induramastic 85.
Finish:	As designated for System No. 1, 2, 3, 4, 5 or 6.

System No. 18 - Exposed Insulated Items

Surface preparation:	SP-M1.

TNEMEC

Primer:	One coat Tnemec Series 6-color Tneme Cryl at 2.0 dry mils.
Finish:	Two coats of Tnemec Series 6-color Tneme-Cryl at 2.0 mils per coat.

SHERWIN WILLIAMS

Primer:	One coat S-W DTM Acrylic Primer/Finish at 2.5 dry mils.
Finish:	Two coats Two coats of S-W DTM Acrylic Primer/Finish at 2.5 dry mils per coat.

INDURON

Primer:	One coat Induron Aquanaut II Acrylic Enamel at 2.0 dry mils.
Finish:	Two coats of Induron Aquanaut II Acrylic Enamel at 2.0 dry mils.

System No. 19 - Exterior Non-Submerged Pipe

Surface preparation: SP-S2.

TNEMEC

Shop prime:	One coat of Series 69-1255 Hi-Build Epoxoline II applied at 3.0 dry mils.
Interior finish:	Two coats of Series 69-color Hi-Build Epoxoline II applied at 3.0 dry mils per coat.
Sunlight exposed finish:	One coat of Series 69-color Hi-Build Epoxoline II applied at 3.0 dry mils topcoated by Tnemec Series 74 Endura-Shield at 2.0 mils.

SHERWIN WILLIAMS

Shop prime:	One coat of S-W Macropoxy 646 Mil White applied at 3.0 dry mils.
Interior finish:	Two coats of S-W Macropoxy 646 Mil White applied at 3.0 dry mils per coat.
Sunlight exposed finish:	One coat of S-W Macropoxy 646 Mil White applied at 3.0 dry mils topcoated by S-W Acrlon 218 S/g at 3.0 mils.

INDURON

Shop prime:	One coat Induron Induramastic 85 applied at 3.0 dry mils.
Interior finish:	Two coats of Induron Perma-Clean II applied at 3.0 dry mils per coat.
Sunlight exposed finish:	One coat of Induron Perma-Clean II applied at 3.0 dry mils topcoated by Induron 6600 Indurethane Plus at 2.0 mils.

System No. 20 - Non-Submerged Hot Surfaces (600°-1200° F.)

Surface preparation: SP-S3.

TNEMEC

Primer:	One coat Tnemec Series 39-1261 Silicone Aluminum applied at 1.0 dry mils.
Finish:	One coat of Tnemec Series 39-1261 Silicone Aluminum at 1.0 mils.

SHERWIN WILLIAMS

Primer:	One coat S-W Heat Flex Hi-Temp 1000 Aluminum applied at 1.5 dry mils.
Finish:	One coat S-W Heat Flex Hi-Temp 1000 Aluminum at 1.5 dry mils.

INDURON

Primer:	One Diamond Vogel Cote-All Enamel AZ-2402 Hi-Temperature applied at 1.0 dry mils.
Finish:	One coat of Diamond Vogel Cote-All Enamel AZ-2402 Hi-Temperature at 1.0 mils.

System No. 21 - Non-Submerged Hot Surfaces (0°-600° F.)

Surface preparation: SP-S3.

TNEMEC

Primer:	One coat of Tnemec Series 39-661 Silicone Aluminum at 1.0 dry mils.
Finish:	One coat of Tnemec Series 39-661 Silicone Aluminum at 1.0 dry mils.

SHERWIN WILLIAMS

Primer:	One coat S-W Heat Flex Hi-Temp 1000 Aluminum applied at 1.5 dry mils.
Finish:	One coat S-W Heat Flex Hi-Temp 1000 Aluminum at 1.5 dry mils.

INDURON

Primer:	One coat of Diamond Vogel Cote-All Enamel AZ-2402 Hi-Temperature at 1.0 dry mils.
Finish:	One coat of Diamond Vogel Cote-All Enamel AZ-2402 Hi-Temperature at 1.0 dry mils.

System No. 22 - Interior Concrete Floors

Surface preparation: SP-C2, SP-C3.

TNEMEC

Primer:	One coat Tnemec Series 69-1255 Beige Hi-Build Epoxoline II at 3.0 dry mils.
Intermediate:	One coat Tnemec Series 69-color Hi-Build Epoxoline II at 3.0 dry mils.
Finish:	One coat of Tnemec Series 74-color Endura-Shield at 3.0 mils.

SHERWIN WILLIAMS

Primer:	One coat Armorseal 1000 HS at 3.0 dry mils.
Intermediate:	One coat Armorseal 1000 HS at 3.0 dry mils.
Finish:	One coat Armorseal Rexthane at 3.0 mils.

INDURON

Primer:	One coat Induron Perma-Clean II at 3.0 dry mils.
Intermediate:	One coat Induron Perma-Clean II at 3.0 dry mils.
Finish:	One coat of Induron Perma-Clean II at 3.0 mils.

System No. 23 - Immersion Service Potable Water - Concrete

Surface preparation: SP-C2.

TNEMEC

Primer:	One coat Tnemec Series 140-1255 Beige Pota-Pox Plus primer at 4.0 mils.
Finish:	Two coats of Tnemec Series 140-WH02 Tank White Pota-Pox Plus at 4.0 mils per coat.

SHERWIN WILLIAMS

Primer:	One coat S-W Macropoxy 646 PW at 4.0 to 6.0 mils dry.
Finish:	Two coats of S-W Macropoxy 646 PW at 4.0 to 6.0 mils dry per coat.

INDURON

Primer:	One coat TInduron PE70 NSF Epoxy Beige at 4.0 mils.
Finish:	Two coats of Induron PE70 NSF Epoxy Aqua White at 4.0 mils per coat.

System No. 24 - Immersion Service Potable Water - Steel

Surface preparation: SP-S3

TNEMEC

Primer:	One coat Tnemec Hydro-Zinc 2000 at 3.0 mils dry
Finish:	Two coats of Tnemec Series 140-WH02 Tank White Pota-Pox Plus at 4.0 mils per coat.

SHERWIN WILLIAMS

Primer:	One coat S-W Corothane 1 Galvapac at 3.0 mils dry
Finish:	Two coats of S-W Macropoxy 646 PW at 4.0 to 6.0 mils dry per coat.

INDURON

Primer:	One coat Induron MC67 Indurazinc at 3.0 mils dry
Finish:	Two coats of Induron PE70 NSF Epoxy Aqua White at 4.0 mils per coat.

System No. 25 – Epoxy Urethane Floor Coating - Concrete

Surface preparation: Shot Blast or Mechanically Abrade, CSP 3-5

TNEMEC

Primer:	One coat Tnemec Series 201 Epoxoprime at 6 to 8 mils dry
Intermediate:	Tnemec Series 280 Tneme-Glaze 280 at 6 to 8 mils coat
Finish:	Tnemec Series 290 CRU at 2.0 to 3.0 mils

SHERWIN WILLIAMS

Primer:	One coat S-W Armorseal 33 Primer at 8.0 mils dry
Intermediate:	S-W Armorseal 650 SL/RC 10 mils dry coat
Finish:	S-W Armorseal Rexthane at 2.0 to 3.0 mils

INDURON

Primer:	One coat Induron Perma-Tuff SL at 6 to 8 mils dry
Intermediate:	Induron Perma-Tuff SL at 6 to 8 mils coat
Finish:	Induron Permastic Urethane at 2.0 to 3.0 mils

11. REQUIRED PAINTING

11.01 The following items shall be painted in accordance with these specifications:

Item	Surface Preparation	Paint System	Notes
Treatment Equipment exterior (Shop Applied and touchup)	Commercial Blast, SP-6 or Hand Tool Clean SP-6	System 2	Spot prime as needed
Piping, ferrous metals	Commercial Blast, SP-6 or Hand Tool Clean SP-6	System 2	Spot prime as needed

PVC and other non-ferrous piping shall be painted in accordance with the color coding below unless otherwise shown on the drawings.

11.02 Colors. Piping and equipment color code shall be in accordance with the following table. Items requiring painting and not listed below shall be painted in a color selected by the Owner from a color chip chart submitted by the Contractor.

WATER LINES

Raw water	Olive Green	110GN Clover
Clarified Water	Aqua	10GN Aqua Sky
Finish Water	Dark Blue	11SF True Blue *

CHEMICAL LINES

Alum or Primary Coagulant	Orange	04SF Tangerine Orange *
Ammonia	White	11WH White
Carbon Slurry	Black	35GR Black
Carbon Dioxide	Red	06SF Candy Apply Red *
Caustic	Yellow	02SF Lemon Yellow *
	w/ Green Band	09SF Spearmint Green *
Chlorine gas or solution	Yellow	02SF Lemon Yellow *
Fluoride	Light Blue	25BL Fountainbleu
	w/ Red Band	06SF Candy Apple Red *
Lime Slurry	Light Green	37GN Irish Spring
Ozone	Yellow	02SF Lemon Yellow *
	w/ Orange Band	04SF Tangerine Orange *
Phosphate Compounds	Light Green	37GN Irish Spring
	w/Red Band	06SF Candy Apple Red *
Polymers or Coagulant Aids	Orange	04SF Tangerine Orange *
	w/ Green Bands	09SF Spearmint Green *
Potassium Permanganate	Violet	14SF Purple Rain *
Soda Ash	Light Green	37GN Irish Spring
	w/ Orange Band	04SF Tangerine Orange *
Sulfuric Acid	Yellow	02SF Lemon Yellow *
Sulfur Dioxide	Light Green	37GN Irish Spring
	w/ Yellow Band	02SF Lemon Yellow *

WASTE LINES

Backwash Waste	Light Brown	68BR Twine
Sludge	Dark Brown	84BR Weathered Bark
Sewer	Dark Gray	33GR Gray

OTHER

Compressed Air	Dark Green	91GN Balsam
Gas	Red	28RD Monterrey Tile
Other Lines	Light Gray	32GR Light Gray
Equipment	Light Gray	32GR Light Gray

12. BASIS OF PAYMENT

12.01 Work shall be incidental to the construction of the applicable item and no separate payment shall be made.

SECTION 15220 GATE VALVES

1. NOTICE

1.01 The General Conditions, Special Conditions, and all other herein bound and accompanying documents are part of these specifications and of the Contract. Submission of proposal implies that the bidder is fully conversant with all requirements of all above mentioned documents.

2. SCOPE

2.01 The work covered by this section consists of furnishing all plant, labor, equipment, tools, services and materials, and performing all operations required to execute the Gate Valve work complete, in strict accordance with this specification and the applicable drawings and subject to the terms and conditions of this contract.

2.02 The Gate Valve work specified herein applies to valves installed underground on distribution and transmission mains. Valves to be installed in treatment plant pumping station or similar facilities shall be as specified in the pipe section of the specifications.

3. SHOP DRAWINGS

3.01 Before commencing work, submit complete shop drawings and illustrations for work in this section for Engineer's approval. Refer to General Conditions for detailed information regarding shop drawings requirements.

4. GATE VALVES

4.01 Valve castings shall be made from superior quality of iron, re-melted in a cupola or air furnace, tough and of even grain.

4.02 Valves shall open in the same direction as those installed in the Owner's existing equipment. In the absence of existing facilities, new gate valves shall open to the left (counter-clockwise). Unless specifically noted on drawings or specified otherwise, valves shall have hub ends, mechanical joint ends or flanged ends. Hydrant auxiliary valves may be provided with one flange end bolting to the hydrant only where so specifically noted on the drawing or directed in writing by the Engineer. Normally such valves shall be of the bell or mechanical joint type installed in the connecting lead between the hydrant and the main. All other valves installed in underground pipelines shall have hub ends or mechanical joint ends.

4.03 All gate valves shall be fully mounted with bronze or other suitable, non-corrodible metal, of the double disc type, with non-rising stems. Fit valves 3 to 12 inches, nominal size, with 2-inch square, cast iron operating nut, mounted directly on the stem. Valves 16 to 48-inches, nominal size, shall be fitted with bevel gears (without gear or grease cases), rollers and tracks, and non-rising stem bypass valves, as per AWWA Specification C500, unless otherwise shown on drawings.

4.04 All valves shall conform to requirements of AWWA C500, latest revision. Valves 3 to 12 inches, nominal size: suitable for pressures of at least 200 psi. Valves 16 to 48-inches, nominal size: suitable for pressures of at least 150 psi.

5. VALVE BOXES

5.01 Provide all valves 3 to 12 inches inclusive, nominal size, and all bypass valves with screw top adjustable metal boxes, approximately 5 inches in diameter, constructed so that removable cover will not be thrown out by travel over same. Provide boxes with suitable hoods at base of lower section to relieve any strain superimposed on valve bonnet.

6. VALVE VAULTS

6.01 Provide all valves 16 to 48 inches, nominal size, with standard manhole enclosure as detailed on the drawings.

7. FOUNDATION

7.01 Set valves securely on concrete or stone foundation, laid on solidly compacted ground. Foundation thickness shall be at least 8 inches; volume, 1 cubic foot minimum. Concrete, if used, shall be Class C, as specified in "Concrete" section of the specifications.

7.02 Valves shall be set at an elevation conforming to the height of connecting pipe so that there is no strain on joints.

8. TAPPING SLEEVES AND CROSSES

8.01 Provide tapping sleeves and gate valves, also tapping crosses, and gate valves where pressure connections to existing facilities are shown on drawings. Tapping sleeves: similar and equal to Mueller H-610, H-611 or H-615, or Clow F-2552 or F-2562. Tapping crosses: similar and equal to Mueller H-710, H-711 or H-715, or Clow F-2565 or F-2567. Gate valves for use with tapping sleeves or crosses: similar and equal to Mueller H-662, H-667, or H-642, or Clow F-2550 or F-2560.

8.02 Install sleeves and valves in watermains as per manufacturer's instructions, and without shutting off pressure in existing mains.

9. GATE VALVE MARKERS

9.01 Where so indicated on the drawings, gate valves shall be witnessed by permanent reinforced concrete posts of size and shape as detailed and at the locations shown. Set posts in or as near fence and valve box tops as possible, with lettering on post facing valve box top. For other conditions, set and witness post markers as directed by the Engineer.

A) Concrete posts shall be of Class "A" concrete and the distance to valve box tops (from face of marker to center of valve box top) shall be given by appropriate figures recessed into the concrete.

B) At the Contractor's option, he may furnish a brass plate of the same cross-sectional size as the concrete post, set securely into the concrete post with anchor bolts. Information which would normally be recessed into the concrete shall be cast into the brass plate.

10. INSTALLATION

10.01 Gate valve installation shall comply fully with applicable portions of the Water Main and Sewer section of these specifications.

11. BASIS OF PAYMENT

11.01 Work shall be incidental and include in the location as listed within the plans for valves or at locations as determined by contractor for watermain crossings. No extra compensation will be provided, but rather shall be included with each applicable item.

SECTION 15400 GREENSAND PRESSURE FILTERS

1. NOTICE

1.01 The General Conditions, Special Conditions, and all other herein bound and accompanying documents are part of these specifications and of the Contract. Submission of proposal implies that the bidder is fully conversant with all requirements of all above mentioned documents.

2. SCOPE

2.01 The work covered by this section consists of furnishing all plant, labor, equipment, tools, services and materials, and performing all operations required to install the factory skid mounted Greensand Pressure Filters complete, in strict accordance with this specification and applicable drawings and subject to the terms and conditions of the Contract.

3. SHOP DRAWINGS

3.01 Before commencing work, shop drawings or appropriate catalog illustrations identifying the equipment to be incorporated into the work shall be submitted to the Engineer for approval.

4. PRESSURE FILTERS

4.01 Furnish and install five factory built (not skid mounted), pressure filters with 84-inch diameter shells and 72-inches straight sides. Each filter shall be designed for a working pressure of 100 psig and a hydrostatic test pressure of 150 psig. Manufacturer shall be Loprest, Inc. Westminister, CO or approved equivalent. Written requests for alternative equipment manufacturers to be considered or equivalent shall be submitted to the Engineer at least 10 days prior to bid opening.

4.02 Filter tanks shall be pressure rated carbon steel vessels with threaded of flanged openings for the pipe connections. Two 14”x18” elliptical manways in the top head for service and media loading shall be furnished for each filter. Provide one spare gasket for each filter. Manway gaskets shall be NSF/ANSI 61 certified. Tank design shall allow for a minimum of 50% freeboard volume to assure adequate bed expansion during backwash. Each tank shall include sampling cock and strainers located in the side of the tank to monitor and adjust the chlorine solution feed rates. Each filter shall have a pressure gauge tapped into the inlet and outlet of the tank and the gauges installed at the face of the filters for convenient reading. Each filter shall be equipped with an air release valve at the top of the tank and piped to the floor sump.

4.03 The upper distributor system shall be constructed of 304 stainless steel to provide even flow of the raw water above the media. The lower distributor underdrain system shall be constructed as a radial hub and lateral manufactured from 304 stainless steel with full slotted non clogging and replaceable ABS strainers. The underdrain shall be covered with a gravel sub fill to provide even distribution of the backwash water into the media.

4.04 Each filter is to be provided with 18" depth of Manganese Greensand Plus filter media. Manganese Greensand Plus media shall have an effective size of 0.30 to 0.35 mm and uniformity coefficient less than 1.60. In addition to the filter media, the filters shall have an anthracite cap, 12 inches in depth. Anthracite shall have an effective size of 0.6 to 0.8 mm and uniformity coefficient less than 1.6. All filter media shall meet the requirements of NSF/ANSI 61.

4.05 The filter manufacturer shall supply graded support gravel as listed below to support the media bed as required for their underdrain design. All support and filter media shall be shipped bagged and palletized and field installed by the Contractor.

No. 6 to No. 12 Sieve – 3"
Gravel, 1/4, to 1/8" - 6"

4.06 Loss of head gauges shall be provided on the inlet and outlet pipes of each filter.

4.07 All mounting hardware, nuts and bolts shall be stainless steel.

4.08 The filter shall be pre-piped, leak tested and painted at the manufacturer's facility. On-site assembly of the filter equipment will not be allowed.

4.09 Face piping shall be schedule 80 pvc with 150 lb threaded or flanged fittings. Face piping shall be properly supported.

4.10 All valves necessary for the operation of the equipment shall be provided. The butterfly valves shall be Bray resilient seated Series 30/31 or approved equal. These valves are wafer type butterfly valves with ductile iron bodies, stainless steel stems, stainless steel disc, buna seats, and infinitely adjustable throttling handles with memory stop. Additional manual isolation butterfly valves shall be provided by the Contractor for each filter at the Raw Water Header, Finished Water Header and Backwash Header.

4.11 The operating sequence of the filters shall be controlled by the plant PLC controller signaling to the electronic butterfly valves on the filter face piping. Electric actuators shall be double operating and suitable for both on-off and throttling operation. They shall include a shaft position indicator and travel stops to limit the valve opening position. Electric actuators shall be Bray Series 70 – Servo Pro or approved equal.

4.12 Each filter effluent line shall include a magnetic flow meter capable of reading in both flow directions. Mag meter shall be installed with display easily read locally or include a remote read for mounting on the filter face piping. Installation of the meter in the face piping shall follow meter manufacturer's recommendation for straight length requirements. Magnetic flow meters shall be 120 V. and shall be Badger, Endres-Hauser or engineering approved equivalent.

4.13 The filter backwash header shall include a backwash rate of flow indicator and control valve to regulate the backwash flow rate.

4.14 The air release valves shall automatically release air under the operating pressure of the filter in operation. The trim and float shall be stainless steel with viton seat. The valve shall be a Val-Matic Model 22 or equal. Air release discharge piping shall be 3/4" Sch 80 pvc and piped to the trench drain.

4.15 Sampling cocks shall be provided at each filter influent and effluent pipe and be smooth nosed for bacterial sampling. Water test kits shall be provided for testing water quality at the filters. One Hach IR20 Iron and Manganese test kit and one Hach Model CN-66 free or total chlorine test kit shall be provided.

4.16 The tanks shall be sand blasted to SSPC SP-10 and factory painted. Interior coating shall be epoxy primer Tnemec Hydro Zinc 2000 at 3.0 mils DFT, and two coats of Series 140-WH02 Tank White PotaPox Plus at 4.0 mils per coat. Exterior surfaces shall be primed with Tnemec series 69-1255 Beige Hi-Build Epoxoline II at 3.0 mils DFT, intermediate coat of Series 69-color Hi-Build Epoxoline II at 3.0 mils DFT and a finish coat of Series 75 color Endura-Shield at 2.0 mils DFT. All interior paint or paint in contact with water shall be NSF61 rated for use with Potable Water Service.

4.17 Filters shall be able to remove iron and manganese from the raw water to levels less than 0.3 mg/l Fe and 0.05 mg/l Mn. Recent raw water analysis from Le Roy wells are shown below

Raw Water Quality

	Well #4	Well #6	Well #7	Well #8	Average
Iron	3.6	4.7	3.6	4.5	**4.1**
Manganese	0.046	0.063	0.091	0.044	**0.061**
Calcium	82	97	83	72	**83**
Magnesium	36	43	36	31	**36**
Sodium	15	29	15	19	**20**
pH	7.0	6.2	6.1	7.2	**6.6**
Chloride	6.4	3.3	3.7	3.0	**4.1**
Sulfate	<10	14	<10	<10	**<10**
Alkalinity	422	501	434	435	**448**
Hardness (as CaCO3)	342	416	369	383	**377**
TDS	424	328	413	443	**402**
TOC	8.4	8.6	5.6	5.5	**7.0**
Ammonia	6.7	5.9	7.7	6.7	**6.7**
Arsenic	0.037	0.028	0.037	0.031	**0.033**

4.18 Filter Performance shall meet the following requirements:

Rate of Filtration across both filters in operation:

152 GPM max each @ 4.0 gpm/sf
760 GPM max total @ 4.0 gpm/sf

Headloss across both filters while in operation:

475 GPM total @ 1.2 psi drop, 2.5 gpm/sf
950 GPM total @ 5.2 psi drop, 5.0 gpm/sf

Backwash rate, per filter, 570 gpm @ 15 gpm/sf

5. DISINFECTION

5.01 The filters shall be disinfected in accordance with AWWA C653, latest revision.

5.02 Representative finished water samples must be collected from the completed project on two consecutive days, and the results of the bacteriological analyses of both sample sets must indicate that the water is safe for drinking. Analyses must be performed by an IEPA laboratory or another certified laboratory and in accordance with IEPA Rules and Regulations.

6. START-UP SERVICES

6.01 The contractor shall furnish the services of a manufacturer's factory service person for final inspection and start-up of all electrical and mechanical equipment furnished by the manufacturer and to instruct owner and contractor's personnel in proper operation and maintenance procedures. A minimum of one (1) day on-site for startup and testing, and one (1) day on-site for operator training.

SECTION 16010 GENERAL ELECTRICAL REQUIREMENTS

1. GENERAL

1.01 Work Includes:

A) Work included in this section is general in nature and applicable to electrical system work. Contractor is also directed to other sections of Division 16 - Electrical for additional related specifications for items described in this section.

B) Work included in this section shall apply to installation and testing of all materials and equipment necessary to completely install electrical system as shown on drawings and as described herein in these specifications, or as may be necessary for a complete and operational electrical system.

C) Unless otherwise noted, all electrical equipment shown on project drawings shall be furnished under Division 16.

D) Drawings pertaining to this installation indicate general location of conduits, wiring, distribution and motor control centers, lighting and outlets, and other details necessary for installation of system.

E) Electrical installation as shown on drawings and as specified herein is based upon best available information, with regard to characteristics of mechanical equipment specified. In the event changes are necessary in order to accommodate mechanical equipment furnished, necessary revisions will be made with approval of Owner's representative.

F) Any minor changes in location of equipment, to include conduits, outlets, etc., from those shown on drawings, shall be made without extra charge if so, directed by Owner's representative. These changes shall be any changes in location that, had new location been the bid-upon location, would not have resulted in an increase in contract construction cost over that actually bid.

G) All electrical equipment shall be installed in conformance with applicable sections of NPFA 70 - National Electrical Code, respective equipment manufacturer's directions, as detailed on drawings and as specified herein. Any installations which void U.L. listing (or other third-party listing) and/or manufacturer's warranty of a device or equipment shall NOT be permitted

H) RELATED CONTRACT WORK DESCRIBED ELSEWHERE IN THESE SPECIFICATIONS:

Electrical Contractor shall note that it is **not** the intent of these Division 16 specifications herein to be all-inclusive of electrically related work to be performed as part of this contract.

Contractor shall also comply with electrical requirements in these sections of the specifications, including, but not limited to, wiring of motors, control panels furnished by others, HVAC equipment and all other electrically powered equipment furnished by others under this project.

1.02 Laws and Ordinances

A) In installation of this work, Contractor shall comply in every respect with requirements of National Electrical Code (NEC), National Board of Fire Underwriters, and any state and local requirements, laws and ordinances as may be applicable.

B) If, in opinion of the Contractor, there is anything in drawings or specifications that will not strictly comply with above laws, ordinances and rules, the matter shall be referred to the attention of the Owner's representative for a decision before proceeding with that part of the work. No changes on drawings or in specifications shall be made without the full consent of Owner's representative.

C) Contractor shall obtain and pay for all licenses, permits and inspections required by above laws, ordinances and rules for entire electric wiring job called for in these specifications and accompanying drawings.

1.03 Drawings

A) Drawings for electrical work will be a part of electrical drawings to which will be added, during the period of construction, any other detail drawings as may be necessary in opinion of Owner's representative, to show proper installation of various appliances or equipment with relation to project.

B) Drawings and specifications are intended to be descriptive only, and any error or omissions of detail in either **shall not** relieve Contractor from obligations thereunder to install in correct detail any and all materials necessary for complete and operating electrical systems to extent shown on drawings and described in this specification.

C) Contractor shall, during progress of job, record any and all changes or deviations from original drawings, and, at completion of project, shall deliver to Owner's representative a **single** marked-up set of "as-built" drawings.

1.04 Shop and Erection Drawings

A) This Contractor shall prepare shop drawings for all parts of his work. Before commencing any work or providing any material, Contractor shall submit for approval of Owner's representative all drawings relating to construction, arrangement or disposition of equipment entering into contract, and show complete equipment with manufacturer's specifications of same.

B) Shop drawings of all distribution and motor control centers, panels, power and lighting systems, fixtures, wire, cables, devices, etc. shall be submitted for approval, as well as complete details of all systems not shown in detail on drawings.

C) Shop Drawings Shall Be Fully Descriptive Of All Materials And Equipment To Be Incorporated Into This Project. Contractor Shall Carefully Check All Submitted Shop Drawings, Making Sure They Are Complete In All Details And Cover Specific Items As Hereinafter Specified.

D) Shop drawings shall be submitted in sufficient quantity as required by the General Conditions. Three (3) copies will be retained by the Engineer for his use and records.

E) No material or equipment shall be allowed at the site until shop drawings approved by the Engineer are received by the Resident Engineer at the site.

F) The following information shall be clearly marked on each shop drawing, catalog cut, pamphlet, specifications sheet, etc. submitted:

PROJECT TITLE:
BRANCH OF WORK: ELECTRICAL
NAME OF BUILDING OR LOCATION:
PAGE OF DRAWINGS OR SPECS WITH WHICH EQUIPMENT COMPLIES:
DATE:
SUBMITTED BY:

2. PRODUCTS

2.01 Products shall be as specified in other sections and as detailed on the drawings.

3. EXECUTION

3.01 Equipment Storage

A) All electrical equipment considered to be a part of this contract, to include, but not be limited to, motor control centers (MCC), starters, transformers, lighting fixtures, etc., shall be stored before installation in a warm, dry, indoor area so as to protect the equipment from physical damage, freezing, dirt and any other harmful effects. Equipment stored under tarpaulins or plastic covers will not be considered as meeting this requirement.

B) The installation of electrical equipment shall not begin until the structure, if required, within which the equipment is to be permanently housed, is complete enough to provide protection from weather and vandalism (i.e. roof and doors installed).

C) The Contractor will be responsible for ensuring conformance with these procedures.

3.02 Equipment Mounting

A) Electrical Contractor shall be responsible for furnishing and setting all anchor bolts required to install Contractor's equipment.

B) Where concrete mounting pads are required for equipment mounting, Electrical Contractor shall furnish all concrete and form work necessary to complete the installation.

C) Where electrical equipment is located on damp or wet walls or locations as directed, it shall be "stand-off" mounted ½" from wall in a manner so that rear of equipment is freely exposed to surrounding air. Method of mounting shall be approved by Owner's representative before equipment is mounted.

D) Unless otherwise noted, top of safety-switches, control panels, and similar equipment shall be 5'-0" above finish floor or finish grade.

E) Enclosures for panelboards, switches or overcurrent devices shall not be used as junction boxes, auxiliary gutters or raceways for conductors feeding through or tapping-off to other switches or overcurrent devices, unless adequate space for this purpose is provided and the equipment is listed for this use.

F) In order to maintain NEC ratings and classifications of cables, do not combine conduit contents or modify conduit materials of construction unless specifically directed or shown otherwise on project documents.

4. BASIS OF PAYMENT

4.01 No extra compensation will be provided Division 16 work, but rather shall be included with each applicable item.

SECTION 16050 BASIC MATERIALS & METHODS

1. GENERAL

1.01 Work Includes:

Provide complete electrical installation for operational pump stations as listed within the plans and these specifications.
Provide new fused disconnects, conduits, switchgear, conductors, etc., as indicated.
Provide upgrade of existing electrical equipment as indicated.
Provide electrical hookups to equipment.
Provide electrical controls necessary to the items specified or required by product manufacturer, in order to preserve factory warranty or special service arrangements.
Provide a complete grounding system and bonding of all equipment per NEC.

1.02 Summary

The work under this Contract shall include all labor, materials, tools, equipment, transportation, insurance, temporary protection, supervision and incidental items essential for proper installation and operation, even though not specifically mentioned or indicated on the drawings, but which are usually provided or are essential for proper installation and operation, of all systems as indicated on the drawings and specified herein.
The specifications and drawings describe the minimum requirements that must be met by the Electrical Subcontractor for the installation of all work as shown on the drawings and as specified hereunder.

1.03 Related Work

Drawings and general provisions of the Contract, including General and Special Conditions and Specification Sections, apply to this Section.

1.04 System Description

Basic materials include:

A) Normal distribution system.
B) Grounding and bonding devices.
C) Connections to HVAC, Plumbing, Automatic Temperature Control, General Contractor and Owner furnished equipment.
D) 120 Volt power for remote alarms.
E) Hoisting, rigging, setting of all conduit, cable and equipment.
F) Testing, cleaning and adjusting.
G) Fees, permits, royalties, guarantees.
H) Firestopping, smokeproofing, waterproofing.
I) Shop drawings. Coordination drawings. Record drawings.
J) Phasing of construction and power interruptions.
K) Access doors.
L) Boxes.
M) Conductors – 600 volts.

N) Conduit.
O) Hangers and supports.
P) Lighting fixtures including lamps.
Q) Motor disconnect devices.
R) Panelboards – branch circuit and distribution.
S) Safety switches.
T) Solderless lugs and connectors.
U) Telecommunications/data empty raceway system.
V) Fuses, breakers and other overload protection controls, fault current devices

Provide all new materials without blemish or defect, in accord with standards specified and U.L. listed or labeled.

1.05 Quality Assurance

A) Regulatory Requirements: ANSI C1/NFPA to comply with: National Electric Code (NEC) 2014, and National Electric Safety Code (NESC), 2012 editions.

B) 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C) Examine all drawings and criteria sheets and all other Sections of the specifications for requirements which affect work under this Section, whether or not such work is specifically mentioned in this Section.

D) Coordinate work with that of all other Trades affecting or affected by the work of this Section. Cooperate with such Trades to assure the steady progress of all work under the Contract.

E) All materials and workmanship shall comply with all applicable Codes, Specifications, Local and State Ordinances, Industry Standards and Utility Company Regulations, latest editions.

F) In case of difference between Building Codes, State Laws, Local Ordinances, Industry Standards and Utility Company Regulations and the Contract Documents, the Electrical Subcontractor shall promptly notify the Engineer in writing of any such difference.

G) In case of conflict between the Contract Documents and the requirements of any Code or Authorities having jurisdiction, the most stringent requirements of the aforementioned shall govern.

H) Should the Contractor perform any work that does not comply with the requirements of the applicable Building Codes, State Laws, Local Ordinances, Industry Standards and Utility Company Regulations, he shall bear all costs arising in correcting the deficiencies, as approved by the Engineer/Owner.

I) Applicable Codes and Standards shall include all State Laws, Local Ordinances, Utility Company Regulations, and the applicable requirements of the following accepted Codes and Standards, without limiting the number, as follows.

(1) NFPA 70: National Electrical Code
(2) NFPA 101: Life Safety Code
(3) Occupational Safety and Health Standards
(4) Environmental Protection Agency
(5) National Fire Protection Association
(6) Department of Environmental Protection
(7) Building Officials Code Association (BOCA)
(8) Illinois Building Code

A) In these specifications, references made to the following Industry Standards and Code Bodies are intended to indicate the latest volume or publication of the Standard. All equipment, materials and details of installation shall comply with the requirements and latest revisions of the following Bodies, as applicable.

(1) ANSI American National Standards Institute
(2) ASTM American Society of Testing Materials
(3) AWG American Wire Gauge
(4) FM Factory Mutual
(5) IEEE Institute of Electrical and Electronics Engineers
(6) NEMA National Electrical Manufacturers Association
(7) UL Underwriters' Laboratories
(8) NFPA National Fire Protection Association

B) Contractor for the work in his scope of work shall give all necessary notices, obtain all permits, pay all governmental taxes, fees and other costs in connection with his work; file for necessary approvals with the jurisdiction under which the work is to be performed. Contractor shall obtain all required Certificates of Inspection for his respective work and deliver same to the Engineer before request for acceptance of his portion of work is made and before final payment.

1.06 Coordination

A) Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

(1) Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.

B) Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

C) Coordinate location of access panels and doors for electrical items that are concealed by finished surfaces.

D) Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

E) The Electrical Subcontractor shall compare his drawings and specifications with those of other Trades as well as the Architectural drawings and specifications and report any discrepancies between them to the Engineer and obtain from the Engineer written instructions for changes necessary in the electrical work.

F) All work shall be installed in cooperation with other Trades installing interrelated work. Before installation, Electrical Subcontractor shall make proper provisions to avoid interferences in a manner approved by the Engineer. All changes required in the work of the Electrical Subcontractor or that of any other trade caused by the Electrical Subcontractor's neglect, shall be made by him at his own expense, to the Engineer's satisfaction.

G) The Contractor must include in his bid sufficient dollar amounts to coordinate the work of this Contract. This project is complex and will require additional time to coordinate all Trades and allow implementation of the Owners Standards and maintenance serviceability requirements. This requirement shall include, but not be limited to, producing the coordination drawings, as many times and as many drawings as required to ensure serviceability of equipment, as approved by the Engineer.

H) Locations of conduits, boxes, distribution equipment, systems, etc. shall be adjusted to accommodate the work with interferences anticipated and encountered. The Contractor shall determine the exact routing and location of his systems prior to fabrication or installation of any system component. Accurate measurements and coordination drawings shall be completed to verify dimensions and characteristics of the various systems installations.

I) Lines which pitch shall have the right-of-way over those which do not pitch. For example, steam piping shall normally have the right-of-way. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed.

J) Offsets, transitions and changes of direction in all systems shall be made as required to maintain proper headroom and pitch of sloping lines whether or not indicated on the drawings. The Electrical Subcontractor shall provide elbows, conduit bends, "LB" fittings, offsets in busway, etc., as required for his work to affect these offsets, transitions and changes in direction.

K) All work shall be installed in a way to permit removal (without damage to other parts) of pull and junction box covers, wiring, lighting fixtures, and all other system components provided under this Contract requiring periodic replacement or maintenance. All pull and junction boxes shall be arranged in a manner to clear the openings of swinging overhead access doors as well as ceiling tiles. All work shall be done to allow easy access for maintaining equipment. The Owner and Engineer will require proof via the preparation of large-scale sections and part plans that pull and junction boxes, etc., are accessible after the work is completed. Any items in the field discovered to be in non-compliance shall be removed and relocated, as required, and as directed by the Engineer.

L) The Contract Drawings are diagrammatic only intending to show general runs and locations of conduits, distribution equipment, lighting fixtures, systems equipment, etc. and not necessarily showing all required offsets, details and accessories and equipment to be connected. All work shall be accurately laid out with other Trades to avoid conflicts and to obtain a neat and workmanlike installation which will afford maximum accessibility for operation, maintenance and headroom.

M) Where discrepancies in scope of work as to what Trade provides items, such as starters, disconnects, flow switches, etc., exist, such conflicts shall be reported to the Engineer during bidding and prior to signing of the Contract. If such action is not taken, the Contractor shall furnish such items as part of his work as necessary, for complete and operable systems and equipment, as determined by the Engineer.

N) The Contractor shall coordinate the installation of all equipment and any catwalks or service platforms provided.

O) Where drawing details, plans, specification requirements and/or scheduled equipment capacities are in conflict and where feeders, branch circuits or equipment are shown to be different between plans and/or between plans and riser diagrams, details or specifications, the most stringent requirement will be included in the Contract. Electrical systems and equipment called for in the specification and/or shown on the drawings shall be provided under this Contract as if it were required by both the drawings and specifications. However, prior to ordering or installation of any portion of work which appears to be in conflict, such work shall be brought to the Engineer's attention for direction as to what is to be provided.

P) Final location of all lighting fixtures, exit signs, switches, receptacles, etc., shall be coordinated with the reflected ceiling plans, architectural elevations, and/or other details, as applicable and shall not be scaled from locations indicated on the electrical drawings. Obtain approval of locations of all devices from Engineer in the field. The Owner/Engineer reserves the right to relocate any receptacle, device, lighting fixture, etc. 10'-0" in any direction prior to installation at no additional cost to the Project.

Q) Water Treatment equipment or other type equipment shown on the Electrical and/or Engineering drawings or supplied by the owner for installation by this contractor shall be provided with the correct voltage, phase, wiring, breaker, fuses, disconnect, wiring cord set services, receptacles, plugs, etc. shall be included under this Contract, including all of the above to facilitate connections to the electrical systems, to make equipment complete and operable. Additional wiring, equipment, (above for mentioned), etc., shall be provided to accomplish the above requirement, all as part of this Contract, at no extra cost for materials or labor to the Owner. This requirement necessitates that the Electrical Contractor review the Architectural drawings, Product Specifications, Process Equipment Electrical requirements, technical data and the drawings of other Trades to ascertain the extent of all requirements, and interface between the Trades, Owner, Engineer and scope of work. Electrical Contractor shall provide Conduit and boxes for equipment before equipment is on site. Installation of wires, circuit breakers, disconnects, fuses, wiring cord sets, plugs, receptacles, etc. shall be at the Electrical contractor's risk if the contractor installs such before the equipment is brought on site. No extras will be paid for coordination not done by the electrical contractor or for his risk of installing Electrical that does not meet the service needs of the equipment. No extras will be paid for conduit or boxes that have been run to the wrong locations (even if so shown on the contract drawings) because the

electrical contractor did not coordinate these locations in writing as a formal Request For Information (RFI) with the Engineer, Other Trades, Owner and Engineer.

R) The Contractor shall coordinate work with other Trades' work so that all equipment and systems can be easily, safely, and properly serviced and maintained. It is imperative that service personnel can safely access all equipment. Provide safety rails, steps, ladders, valves chains, handle extensions, etc. as required, in addition to the ones shown on the drawings, to ensure safe and easy access to all equipment is provided in a manner approved by the Engineer.

S) All lighting fixtures shall be provided with lighting controls under base bid. Provide necessary switches, 3 pole switches, 4 pole switches , lighting control system ,lighting relays, lighting slave pack relays ,PIR/microwave occupancy motion controls , automatic switch timers ,etc. as required to provide a working lighting system regardless if shown on plans and specifications or not. The lighting system shall be complete and be in accordance with all codes including the International Energy codes of 2012, and NFPA101 (emergency lighting).

T) Contractor shall keep himself fully informed as to the shape, size and position of all openings required for his apparatus and shall give information to the General Contractor and other Contractors sufficiently in advance of the work so that all openings may be built in advance.

U) Coordinate all work with other trades.

1.07 References.

Specified references, or cited portion thereof, current at date of bidding documents unless otherwise specified, govern the work. In conflict between referenced standards and contract documents, notify Engineer immediately. Confirm notification in writing. Do not proceed with the work until Engineer issues written instructions.

American National Standards Institute (ANSI):

C8- Specification for Rigid Steel Conduit, Zinc- Coated.
C8- Specification Electrical Metallic Tubing, Zinc- Coated.
C8- Specification for Fittings for Rigid Metal Conduit and Electrical Metallic Tubing.

American National Standards Institute/National Fire Protection Association (ANSI/NFPA):

ANSI CI/NFPA 70-National Electrical Code (NEC).

National Electrical Manufacturers Association (NEMA):

FB-1	*- Conduit and Cable Assemblies.*
KS-1	*- Switches.*
OS-1	*- Sheet Steel Outlet Boxes, Devices Boxes, Covers and Box Supports.*
TC-2	*- Electrical Plastic Tubing and Conduit.*
TC-3	*- PVC Fittings for Use with Rigid PVC conduit and tubing.*
WC-5	*- Thermoplastic Insulated Wire and Cable.*
WD-1, WD-5	*- General Purpose Wiring Devices.*
250	*- Enclosures for Electrical Equipment.*

Manufacturer's Catalogs: Specified manufacturer's catalogs are incorporated by reference to same force and effect as if repeated herein.

1.08 Equipment and Materials

A) Equipment and materials shall be delivered to the site and stored in original sealed containers, suitably sheltered from the elements, but readily accessible for inspection by the Engineer until installed. All items subject to moisture damage such as controls shall be stored in dry, heated spaces.

B) Equipment shall be tightly covered and protected against dirt, water and chemical or mechanical injury and theft. At the completion of the work, equipment and materials shall be cleaned and polished thoroughly and turned over to the Owner in a condition satisfactory to the Engineer. Damage or defects that develop before acceptance of the work shall be made good at the Contractor's expense.

C) The Contractor shall make necessary field measurements to ascertain space requirements, for equipment and connections to be provided under his respective Trade and shall furnish and install such sizes and shapes of equipment to allow for the final installation to conform to the drawings and specifications.

D) The manufacturers listed within this specification have been preselected for use on this project. No submittal will be accepted from a manufacturer other than specified. **Should the Electrical Subcontractor wish to propose a substitution during the bid period, such request shall be made in writing to the Engineer, no less than fifteen (15) working days, prior to bid date.** If substitutions are deemed acceptable by the Engineer, a written authorization will be issued by the Engineer to allow such substitution. The above requirement is mandatory. Where specifications indicate "Owner's approved equal", the Contractor shall propose "equal" manufacturers, in writing, to the Engineer, no less than (7) working days prior to bid date. If proposed "equal" is deemed acceptable to the Owner and Engineer, a written authorization will be issued by the Engineer. If the proposed equal is not deemed acceptable, the Contractor shall supply equipment from the specified manufacturer.

E) Manufacturer's directions shall be followed completely in the delivery, storage, protection and installation. Promptly notify the Engineer in writing of any conflict between any requirements of the Contract Documents and the manufacturer's directions. Obtain the Architect's written instructions before proceeding with the work. Should Contractor perform any work that does not comply with the manufacturer's directions or written instructions from the Engineer, he shall bear all costs arising in correcting any deficiencies that should arise.

F) Contractor shall furnish and install all equipment, accessories, connections and incidental items necessary to fully complete the work under his Contract for use, occupancy and operation by the Owner.

G) Where equipment of a substitute manufacturer differ from that specified and require different arrangement or connections from those shown, it shall be the responsibility of the Contractor responsible for the substitution to modify the installation of the equipment to operate properly and in harmony with the original intent of the drawings and specifications. When directed by the Engineer, the Contractor shall make all necessary changes in all

affected related work provided under his and other Sections including location of roughing-in connections by other Trades, conduit, supports, etc. All changes shall be made at no increase in the Contract amount or additional cost to the Owner. The General Contractor shall be responsible to assure that the Contractor responsible for the substitution bears the cost to all other Trades as a result of the substitution.

H) Unless specifically indicated otherwise, all equipment and materials rewired for installation under these specifications shall be new, unused and without blemish or defect. Equipment and materials shall be products which will meet with the acceptance of the Authorities having jurisdiction over the work and as specified hereinbefore. Where such acceptance is contingent upon having the products listed and/or labeled by FM or UL or another testing laboratory, the products shall be so listed and/or labeled. Where no specific indication as to the type or quality of material or equipment is indicated, a first-class standard article shall be provided.

I) All equipment of one type (such as distribution equipment, panelboards, variable frequency motor controls, cable, wiring devices, fire alarm system, etc.) shall be the products of one manufacturer.

J) Equipment pre-purchased by the General Contractor on behalf of the Owner or by the Owner himself, if assigned to the Contractor, shall be received, installed, tested, etc., as if the equipment was purchased by the Contractor. All guarantees, service contracts, etc., shall be the same as for all other equipment provided under this Contract.

1.09 Use of Premises

A) The Contractor shall confine all apparatus, storage of materials and construction to the limits as directed by the Engineer and he shall not encumber the premises with his materials. The Contractor shall be held responsible for repairs, patching, or cleaning arising from any unauthorized use of premises.

B) Notwithstanding any approvals or instructions which must be obtained by the Contractor from the Engineer in connection with the use of the premises, the responsibility for the safe working conditions at the site shall remain that of the Contractor. The Engineer, Engineer or Owner shall not be deemed to have any responsibility or liability in connection with safe working conditions at the site.

1.10 Protection

A) Materials, conduit, lighting fixtures, panelboards, etc., shall be properly protected during construction and all conduit openings shall be temporarily closed so as to prevent obstruction and damage. Post notice prohibiting the use of all systems provided under the Electrical Contract, prior to completion of work and acceptance of all system by the Owner except as otherwise, instructed by the Engineer. Take precautions to protect all materials furnished from damage and theft.

B) The Contractor shall furnish, place and maintain proper safety guards for the prevention of accidents that might be caused by the workmanship, materials, equipment or electrical systems provided under his Contract.

1.11 Damage to Other Work. The Contractor shall be held responsible and shall pay for all damages caused by his work to the building structures, equipment, conduits, systems, etc., and all work and finishes installed under this Contract. Repair of such damage shall be done by the Contractor at the expense of the Contractor, to the Engineer's satisfaction.

1.12 Correction of Work. The Contractor shall promptly correct all work provided under his Contract and rejected by the Engineer as defective or as failing to conform to the Contract Documents, whether observed before or after completion of work, and whether or not fabricated, installed or completed.

1.13 Extra Work. No claim for extra work will be allowed unless it is authorized by the Engineer before commencement of the extra said work.

1.14 Submittals

A) Prepare and submit shop drawings in accordance with the requirements hereinbefore specified, and with the Shop Drawings, Product Data and Samples Section in the manner described therein, modified as noted hereinafter.

B) All shop drawings shall have clearly marked the appropriate specification number of drawing designation, for identification of the submittal.

C) Disposition of shop drawings shall not relieve the Contractor from the responsibility for deviations from drawing or specifications, unless he has submitted in writing a letter itemizing or calling attention to such deviations at time of submission and secured written approval from the Engineer, nor shall such disposition of shop drawings relieve the Contractor from responsibility for errors in shop drawings or schedules.

D) Shop drawings shall include, but shall not be limited to, the following:

(1) Access doors.
(2) Boxes.
(3) Cable assemblies (prefabricated).
(4) Conductors – 600 volts.
(5) Conduit.
(6) Enclosed circuit breakers.
(7) Fuses.
(8) Fuel tank, wiring and connection.
(9) Hangers and supports.
(10) Lighting fixtures including lamps.
(11) Mechanical suspension channel.
(12) Motor disconnect devices.
(13) Panelboards – branch circuit and distribution.
(14) Telephone terminal cabinets.
(15) Safety switches.
(16) Solderless lugs and connectors.
(17) Surface mounted raceway system.
(18) Telecommunications/data empty raceway system.
(19) Wireways.
(20) Wiring devices and device plates.
(21) Routing of all conduits 2 inches in diameter and larger.

(22) Starters, overloads & thermal protection
(23) Grounding system
(24) In addition to the coordination drawings, the following equipment rooms with all the electrical equipment laid out with dimensions, Code clearances, etc., indicated shall be submitted with the equipment shop drawings. Acceptance of these shop drawings shall be obtained prior to installation of feeder conduits.

i. All electrical rooms and closets.
ii. Process Equipment

Note: Equipment shop

1.15 Submittals. In accord with 01340, submit:

Shop Drawings for:
Cable and Wire
Disconnect Switches
Fuses: Time Current Curves
Wiring Devices
Non-Metallic Junction Boxes
Conduit Sealing Fittings
Conduit or Box Sealing Compounds
Conduit Fittings

Test Results For:
Meg tests for underground feeders for main service, well pumps, etc.
See other sections for required submittals.

1.16 Delivery, Storage, and Handling

Materials shall be suitably packaged by manufacturer to prevent damage during shipment. Damaged materials will not be acceptable for use.

Store materials on site in clean, dry storage area; when outside, elevated above grade and enclosed with durable watertight wrapping.

Handle all materials carefully to prevent damage. Minor scratches, marks or blemishes to finish shall be repaired to satisfaction of Engineer.

1.17 Project Site Conditions

Contractor shall be responsible for verifying the locations of existing utilities.

Where unmarked utility lines, underground obstructions, or piping may be uncovered on the premises, the Contractor shall notify the authority having jurisdiction thereof.

Contractor shall take necessary measures to prevent interruption of services that may be damaged or interrupted through Contractor's own negligence and shall be responsible for immediate repair and/or restoration at his expense.

2. PRODUCTS

2.01 Raceways

Conduit:
Steel Rigid Metal: *ANSI C80.1 & UL-6.*
Steel Liquidtight Flexible: *UL-1.*
Rigid Nonmetallic: *NEMA TC-2, PVC, Schedule 40.*

Tubing: Steel Electrical Metallic. Comply with ANSI C80.3 & UL 797.

Acceptable Manufacturers:
Allied Tube & Conduit Corp. Harvey, IL.
Anaconda Metal Hose, American Brass Div., Hinsdale, IL.
ETP, Oakbrook, IL.
Carlon Electrical Sciences, Inc., Cleveland, Oh.
Certain-Teed Corp., Pipe & Plastics Group, Valley Forge, Pa.
International Metal Hose, Bellevue, Oh.
Krayloy Products, Inc., San Dimos, CA.
LTV Steel Co., Cleveland, Oh.
Triangle Industries, Inc., New Brunswick, NJ.
1Wheatland Tube Co., Collingswood, NJ.

2.02 Fittings

Rigid
ANSI C80.4
Locknuts; steel or malleable iron.
Bushings; insulating or insulated throat type.
Couplings; threaded or gland compression malleable iron type. Set screw or indented type not acceptable.

Electrical Metallic Tubing: Couplings and Connectors; steel compression type. Set screw or indented type not acceptable.
Flexible Connectors; steel or malleable iron compression type with insulated throat and "O" ring assembly for liquidtight conduit.

PVC: Couplings and box adapters shall be solvent-weld type suitable for use with Schedule 40.

Acceptable Manufacturers:
Appleton Electric Co., Chicago. IL.
Carlon Electrical Sciences, Inc., Cleveland, Oh.
Certain-Teed Corp., Pipe & Plastics Group, Valley Forge, Pa.
Crouse Hinds Co., Syracuse, N.Y.
EFCOR, East Farmingdale, N.Y.
General Signal Corp/OZ-Gedbey, Terryville, CT.
Killark Electric Mfg. Co., St. Louis, MO.
Raco, Inc., South Bend, IN.
Thomas & Betts Corp, Raritan, N.Y.

2.03 Sealing

Interior and Exterior Walls:
Seal all penetrations of walls around conduit on both sides of wall. Where area to be sealed is less than 1/2", seal with premium grade silicone caulking.
Seal all penetrations in such walls where plans call for existing conduits or other wiring to be removed.

Water Seal: Seal penetrations of perimeter walls or floors below grade to prevent entry of water. Use materials compatible with wall or floor construction and approved by Engineer.

2.04 Wire and Cable

600 Volt Underground and Feeder Wire

Underground and Feeder Wire shall be copper, 98% conductivity, 600 V. insulation, type XLPE- USE for direct burial, type THHN/THWN for dry locations, or underground installations in conduit.
Wire through #12 shall be solid, except all power and control wiring for motors or other devices subject to vibration shall be stranded. Wire #10 and larger shall be stranded.
Conductor size for power systems shall be #12 AWG unless noted otherwise on the plans.
Conductors for systems other than power shall be sized per system manufacturer's standards; #14 AWG unless otherwise noted on the plans.
Color-code conductors to designate phase, neutral, and equipment ground. Colors shall be per 16050-3.03 (G).
Reduced size neutrals will not be allowed unless specifically noted otherwise on the plans.
Acceptable Manufacturers:

Anaconda Metal Hose, American Brass Div., Hinsdale, IL.
Carol Cable Corp., Pawtucket, RI.
Collyer Insulated Wire Div., Lincoln, RI.
Pirelli Cable Corp., Union NJ.
Triangle Industries, Inc., New Brunswick, NJ.

Joints and Splices:

Wire No. 8 or smaller: Compression or crimp type with insulating wrap cover, or insulated twist-on spring connector. Acceptable Products:

Manufacturer	Connector Type
IDEAL	Wing Nut
ITT-H	Free Spring
BUCH	B Cap
3M	Scotchlok
T&B	Piggy

Wire No. 6 or larger: Mechanical compression or bolted type connector covered with insulating tape or heat shrinkable insulation equal to conductor insulation. Acceptable Manufacturers:

AMP Products Co., Schaumburg, IL.
Anderson Electrical Connectors, Leeds, AL
Burndy Corp., Norwalk, CT.
General Electric Co., Schenectady, NY.
General Signal Corp/O-Z Gedney Co., Terryville, CT.
Ideal Industries, Inc., Sycamore, IL
ITT Holub, Sycamore, IL.
Three M Co., St. Paul, MN.
Thomas & Betts Corp., Raritan, NY.

Wire Pulling Lubricants:

Pulling Lubricant shall be a UL listed, water-based, polymer solution. Lubricants containing waxes or soaps are not acceptable.

The lubricant shall be compatible with the cable insulation and shall not cause any premature deterioration of the insulating material. When used on high voltage cable, the lubricant shall not affect the volume resistivity of any semi-conducting jacket or insulation shield present.

Dried residue from lubricant shall not become tacky or gum-up. Cables shall remain pullable after lubricant has dried.

The lubricant shall be approved by the cable manufacturer for use with their cables.

Acceptable Manufacturers/Products:

Manufacturer	Product
American Colloid, Arlington Hts., I	Poly X
American Pollywater, Stillwater, M	Polywater J
Arnco, Elyria, OH.	Hydra Lube
Buchanan Div.,Elasticmold Hackettstown, NJ	Quick Slip
Condux International,Mankato, MN.	Super-Lube
Ideal Ind., Inc., Sycamore, IL.	Aqua-Gel

2.05 Boxes

Pull Boxes and Junction Boxes:

NEC 2014-370 and U.L. 50.

Flush mounted pull boxes: Overlapping cover with flush head security type retaining screws, prime-coated. Provide two screw removal insertion tools to Using Agency. Overlap two inches all sides.

Surface mounted boxes: Screw-on or hinged cover. Provide silicon bronze standard retaining screws where accessible only to authorized personnel, security type in all other locations. Spaced twelve inch maximum.

Boxes of 14-gauge steel minimum, galvanized or prime coated in finished areas. Non-metallic, fiberglass boxes permitted where specifically shown on the plan.

Boxes greater than 1400 sq. in., make of 1 1/2 in. x 1 1/2 in. x 1/4 in. galvanized angle covered with 10-gauge galvanized sheet steel riveted or bolted; cover of 11-gauge galvanized steel.

Outlet Boxes:

Hot dipped galvanized, 1.25 oz.\sq. ft., sherardized or cadmium plated. U.L. 514.

Interior Boxes: Sheet steel with conduit knockouts, attached lugs for locating.

Exterior boxes or exposed interior in wet/damp locations: Cast aluminum, deep type, corrosion proof fasteners, watertight, gasketed, and threaded hubs.

For suspended or surface mounted fixtures 4 in. octagonal or square with concrete rings according to devices used, minimum of 1 1/2in. deep. 4 in. octagonal or square for all conduit work with fixture extension pan or deep fixture canopy to enclose the box. Vapor-tite fixture outlet boxes shall be cast aluminum or steel as furnished by the fixture manufacturer. Use #14 stranded, type AF, 300-volt wire in pipe pendants.

Switch and Receptacle Box Wall-4 in. square for up to two devices. Solid gang boxes for over two devices. Complete with 3/4 in. minimum depth tile ring where used in exposed tile, concrete, block or paneled walls. Install with 1/2 in. raised galvanized device covers where used for exposed conduit work.

Provide corrosion resistant steel knockout closures for unused openings.

Conduit Bodies:

Galvanized cast steel of type, shape and size to fit location.
Constructed with threaded conduit ends, removable cover corrosion resistant screws.
Furnish large capacity bodies for all sizes over 1".

Acceptable Manufacturers:

Appleton Electric Co., Chicago, IL.
Crouse-Hinds Co., Syracuse, NY.
General Electric Co., Schenectady, NY.
General Signal Corp/OZ/Gedney Co., Terryville, CT.
Hoffman Engineering Co., Div. of Federal Cartridge Corp., Anoka, MN.
Killark Electric Mfg. Co., St. Louis, MO.
Raco, Inc., South Bend, IN.
Square D Co., Distribution Equipment Division, Lexington, KY.
Thomas & Betts Corp., Raritan, NY.

2.06 Fuses

System Coordination and current limitation for protection of each component of the electrical system have been designed in accord with the type, class and characteristic specified. No substitutions will be considered. Use fuses made by a single manufacturer throughout.

Power fuses: 200,000: Interrupting capacity at 480-volt AC.
Control fuses: 200,000: Interrupting capacity at 250-volt AC.
Fuse features:

Maximum operating temperature: 300 degrees F.
Self-protecting thermally.
Separate overload and short circuit element.
Incorporate a spring-activated "snap-trigger" thermal overload element responsive to fuse temperatures exceeding 284 degrees F.
UL Class: RK-5 for size 1/10 to 5 amp: RK-1, current limiting, for sizes 6 to 600 AMP; Class L for all fuses above 600 amp.
Acceptable Manufacturers.

Bussman Div., McGraw-Edison Co., St. Louis, MO.
Littlefuse, Des Plaines, IL.
Gould, Inc., Circuit Protection Div. Newburyport, Ma.

Provide Class R fuse rejection kits on all safety switches not already fitted for Class R. fuses.

Identification: In addition to labeling requirements specified elsewhere, place a fuse identification label to indicate fuse type, ampere and interrupting ratings, inside each switch door.

Spare Fuses: Furnish using agency with a complete set of spare fuses, consisting of three of each type and rating specified.

2.07 Identification

Provide equipment and wiring identification as specified herein.

3. EXECUTION

3.01 Installation

Cooperate with other contractors and utilities engaged in project. Execute work in a manner not to interfere with other contractors or Using Agency's operation.

Coordinate work with other contractors and the using agency regarding location and size of pipe, raceways ducts, openings, switches, outlets, so there is no interference between installation or of progress of any contractor.

Install all equipment with ample space allowed for removal, repair, or changes to equipment. Provide ready accessibility to removable parts of equipment and to all wiring without moving equipment installed or already in place.

Provide sleeves for all electrical conduits passing through walls, partitions, ceilings and floors. Provide sleeves of sufficient length to extend through full thickness of wall construction with ends flush. Extend floor sleeves one inch above finish floor.

Where exposed outlets and conduit are allowed, expose ceiling outlets and conduit with due consideration to ventilating ducts and mechanical piping. Where numerous ducts occur, install conduits and outlets after ventilating ducts. Puncturing of duct work or hanging equipment such as light fixtures, ceiling hangers, conduits, from duct work is prohibited, unless specifically noted otherwise.

Where cutting is required to facilitate construction, patch and repair cut items to original state. Do not cut structural work without prior written approval of Engineer.

Cut holes through concrete and masonry in new and existing structures with a diamond drill, electric rotary hammer drill, or concrete saw. Pneumatic hammer, hand or manual hammer type drills not allowed, except where permitted by Engineer because of limited working space.

Layout holes in advance. Notify Engineer prior to drilling through structural sections, for determination of proper layout.

Make exterior wall and roof seals watertight.

At project completion, clean all equipment to original finish. Remove all shipping labels.

3.02 Conduit

Conduit Schedule: Minimum Conduit Size: 3/4 in. unless otherwise specified. ½" in space limiting shall be permitted with engineer's approval.

Install conduit as follows:

Use EMT conduit for branch circuits within block walls, above dropped or suspended ceilings, and on the surface of dry interior areas.

Use liquid-tight metallic flexible conduit for the final 18" only to motors, unit and duct heaters, fans, motorized dampers, valve actuators, limit switches, solenoid valves, air conditioning or heat pump units, or other equipment subject to vibration.

Use galvanized heavy wall rigid steel for conduit exposed to weather; installed underground; installed within concrete walls, ceilings or floor slabs; exposed inside the water plant filter room.
Use PVC Schedule 40 conduit only where specifically noted on the Plans.

Conduit Runs - Steel

Size all conduit as indicated on Drawings; where not shown, in accord with NEC. Make all conduit systems mechanically and electrically continuous from source of current to all outlets, and ground in accord with the NEC.
Conceal conduit runs in new construction wherever possible. Exposed conduit shall only be allowed for the vertical portion of the run to equipment or devices which cannot be recessed within walls or ceilings. This shall apply to motors, starters, contactors, motor control centers, disconnect switches, enclosed circuit breakers, panelboards specified as surface mounted, other special control panels, and transformers. Conduit shall be concealed within walls, floor slabs, concrete ceilings, or suspended ceilings for toggle switches, receptacles, light fixture outlet boxes, telephone outlets, and the final recessed junction or pull box at fans, motorized dampers, and unit heaters. For final connections to fans, motorized dampers, and unit heaters provide short lengths of liquid-tight flexible conduit from the recessed junction box to the equipment. Exposed diagonal runs of exposed conduit shall not be permitted. No conduit shall be exposed in water storage tanks or chemical storage tanks. Do not install conduit on roof surfaces unless specifically indicated on drawings. Roof installations require special coordination with the Engineer.

Conduit embedded in concrete structures shall not be larger in outside diameter than one-third the thickness of the slab, wall or beam in which it is embedded, and shall have a minimum spacing of three outside diameters on center in parallel runs. Conduit shall be installed at least one pipe diameter away from surface of concrete, except where offsets into recessed boxes are required, or the conduit must exit the concrete to a surface mounted device. Crossing conduits shall be avoided wherever possible. Where crossing is necessary, maintain the minimum distance required from surface of concrete at the point of crossing.

Install conduit at least 12 in. from steam or hot water piping parallel runs, at 6 in. in cross runs and at least 3 in. from cold water piping.

Ream steel conduit after threads are cut. Cut ends of all conduits square and butt solidly into couplings.

Prevent the accumulation of water, foreign matter or concrete in the conduits during execution of work. Temporarily plug conduit, blowout and swab before wires are pulled.

Fasten conduits to all sheet metal boxes and cabinets with two locknuts, in accord with NEC, and an insulated non-metallic bushing. Where conduits cannot be brought into contact with the enclosure, or where concentric knockouts still remain, provide steel grounding type insulated bushings and bond to the enclosure with the same size equipment ground as is run in the conduit. Where two locknuts cannot be used due to enclosure construction use at least a single locknut and steel bushing.
Seal each underground joint and make watertight.

Where building construction or other conditions make it impossible to use standard threaded fittings, thread less fittings may be used, only with permission of the Engineer.

Make changes in direction of runs with symmetrical bends or cast-metal fitting. Make field- made bends and offsets with conduit bending machine to avoid changing the internal diameter of the conduit and not damage its protective coating either inside or outside. Individual bends shall not exceed 90 degrees and not more than 270 degrees total bends will be allowed in any one conduit run. Where more bends are necessary or conduit runs exceed 150 lin. ft., install a suitable pull box or junction box.
Use flexible liquid-tight metallic conduit for final connection to motors, portable equipment and for equipment subject to vibration and noise transmission. Use minimum length of 12 in. and maximum length of 18 in.

Underground conduits shall be installed a minimum of two (2) feet below grade in trench 6" wide, minimum.

3.03 Wire and Cable

Make conductors continuous from outlet to outlet. Do not make splices except in outlet or junction boxes. Make all feeder cables continuous from original panel or equipment terminations without running splices in intermediate pull or boxes, unless specifically indicated on the drawings or approved in writing by Engineer.

Do not exceed conduit fill established by the National Electrical Code for number of conductors installed in race way.

Use minimum wire sizes as shown on the drawings or specified herein:
Control and Signal: #14 AWG. (Or as specified on Plans)
Branch Circuits: #12 AWG. (Or as specified on Plans)

Do not pull any cable or wire in a raceway until conduit system is complete and internal raceway has been cleaned.

Strain on cables shall not exceed manufacturer's recommendations during pulling. Use approved pulling lubricant on long pulls or when pulling #4 or larger wire. Apply lubricant directly before and during pull. Lubricant may be applied to inside of conduit, directly onto cable insulation, or both.

All underground wires are to be installed in conduit, except as noted herein or on Drawings.

Color code all wire ends, except for factory wiring, with colored vinyl electrical tape. This tape shall be at least 3/4" inch wide and shall have two complete wraps of tape (one on top of the other) around the wire to be color coded. The tape wrapping shall be within 0 to 3" from the end of insulation of the wire end.

120/208 V 3-phase		*480 V 3-phase*	
Phase A	*Black*	*Phase A*	*Black*
Phase B	*Red*	*Phase B*	*Red*
Phase C	*Blue*	*Phase C*	*Blue*
Neutral White		*Neutral White*	
Ground Green		*Ground Green*	

Provide each cable or conductor in panels, pull boxes or troughs with a permanent pressure-sensitive label with suitable numbers or letter for easy identification. Identify control wires at each end and in junction boxes with designated wire numbers corresponding to control schematic drawings.

There shall be no underground splices. All above ground splices shall be in UL approved junction boxes or power panels.

Make all splices and taps in wires #6 and larger with solderless connectors such as O.Z., Thomas & Betts, or Burndy screw on, set screw, clamp on, split bolt, or crimp and compression type lugs, taps and terminal fittings.

Use a UL approved commercial insulator or plastic electricians' tape to an equivalent insulation thickness on all uninsulated splices.

Leave at least 6 in. loops or ends at each outlet for installation of devices or fixtures. Roll up all wires in outlet boxes not for connection to fixture or device at that outlet, and tape wire ends.

Upon completion of cable and wire installation, but before termination to equipment, test each wire for grounds and short circuits. Replace or correct defective wiring.

NEC conduit fill requirements shall be met for all special signal and control cable installations. Where increases in conduit sizes above those shown on the plans are required to accommodate such cables, such work shall be considered incidental to the contract and no additional compensation shall be allowed.

Shielded signal and control cables shall not be spliced between end terminations unless specifically allowed in writing by the equipment manufacturer.

3.04 Boxes

Locate all ceiling outlets with due consideration to clearance from ventilation ducts and piping.

Location of outlets shown on the drawings is diagrammatic only. Coordinate exact location of outlets with architectural details, equipment connection requirements and work of other contractors, Engineer may alter the location of outlets shown within a six feet radius prior to installation.

Protect all outlet boxes from entry of foreign materials. Boxes recessed in concrete, or block walls, or ceilings shall have all openings sealed.

Independently support all boxes. No parts of the weight or stress thereof shall be borne by conduits terminating therein.

Plug all unused openings. Use threaded plugs for cast boxes and snap in metal plugs for sheet metal boxes.

Height of outlets and devices is indicated on the drawings. Use the following as a guide for mounting of outlet boxes.

Device	*Height above Finished Floor to Bottom Of Box*
Receptacles (Unfinished Areas)	*44 inches*
Switches	*48 inches*

Coordinate height of outlets with drawings and equipment installations drawings and properly locate height of all outlets.

3.05 Devices

See Paragraph 3.04 for typical mounting heights of devices.

Fit all flush type outlets with device plate that completely conceals opening. Use multiple gang plates where several devices are grouped.

Connect wiring device grounds in accord with NEC.

Locations shown are approximate. Determine exact locations at site by reference to building drawings and in conjunction with work by other crafts.

3.06 Circuit Labeling

Typewritten label shall be affixed to the inside door of all panels and these labels shall identify, by circuit number and load description, all circuit loads.

Circuit labels shall be protected by a clear plastic covering, clear varnish coating, or Scotch Brand Magic Marker clear tape.

Labeling shall conform to guidelines in accord with NEC and the Labeling specifications within the contract.

3.07 Raceway Support and Hangers

Securely fasten raceways in place and support from ceiling or walls at spacings not exceeding:

Material	*Max. Spacing of Supports*	
	Steel	*PVC*
1/2" Through 1" Trade size Conduit	*6 ft.*	*3 ft.*
Flexible Liquidtite Conduit	*4 1/2 ft.*	

Support rigid, or EMT conduits within 3 ft. of every outlet box, junction box, pull box, cabinet or termination. Support flexible conduit within 12 in. of every outlet box or fitting.

Support vertical runs or conduits at each floor level and at intervals not to exceed 10 ft.

Support conduits by pipe straps, wall brackets, hangers, or ceiling trapeze. The use of perforated iron or wire for supporting conduits is prohibited. Fasten with wood screws or screw nails to wood, by toggle bolts on hollow masonry units, by concrete inserts, or expansion steel conduits on steel. Do not weld conduits or pipe straps to steel structures unless specifically indicated.

The load applied to fasteners or hangers shall not exceed one-third the proof test load of the fasteners

For fasteners attached to concrete, use vibration and shock resistant type.

Make hangers of durable materials suitable for the application involved.

Fabricate all screws, bolts, washers and miscellaneous hardware used for conduit supports from rust- resisting metal. Trapeze hangers shall have hanger assemblies protected with galvanized finish.

3.08 Final Inspection

After all work is completed, the system is ready for operations, and the Owner/Using Agency is satisfied with the job, contact and notify the Engineer that the project is ready for Final Inspection. At this time provide the Engineer with a signed copy of his test data and a certification that all required tests are complete, and the system is ready for public use. The Engineer will inspect the project within four (4) working days of this notification. The job shall not be considered completed until the Engineer has approved all work as acceptable and complete.

3.09 Supporting Devices

A) Contractor shall provide all stainless-steel supports and hangers required to support all equipment or materials provided under this Contract.

B) All supports shall be stainless steel cut, assembled, welded and finished by skilled mechanics. Welds shall be ground smooth. Stands, brackets and framework shall be properly sized and strongly constructed.

C) Measurements shall be taken on the job and worked out to suit adjoining and connecting work. All work shall be performed by experienced metal-working mechanics. Members shall be straight and true and accurately fitted.

D) Material: Cold-formed stainless steel.

E) Metal Items for Use Outdoors or in Damp Locations: Stainless steel.

F) Mechanical suspension channel stainless steel shall be furnished and installed to support electrical equipment, (panelboards, disconnect switches, starters, transfer switches, transformers, etc.) independent of walls. Where walls back up to occupied spaces, the suspension channels shall be at least ½" clear of the wall and shall not be connected or braced to the wall.

(1) Channel shall be Unistrut, stainless steel Type P3000 or approved equal. All fasteners and fittings stainless steel shall be supplied to provide a complete installation as required. Channel shall be sized and mounted to allow for future conduits.

(2) All channel and fittings shall be furnished with stainless steel hardware finish.

(3) Channel shall be manufactured by one of the following: Unistrut Products Co., Kindorf, or B-Line.

G) Raceway and Cable Supports: Manufactured stainless-steel clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and stainless-steel clamps.

H) Pipe Sleeves: ASTM A 53, Type E, Grade A, Schedule 40, stainless steel.

I) Expansion Anchors: Stainless steel.

J) Toggle Bolts: All-stainless steel (see Section 16075) springhead type.

3.10 Electrical Equipment Installation

A) Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.

B) Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

C) Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.

D) Right of Way: Give to raceways and piping systems installed at a required slope.

3.11 Electrical Supporting Device Application

A) Selection of Supports: Comply with manufacturer's written instructions.

B) Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb design load.

3.12 Support Installation

A) Install support devices to securely and permanently fasten and support electrical components.

B) Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.

C) Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.

D) Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.

E) Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.

F) Install stainless steel channel or slotted stainless-steel channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.

G) Install sleeves for cable and raceway penetrations of concrete slabs and walls. Install sleeves for cable and raceway penetrations of masonry and fire-rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

H) Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:

(1) Wood: Fasten with stainless steel screws or screw-type nails.
(2) Masonry: Stainless steel toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
(3) New Concrete: Stainless steel concrete inserts with machine screws and bolts.
(4) Existing Concrete: Stainless steel expansion bolts.
(5) Light Steel: Stainless steel sheet-metal screws.
(6) Fasteners: Select so the load applied to each stainless-steel fastener does not exceed 25 percent of its proof-test load.

3.13 Identification Materials and Devices (See Section 16075)

3.14 Firestopping and Smoke proofing

A) Where conduits pass through walls or floors, the Contractor shall provide and set individual sleeves for each conduit and all other work under his charge, as necessary for passage of all raceways. Sleeves shall be of sufficient size to provide ½" air space around the conduit passing through the floor or walls. All openings shall be sealed, smoke proofed and made tight. The Contractor shall be responsible for the exact location of sleeves provided under this Contract and shall coordinate all requirements for conduit sleeves.

B) The Contractor shall review firestop or smokestop systems provided.

C) The Contractor for work under his charge shall determine the required inside diameter of each individual wall opening or sleeve before ordering, fabrication or installation. The inside diameter of the wall opening shall be sized to fit the conduit and ensure a watertight joint. Where applicable, when installing seals, consider the conduit O.D. if nonstandard due to coating or jacketing.

D) Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly.

3.15 Refinishing and Touchup Painting

Refinish and touch up paint. Paint materials and application requirements are specified in Section 9.08 "Painting."

A) Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.

B) Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.

C) Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

D) Repair damage to paint finishes with matching touchup coating recommended by manufacturer.

3.16 Cleaning and Protection

On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.

Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

3.17 Parts List and Instructions for Operation and Maintenance

A) The Contractor shall thoroughly instruct the Owner, to the complete satisfaction of the Engineer, in the proper operation of all systems and equipment provided by him. The Contractor shall make arrangements, via the Engineer, as to whom the instructions are to be given in the operation of the basic and auxiliary systems and the period of time in which they are to be given. The Engineer shall be completely satisfied that the Owner has been thoroughly and completely instructed in the proper operation of all systems and equipment before final payment is made. If the Engineer determines that complete and thorough instructions have not been given by the Contractor to the Owner's representative, then the Contractor shall be directed by the Engineer to provide whatever instructions are necessary until the intent of this specification has been complied with.

B) Contractor shall submit to the Engineer for approval, the required typed sets (see General Conditions and Division 1) bound neatly in loose-leaf binders, of all instructions for the installation, operation, emergency operation, start-up, care and maintenance of all equipment and systems (including instructions for the ordering and stocking of spare parts for all equipment installed under this Contract). The lists shall include part numbers and suggested supplier. Each set shall also include an itemized list of component parts that should be kept on hand and where such parts can be purchased.

C) Information shall indicate possible problems with equipment and suggested corrective action. The manuals shall be indexed for each type of equipment. Each section shall be clearly divided from the other sections. A sub-index for each section shall also be provided.

The methodology of setting-up the manuals shall be submitted to the Engineer and Owner for review prior to final submission of manuals.

D) The instructions shall contain information deemed necessary by the Engineer and include but not limited to the following:

(1) Introduction

i. Explanation of Manual and its use.
ii. Summary description of each Electrical system.
iii. Purpose of each system.

(2) System

iii. Detailed description of each system.
iv. Illustrations, schematics, block diagrams, catalog cuts, and other exhibits.

(3) Operations

Complete detailed, walk-through, with step-by-step, sequential description of all phases of operation for all portions of the systems, including start-up, shutdown, testing and adjusting. Include all posted instruction charts.

(4) Maintenance

i. Parts list and part numbers.
ii. Maintenance, and replacement charts and Electrical Subcontractor's recommendations for preventive maintenance.
iii. Troubleshooting charts for systems and components.
iv. Instructions for testing each type of part.
v. Recommended list of on-hand spare parts.
vi. General or miscellaneous maintenance notes.
vii. Provide an estimate of man hours and material costs to perform scheduled preventative maintenance.

(5) Manufacturer's Literature

i. Complete listing for all parts with names, addresses and telephone numbers.
ii. Care and operation.
iii. All and only pertinent brochures, illustrations, drawings, cuts, bulletins, technical data, certified performance charts and other literature with the model actually furnished to be clearly and conspicuously identified.
iv. Internal wiring diagrams and engineering data sheets for all items and/or equipment to be furnished.
v. Guarantee and warranty data.

3.18 Manufacturer's Representative

The Contractor shall provide, at the appropriate time or as directed by Engineer, the on-site services of a competent factory trained Engineer of the manufacturer of specific equipment, such as variable

frequency drive etc., to inspect, test, adjust and place in proper operating condition any and all items of the same manufacturer. No additional compensation will be allowed for such services. A written report shall be issued by the particular manufacturer with his findings for the Engineer's record.

3.19 Connections to Water Treatment Equipment, HVAC, Plumbing and Owner Furnished Equipment

A) The Contractor shall provide all conduit and wire connections to equipment provided under other Sections of the specifications including final connections to all equipment to result in a complete system, fully operational. Provide under Base Bid in addition to what is shown on the Contract Drawings (20) twenty additional connections 1" conduit schedule 80 PVC with either (5) #12 THHN copper conductors or (1) Belden 1048A cable a length of 200 feet of both cable and conduit with terminals and terminal strips at each end. Coordinate location of all equipment with the General Contractor. Obtain installation diagrams and methods of installation of all equipment and sensors, from manufacturers. Follow instructions strictly. If additional information is required, obtain same from Engineer. An allowance to be called on by the Engineer only by written ESI.

B) All electrical connections to vibration isolated equipment shall be by flexible conduit of length at least 15 diameters, installed with visible slack, or in a loop configuration, to allow free movement of the equipment and prevent transmission of noise and vibration.

C) Contractor shall provide all power supplies, J-Boxes, fuses, relays, sockets, connectors, lugs, etc. and labor to make the Owner's softener equipment operate without additional cost to the Owner.

3.20 Coordination Drawings

A) Before materials are purchased, fabricated or work is begun, Contractor shall prepare and obtain approval of coordination drawings, and sections for all floors/areas, including buried system/services, resulting in (1) set of all-Trade-composite at 3/8" scale drawings, showing the size and location of all equipment, in the manner described hereunder General Requirements. Engineers review and approval of coordination drawings must be obtained prior to any fabrication or installation of any equipment or systems.

B) The Contractor shall indicate all electrical equipment and conduit provided by him or his sub-subcontractors on the coordination drawings. This equipment and conduit shall include, but not be limited to, the following:

Electrical Room and Water Treatment Equipment and Wells No. 18, 19, 20, and No. 21.

(1) All electrical distribution equipment drawn to scale, with clearance requirements. (Substations, switchboards, busway, transformers, panelboards, emergency generator, etc.)

(2) All panelboard feeder conduits.

(3) All conduits for all systems over 2" in diameter.

(4) Conduit routing and rack locations for all conduits regardless of conduit size when more than 4 conduits are grouped in a rack.

(5) All pull and splice boxes over 8" in any direction.

(6) Lighting fixture housing and supports that interfere with other system and furnishings.

C) All costs associated with all aspects of coordination drawings, regardless as to how long they take to produce and how many times they have to be redrawn, shall be borne by the Contractor.

3.21 Guarantee

A) Attention is directed to provisions of the General Requirements and Supplementary General Requirements regarding guarantees and warranties for work under this Contract.

B) Manufacturers shall provide their standard guarantees for work under the Electrical Trades. However, such guarantees shall be in addition to, and not in lieu of, all other liabilities which the manufacturer and Electrical Subcontractor may have by law or by other provisions of the Contract Documents.

C) All materials, items of equipment and workmanship furnished under the Electrical Section shall carry the standard warranty against all defects in material and workmanship. Any fault due to defective or improper material, equipment, workmanship, or design which may develop shall be made good, forthwith, by and at the expense of the Electrical Subcontractor for the work under his Contract, including all other damage done to areas, materials, and other systems resulting from this failure.

3.22 Record Drawings/As-Built Drawings

A) The Contractor shall maintain current at the site a set of his drawings on which he shall accurately show the actual installation of all work provided under his Contract indicating hereon any variation from the Contract Drawings, in accordance with the General Conditions. Changes, whether resulting from formal change orders or other instructions issued by the Engineer, shall be recorded. Include changes in sizes, location, and dimensions of conduit, switchgear, lighting fixtures, fire alarm equipment, generator set, wiring devices, etc.

B) The Contractor shall indicate progress by coloring-in various conduits, equipment and associated appurtenances exactly as they are erected. This process shall incorporate both the changes noted above and all other deviations from the original drawings whether resulting from job conditions encountered or from any other causes.

C) The marked-up and colored-up prints will be used as a guide for determining the progress of the work installed. They shall be inspected periodically by the Engineer and Owner and they shall be corrected immediately if found either inaccurate or incomplete. This procedure is mandatory.

D) At the completion of the job, these prints shall be submitted to the Engineer for final review and comment. The prints will be returned with appropriate comments and recommendations.

E) The Subcontractor shall be responsible for generating as-built Record Drawings utilizing CAD based documents in AutoCAD 2013. A bound set of plans, as well as the computer files, on disk, shall be turned over to the Engineer for review. After acceptance of the as-built documents by the Engineer, the Contractor shall make any corrections necessary to the as-built documents and prepare one reproducible set of drawings as well as bound blueprint set(s) for distribution to the Owner via the Engineer.

F) The updated drawings may not include all changes made during the course of construction and it shall be the Contractors responsibility to update the as-built documents to include all changes brought forth to the project resulting from bulletins, request for information (RFI's), change orders, etc.

G) Included with the above shall be a complete drawing list and a standard layering system, which shall be required to be maintained within the as-built Record CAD documents.

H) The Subcontractor shall be issued bulletins in the same manner as the original Design Documents described above.

I) The as-built CAD documents required shall be in addition to other requirements stated elsewhere.

3.23 Related Work Specified Elsewhere

For additional requirements and/or work not included in this Section and required to be performed under other designated Sections, see the following:

A) Cutting and patching in concrete.
B) Cutting and patching in walls.
C) Finish painting.
D) Installation of access panels by Trades as determined by the General Contractor.
E) Plumbing work.
F) Heating, ventilating, and air conditioning work.
G) Automatic temperature control system including wiring and conduit.
H) Process control, control systems including wiring, cabling, wires, fittings, and conduits.

SECTION 16120 CONDUCTORS AND CABLES

1. GENERAL

1.01 Related Documents

Drawings and general provisions of the Contract, including General and Special Conditions, apply to this Section.

1.02 Summary

This Section includes the following:

A) Building wires and cables rated 600 V and less.

B) Connectors, splices, and terminations rated 600 V and less.

C) Sleeves and sleeve seals for cables.

1.03 Submittals

A) Product Data: For each type of product indicated.

B) Qualification Data: For testing agency.

1.04 Quality Assurance

A) Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

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

C) Comply with NFPA 70.

1.05 Coordination. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

2. PRODUCTS

2.01 Conductors and Cables

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

B) Manufacturers: Subject to compliance with requirements, provide products by one of the following:

(1) American Insulated Wire Corp.; a Leviton Company.
(2) General Cable Corporation.
(3) Senator Wire & Cable Company.
(4) Southwire Company.

C) Copper Conductors: Comply with NEMA WC 70.

D) Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.

2.02 Connectors and Splices

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

(1) Hubbell Power Systems, Inc.
(2) O-Z/Gedney; EGS Electrical Group LLC.
(3) 3M; Electrical Products Division.

B) Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.03 Sleeve Seals – 2 Hour Fire Rated

A) Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:

3-M Company

B) Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

Sealing Elements: 3-M Fire Barrier Quick Pass Device, square shaped to fit surface of conduit or cable trays. Include type and number required for material and size of raceway or cable.

3. EXECUTION

3.01 Installation of Conductors and Cables

A) Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B) Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C) Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

D) Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

E) Identify and color-code conductors and cables according to Division 16 Section "Electrical Identification".

3.02 Connections

A) Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B) Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

C) Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.03 Field Quality Control

A) Contractor will ring out every control set of wiring before control panel integrators arrive on site. Written report of each pair giving state of device No. on N.C. and actuation No. on N.C. shall be submitted 10 days before pay request date of scheduled integrator.

B) All feeders to panels and motors shall be meggered and a written report submitted 10 days before pay request before startup is scheduled.

SECTION 16140 WIRING DEVICES

1. GENERAL

1.01 Related Documents

A) Drawings and general provisions of the Contract, including General and Special Conditions, apply to this Section.

1.02 Summary

A) This Section includes the following:

(1) Receptacles, receptacles with integral GFCI, and associated device plates.

1.03 Definitions

A) EMI: Electromagnetic interference.

B) GFCI: Ground-fault circuit interrupter.

C) Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D) RFI: Radio-frequency interference.

E) TVSS: Transient voltage surge suppressor.

F) UTP: Unshielded twisted pair.

1.04 Submittals

A) Product Data: For each type of product indicated.

B) Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.

C) Field quality-control test reports.

D) Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.05 Quality Assurance

A) Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

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

C) Comply with NFPA 70.

1.06 Coordination

A) Receptacles for Owner-Furnished Equipment: Match plug configurations.

(1) Cord and Plug Sets: Match equipment requirements.

2. PRODUCTS

2.01 Manufacturers

A) Manufacturers' Names: Shortened versions of the following manufacturers' names are used in other Part 2 articles:

(1) Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
(2) Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).
(3) Bryant.

2.02 Straight Blade Receptacles

A) Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

(1) Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
(2) Products: Subject to compliance with requirements, provide one of the following:

i. Hubbell; CR 5362.
ii. Pass & Seymour; 5362.
iii. Bryant; 5362-A.

2.03 GFCI Receptacles

A) General Description: Straight blade, non-feed through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.

B) Duplex GFCI Convenience Receptacles, 125 V, 20 A:

(1) Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

(2) Products: Subject to compliance with requirements, provide one of the following:

i. Hubbel; 26F5362
ii. Pass & Seymour; 6F5342.
iii. Bryant; 2091-S

2.04 Cord and Plug Sets

A) Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.

(1) Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
(2) Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.05 Snap Switches

A) Comply with NEMA WD 1 and UL 20.

B) Switches, 120/277 V, 20 A:

(1) Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
(2) Products: Subject to compliance with requirements, provide one of the following:

i. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
ii. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).
iii. Arrow Hart; 1991 (single pole), 1992 (two pole), 1993 (three way), 1994 (four way).

2.06 Occupancy Sensors

A) Wall-Switch Sensors (Provide in storage rooms and bathrooms):

(1) Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
(2) Products: Subject to compliance with requirements, provide one of the following:

i. Hubbell; WS1277.
ii. Pass & Seymour; WS3000.
iii. Watt Stopper (The); WS-200.

(3) Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft..
(4) Provide an Automatic Occupant Override Time Switch with each wall sensor to comply with International Energy Conservation Code Article 805.2.2.1.
(5) Provide in storage rooms and bathrooms regardless if shown on plans or not.

2.07 Wall Plates

A) Exterior, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, thermoplastic "IN USE" type with lockable cover.

(1) Plate securing screws: Stainless steel
(2) Material for finished spaces: Stainless steel #302 .032" thickness.
(3) Material for unfinished spaces: Plastic.
(4) Material for damp locations: Plastic with in-use covers.

2.08 Heavy Duty Motor Receptacle Disconnects NEMA-4X

A) Plugs and receptacles must be listed to UL Subject 2682 'Switch Rated Plugs and Receptacles.

B) Plugs and receptacles must have constant pressure butt-contacts with solid silver-nickel tips or pin and sleeve contacts.

C) Receptacles must have dead front construction. With spring cover Nema4x

D) Plugs and receptacles must be able to close at least once on a conditional short-circuit current of 65,000A. (Short circuit testing should be performed with RK1 current limiting fuses sized at 400% of the highest full load motor ampacity associated with the device).

E) Plugs and receptacles must incorporate an integral switching mechanism to ensure the load is broken before the plug is removed from the receptacle.

F) The minimum environmental rating of plugs and receptacles must be, NEMA 4X and IP 66+67 (DSN Series), or IP67 (DB Series).

G) Ingress protection must be achieved automatically or manually when the plug is fully inserted into the receptacle.

H) Plugs and receptacles must be color coded and or keyed for a different system voltage to discriminate between circuits or incompatible operating voltages.

I) Plug and Receptacle be of the voltage and amp rating and horsepower rating of the motor served.

J) Provide minimum 3 feet of motor service cord 3cond w/grd Type W, 2000V rated cable, fine stranded Copper Jacket of Hypalon. With Hubbel # 073031204 or similar size Dust Tight Relief Grip at Plug end and Hubbel 07401025 or similar size cord connector at the motor

K) Plugs and receptacles installed outdoor must be able to withstand UV radiation.

L) Receptacles shall be mounted stationary with minimum (2) Stainless steel P1000 strut on rigid RMS with FS box, sized larger as required.

M) Receptacles inside with minimum (2) Stainless steel P1000 strut on rigid PVC Schedule 80 conduit shall be mounted with FS box sized larger as required.

N) Provide Identification Nameplate per 16075 same as any disconnect, laminated engraved plastic, held with two self-tapping screws. Stating name of equipment served, HP, and Voltage.

O) O. Plugs and receptacles shall be Meltric, Appleton, or Crouse Hinds.

3. EXECUTION

3.01 Installation

A) Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.

B) Coordination with Other Trades:

(1) Take steps to ensure devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
(2) Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
(3) Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
(4) Install wiring devices after all wall preparation, including painting, is complete.

C) Conductors:

(1) Do not strip insulation from conductors until just before they are spliced or terminated on devices.
(2) Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.

(3) The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
(4) Existing Conductors:

i. Cut back and pigtail or replace all damaged conductors.
ii. Straighten conductors that remain and remove corrosion and foreign matter.
iii. Pigtailing existing conductors is permitted provided the outlet box is large enough.

D) Device Installation:

(1) Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
(2) Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
(3) Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
(4) Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
(5) When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
(6) Use a torque screwdriver when a torque is recommended or required by the manufacturer.
(7) When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
(8) Tighten unused terminal screws on the device.
(9) When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

E) Receptacle Orientation:

(1) Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

F) Device Plates: Use oversized plates on masonry walls. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G) Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

H) Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

I) Tests for Convenience Receptacles:

(1) Line Voltage: Acceptable range is 105 to 132 V.
(2) Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
(3) Ground Impedance: Values of up to 2 ohms are acceptable.
(4) GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
(5) Using the test plug, verify that the device and its outlet box are securely mounted.
(6) The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions remove malfunctioning units and replace with new ones, and retest as specified above.

SECTION 16410 ENCLOSED SWITCHES AND CIRCUIT BREAKERS

1. GENERAL

1.01 Related Documents

A) Drawings and general provisions of the Contract, including General and Special Conditions, apply to this Section.

1.02 Summary

A) This Section includes the following individually mounted, enclosed switches and circuit breakers:

(1) Fusible switches.
(2) Non-fusible switches.
(3) Molded-case circuit breakers.
(4) Molded-case switches.
(5) Enclosures.

1.03 Definitions

A) GD: General duty.
B) GFCI: Ground-fault circuit interrupter.
C) HD: Heavy duty.
D) RMS: Root mean square.
E) SPDT: Single pole, double throw.

1.04 Submittals

A) Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

(1) Enclosure types and details for types other than NEMA 250, Type 1.
(2) Current and voltage ratings.
(3) Short-circuit current rating.
(4) UL listing for series rating of installed devices.
(5) Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

B) Shop Drawings: Diagram power, signal, and control wiring.

C) Field quality-control test reports including the following:

(1) Test procedures used.
(2) Test results that comply with requirements.

(3) Results of failed tests and corrective action taken to achieve test results that comply with requirements.

D) Manufacturer's field service report.

E) Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Operation and Maintenance Data," include the following:

(1) Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
(2) Time-current curves, including selectable ranges for each type of circuit breaker.

1.05 Quality Assurance

A) Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

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

C) Comply with NFPA 70.

D) Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.06 Project Conditions

A) Environmental Limitations: Rate equipment for continuous operation under the following conditions, unless otherwise indicated:

(1) Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
(2) Altitude: Not exceeding 1000 feet.

1.07 Coordination

A) Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

2. PRODUCTS

2.01 Fusible and Non-fusible Switches

A) Manufacturers:

(1) General Electric Co.; Electrical Distribution & Control Division.
(2) Siemens Energy & Automation, Inc.
(3) Square D/Group Schneider.

B) Fusible Switch: NEMA KS 1, Type HD, with clips or bolt pads to accommodate specified fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C) Non-fusible Switch: NEMA KS 1, Type HD, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

D) Accessories:

(1) Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
(2) Neutral Kit: Internally mounted; insulated, capable of being grounded, and bonded; and labeled for copper and aluminum neutral conductors.
(3) Auxiliary Contact Kit: Auxiliary set of contacts arranged to open before switch blades open.

2.02 Molded-Case Circuit Breakers and Switches

A) Manufacturers:

(1) General Electric Co.; Electrical Distribution & Control Division.
(2) Siemens Energy & Automation, Inc.
(3) Square D/Group Schneider.

B) Molded-Case Circuit Breaker: NEMA AB 1, with interrupting capacity to meet available fault currents.

(1) 1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

C) Molded-Case Circuit-Breaker Features and Accessories:

(1) Standard frame sizes, trip ratings, and number of poles.
(2) Lugs: Mechanical style suitable for number, size, trip ratings, and conductor material.
(3) Application Listing: Type SWD for switching fluorescent lighting loads; Type HACR for heating, air-conditioning, and refrigerating equipment.

2.03 Enclosures

A) NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

(1) Indoor Ramp Locations: NEMA 250, Type 3R.
(2) Exterior Areas: NEMA 250, Type 4X, stainless steel.

3. EXECUTION

3.01 Examination

A) Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.

B) Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 Installation

A) Comply with applicable portions of NECA 1, NEMA PB 1.1, and NEMA PB 2.1 for installation of enclosed switches and circuit breakers.

B) Provide stainless steel unistrut mount from floor to +48" above floor. Mount switch on unistrut mount. Mount disconnect such that NEC working clearances are maintained.

3.03 Identification

A) Identify field-installed conductors, interconnecting wiring, and components; provide signs as specified in Division 16 Section "Electrical Identification."

B) Enclosure Nameplates: Label each enclosure with laminated-plastic nameplate as specified in Division 16 Section "Electrical Identification."

3.04 Adjusting

A) Set field-adjustable switches and circuit-breaker trip ranges.

3.05 Cleaning

A) On completion of installation, vacuum dirt and debris from interiors; do not use compressed air to assist in cleaning.
B) Inspect exposed surfaces and repair damaged finishes.

SECTION 16470 PANEL BOARDS

1. GENERAL

1.01 Work Includes

A) Contractor Provide:

(1) Distribution panelboards.
(2) Branch circuit panelboards.
(3) Load centers.
(4) Disconnects.

1.02 Related Work

A) Specified Elsewhere:

(1) Section 16050 – Basic Electric Materials and Methods.

1.03 References

A) NECA Standard of Installation (published by the National Electrical Contractors Association).
B) NEMA AB1 - Molded Case Circuit Breakers.
C) NEMA ICS 2 - Industrial Control Devices, Controllers and Assemblies.
D) NEMA KS1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
E) NEMA PB 1 - Panelboards.
F) NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
G) NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment (published by the International Electrical Testing Association).
H) NFPA 70 - National Electrical Code.

1.04 Submittals for Review

A) Section 01340 - Submittals: Procedures for submittals.
B) Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.

1.05 Submittals for Information

A) Shop Drawings: Submittals for information.
B) Submit manufacturer's installation instructions. Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.06 Submittals for Closeout

A) Contract Closeout: Warranties.
B) Record actual locations of panelboards and record actual circuiting arrangements in project record documents.
C) Maintenance Data: Include spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.07 Qualifications

A) Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three (3) years' experience.

1.08 Regulatory Requirements

A) Conform to requirements of NFPA 70.
B) Products: Listed and classified by [Underwriters Laboratories, Inc.] [testing firm acceptable to the authority having jurisdiction] as suitable for the purpose specified and indicated.

1.09 Maintenance Materials

A) Section 01700 - Contract Closeout.
B) Furnish two (2) of each panelboard key.

2. PRODUCTS

2.01 Distribution Panelboards

A) Section 01600 - Material and Equipment: Product Options [and Substitutions].
B) Manufacturers:

(1) Square D Model I-Line (480 V)
(2) Substitutions: Permitted.

C) Description: NEMA PB 1, circuit breaker type.
D) Panelboard Bus: Aluminum, ratings as indicated. Provide copper ground bus in each panelboard.
E) Minimum integrated short circuit rating: 200,000 amperes rms symmetrical for 240-volt panelboards; 200,000 amperes rms symmetrical for 480-volt panelboards, or as indicated.
F) Fusible Switch Assemblies: NEMA KS 1, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse clips: Designed to accommodate Class R fuses.
G) Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.

H) Molded Case Circuit Breakers with Current Limiters: NEMA AB 1, circuit breakers with replaceable current limiting elements, in addition to integral thermal and instantaneous magnetic trip in each pole. (All motor circuits)

I) Current Limiting Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 100,000 symmetrical amperes let-through current and energy level less than permitted for same size Class RK-5 fuse.

J) Controllers: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower, with melting alloy overload relay. Coil operating voltage: 120 volts, 60 Hertz. Size as shown on Drawings. Provide [unit mounted control power transformer and [STOP-START pushbutton station and GREEN indicating light in front cover.

K) Circuit Breaker Accessories: Trip units and auxiliary switches as indicated.

L) Cabinet Front: Surface type, fastened with [concealed trim clamps] [screws] [hinge and latch], [hinged door with flush lock,] [metal directory frame,] finished in manufacturer's standard gray enamel.

2.02 Branch Circuit Panelboards

A) Material and Equipment: Product Options and Substitutions.

B) Manufacturers:

(1) Square D Model NQOD.
(2) Substitutions: Permitted.

C) Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

D) Panelboard Bus: Copper ratings as indicated. Provide copper ground bus in each panelboard[; provide insulated ground bus where scheduled.

E) Minimum Integrated Short Circuit Rating: amperes rms symmetrical for 240-volt panelboards; 14,000 amperes rms symmetrical for 480-volt panelboards, or as indicated.

F) Molded Case Circuit Breakers: NEMA AB 1, bolt-on type thermal magnetic trip circuit breakers, with common trip handle for all poles, listed as Type SWD for lighting circuits, Type HACR for air conditioning equipment circuits, Class A ground fault interrupter circuit breakers where scheduled. Do not use tandem circuit breakers.

G) Current Limiting Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole, coordinated with automatically resetting current limiting elements in each pole. Interrupting rating 200,000 symmetrical amperes let-through current and energy level less than permitted for same size Class RK-5 fuse.

H) Cabinet Front: Surface cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

3. EXECUTION

3.01 Installation

A) Install panelboards in accordance with NEMA PB 1.1 and the NECA "Standard of Installation".
B) Install panelboards plumb.
C) Height: six (6) feet to top of panelboard; install panelboards taller than six (6) feet with bottom no more than four (4) inches above floor.
D) Provide filler plates for unused spaces in panelboards.
E) Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.
F) Provide engraved plastic nameplates.
G) Ground and bond panelboard enclosure.

3.02 Field Quality Control

A) Section 01410 – Testing Laboratory Services.
B) Inspect and test in accordance with NETA ATS, except Section 4.
C) Perform inspections and tests listed in NETA ATS, Section 7.4 for switches, Section 7.5 for circuit breakers.

3.03 Adjusting

A) Contract Closeout. Adjusting installed work.
B) Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within twenty (20) percent of each other. Maintain proper phasing for multi-wire branch circuits.

SECTION 16491 FUSES

1. GENERAL

1.01 Related Documents

A) Drawings and general provisions of the Contract, including General and Special Condition, apply to this Section.

1.02 Summary

A) This Section includes the following:

(1) Cartridge fuses rated 600 V and less for use in switches.
(2) Spare-fuse cabinets.

1.03 Submittals

A) Product Data: Include the following for each fuse type indicated:

(1) Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
(2) Let-through current curves for fuses with current-limiting characteristics.
(3) Time-current curves, coordination charts and tables, and related data.
(4) Fuse size for elevator feeders and elevator disconnect switches.

B) Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.

(1) For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
(2) Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.

C) Operation and Maintenance Data: For fuses to include in emergency, operation, and maintenance manuals.

(1) In addition to items specified in Division 1 Section **"Operation and Maintenance Data"**, include the following:

i. Let-through current curves for fuses with current-limiting characteristics.
ii. Time-current curves, coordination charts and tables, and related data.
iii. Ambient temperature adjustment information.

1.04 Quality Assurance

A) Source Limitations: Obtain fuses from a single manufacturer.

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

C) Comply with NEMA FU 1.

D) Comply with NFPA 70.

1.05 Project Conditions

A) Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.06 1.6 Coordination

A) Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size.

1.07 Extra Materials

A) Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

(1) Fuses: Quantity equal to ten (10) percent of each fuse type and size, but no fewer than three (3) of each type and size.

2. PRODUCTS

2.01 Manufacturers

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

B) Manufacturers: Subject to compliance with requirements, provide products by one of the following:

(1) Cooper Bussman, Inc.

(2) Eagle Electric Mfg. Co., Inc.; Cooper Industries, Inc.

(3) Ferraz Shawmut, Inc.

2.02 Cartridge Fuses

A) Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.

3. EXECUTION

3.01 Examination

A) Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
B) Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
C) Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 Fuse Applications

A) Service Entrance: Class RK1, time delay.
B) Feeders: Class L, time delay.
C) Motor Branch Circuits: Class RK5, time delay.
D) Other Branch Circuits: Class J, fast acting.

3.03 Installation

A) Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.04 Identification

A) Install labels indicating fuse replacement information on inside door of each fused switch.

SECTION 16900 TESTING

1. GENERAL

1.01 Work Includes

A) Contractor Provide:

(1) Testing of electrical components and systems:

i. Insulation resistance test.
ii. Grounding electrode test.
iii. Continuity test.
iv. Voltage test.
v. Phase relationship verification.

(2) Test Reports
(3) Correction of defective components or systems.
(4) Retest of corrected components, systems.

1.02 Related Work

A) Specified elsewhere:

(1) Shop Drawings
(2) Contract Closeout: Closeout Submittals
(3) Project Record Documents
(4) Operating and Maintenance Manuals.
(5) Basic Electrical Materials and Methods

1.03 Submittals

A) Test reports: Submit 3 copies of all test reports to Engineer.

B) Type each test report on 8 1/2 in. x 11 in. paper. Include:

(1) Project Number
(2) Project title and location.
(3) Test Performed.
(4) Date Performed.
(5) Test equipment used.
(6) Contractor's name, address, and telephone number.
(7) Testing firm's name, address and telephone number.
(8) Names and titles of persons

i. Performing test.
ii. Observing test.

(9) Statement verifying each test.
(10) Name plate data from each motor and equipment item tested.
(11) Test results
(12) Retest results after correction of defective components, systems.

C) For each copy, assemble all test reports and bind them in a folder. Label each folder, "Electrical Test Reports" and include Project Number, Title and Locations.

2. PRODUCTS

2.01 Materials

A) Furnish all equipment, manpower and casual labor to perform specified testing.

3. EXECUTION

3.01 Preparation

A) Ensure that all electrical work is complete and ready for testing.
B) Disconnect any devices or equipment that might be damaged by test voltages, voltage of reversed phase sequence or other test procedures.
C) Energize each feeder from existing main panel to new distribution panels.
D) Energize each feeder from distribution panel to each subpanel.

3.02 Testing

A) Conduct tests and adjust equipment to verify compliance with specified performance.

3.03 Insulation Resistance Tests

A) Resistance measured, line to ground.
B) Perform testing on the following items:

ITEM TESTED	MIN ACCEPTANCE VOLTAGE OF TEST	RESISTANCE IN MEGOHMS
(1) No 2 and larger Cables (600V)	1000V	50
(2) Motors provided under this project	500V	5
(3) Panels	1000V	25

3.04 Grounding Electrode Test

Measure and record ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Maximum acceptable resistance: 10 ohms. When resistance exceeds 10 ohms drive and bond another ground rod two ground rod length away and repeat test.

3.05 Continuity Test

Test branch circuits and control circuits to determine continuity of wiring and connection.

3.06 Voltage Tests

A) Make and record voltage tests and recorded at the following listed points. Conduct tests under normal load conditions.

(1) Service entrance at main disconnect switch.
(2) Terminals at this project's panels.
(3) Terminals of all motors.

3.07 Phase Relationship

Examine connections to equipment for proper phase relationships. Verify proper motor rotation.

3.08 Correction of Defects

A) When tests disclose any unsatisfactory workmanship or equipment furnished under this Contract, correct defects and retest. Repeat tests until satisfactory results are obtained.
B) When any wiring or equipment is damaged by tests, repair or replace such wiring or equipment. Test repaired items to ensure satisfactory operation

SECTION 16901 INSTRUMENTATION

1. GENERAL

1.01 DESCRIPTION OF THE WORK

The Contractor shall furnish and install Magnetic Flow Meters as described herein and as shown on the plans.

1.02 RELATED WORK

Section 16 Electrical

1.03 QUALITY ASSURANCE

Flowmeter manufacturers shall have a minimum of five years' experience in the manufacture and operation of flowmeters of the type specified herein.

1.04 SUBMITTALS

Submittals shall provide for flow meters, pressure transmitter and nitrate analyzer and associated equipment. Also include a calibration report for each flowmeter.

1.05 WARRANTY AND SERVICES

The Contractor shall provide warranty for all items under this section for one year form the date of acceptance by the Owner. During that one year, the Contractor shall at his expense replace any part or parts that malfunction or corrode due to defective manufacture or installation. During start up, the flowmeter manufacturer shall provide a representative to be present and provide adjustments as needed. The manufacturer's authorized representative shall be present for equipment start-up.

2. PRODUCTS

2.01 MAGNETIC FLOW METERS

All magnetic flow meters used on this project shall be the same manufacturer. Flowmeter shall be manufactured by one of the following manufacturers:

A) Foxboro 9500A with IMT30A Transmitter

B) Or other approved equal.

2.02 MAGNETIC FLOWTUBE FLOWMETERS

A) Flow Tube

(1) The flowmeter shall be of the electromagnetic type, utilizing DC excitation and shall be microprocessor based. The flowmeter shall ensure flow signals throughout the cross-sectional area. Single or multi-point measurement devices are not acceptable. It shall be capable of measuring flowrate and flow total in both directions, with two independent totalizers to give new flow for network management purposes.

(2) The flowmeter accuracy shall be better than ±0.2% of reading or ±1mm/s in both forward and reverse flows. The working flow range shall be 15 cm/a to 15m.s (1000:1).

(3) The repeatability shall be ±0.1% of reading or better.

(4) The meter shall offer a lifetime stable zero and shall not require routine zeroing. The meter shall automatically indicate zero under empty sensor conditions.

(5) It shall be possible to use modern digital fingerprinting techniques to verify the integrity of sensor, cabling and transmitter, once the meter has been installed in the user pipeline. The testing technique shall provide verification of the complete flow system, i.e., sensor and transmitter, without removal of, or access to, the sensor. A verification certificate shall be provided. Upon request, references indicating successful installations with over two years operation shall be provided.

(6) The meter performance shall be verified on a test facility that is internationally acceptable (e.g. NAMAS, NIST or equal) so that full traceability is assured. Laboratory traceability packs should be available upon request.

(7) The flowmeter shall be designed and manufactured under ISQ 9001 series of quality standards.

(8) The wetted materials shall be compatible with and suitable for use for raw water and finished water with chlorine. The liner shall be hard rubber and shall be certified and internationally recognized by a body such as WRC, AWWA or equal. The electrodes shall by type 316 stainless steel.

(9) The flow sensor shall be rated to IP68 and suitable for indefinite submergence in water to a depth of 10m. The sensor shall also be suitable for installation in underground pipes without the need for a metering chamber, vault or pit (i.e., it shall be capable of direct burial). The manufacturer shall, on request, provide evidence of satisfactory operation of such sensors for a minimum period of 5 years in buried installations.

(10) The metering tube shall be constructed of 304 SST with 150# ANSI carbon steel flanges.

(11) All Magmeter grounding and bonding shall be per the manufacturer's recommendation. Grounding electrodes of the same material as the measurement electrode are acceptable in lieu of grounding rings.

(12) Flowmeter shall be provided with an aluminum terminal box with ½ inch conduit threads and coated carbon steel.

B) Flow Converter

C) There shall be separate isolated analog outputs (4-20mA) and pulse outputs (volt free) for forward and reverse low directions. The working flow range shall be fully configurable by the user.

(1) The input impendence shall be 1015 Ohms or greater so that the electrode fouling does not affect signal and electrode seal integrity.
(2) The transmitter display shall be capable of indicating flowrate and totalization simultaneously in user selectable engineering units. The totalizer shall be 9 digits. Display shall also be capable of indicating alarm status, percentage of span, and velocity. A separate totalization shall be displayed for forward and reverse flows.
(3) The transmitter shall be configurable by use of a keypad located on the front face of the transmitter. Operation of the keypad shall be possible without opening the transmitter cover, therefore breaking the NEMA 4X rating.

2.03 EXECUTION

A) Install flowmeter as shown on drawings and per manufacturer's recommendations.
B) All flow meters shall be factory tested and calibrated for respective flow ranges.

2.04 INSTALLATION

A) Contractor will install the sensor in strict accordance with the manufacturer's instructions and recommendation.
B) Manufacturer's representative will include a half-day of start-up service by a factory-trained technician.

END OF SECTION

SECTION 16920 TELEMETRY/CONTROLS

1. GENERAL

1.01 WORK INCLUDES

A) This section covers work necessary for the design, documentation, assembly, test, installation, field testing, startup, training, and final documentation for a Supervisory Control and Data Acquisition (SCADA) system for the City of Le Roy, as described herein.

B) The naming of a manufacturer in this specification is not intended to eliminate competition or prohibit qualified manufacturers from offering equipment. Due to the complexity of interfacing the three existing control systems into one graphical HMI, the System Integrator of the HMI will supply the telemetry system for the new system. The base bid shall be specified as provided by R.E. Pedrotti Co., Inc. or Vandevanter Engineering. The system integrator will modify the existing treatment plant control, coordinate the installation and operation of a new water treatment plant telemetry system, and ensure new water treatment telemetry communicates with existing well radio telemetry.

C) Other "approved equal" systems integrators may be used on this Project, only with prior approval of the Engineer. To obtain approval of alternate systems integrators, the General Contractor shall submit in writing, prior to acceptance of Bids, references (Owners' contact name, address, and telephone number) of at least three controls installations at water plants of similar size with at least 1 year of acceptable operating experience by the proposed alternate systems integrator. Provide sufficient time (minimum 1 weeks before the bid opening date) by the engineer to review the submittal, references, and issue an Addendum. Acceptable operating experience means:

(1) The system was installed and programmed by the systems integrator.
(2) The facility is presently using the installed system for data acquisition and control.
(3) The system control and data communication system components were furnished and programmed by the systems integrator.
(4) The personnel proposed to do the actual programming shall be employed by the Systems Integrator.

1.02 GENERAL

A) Major components of this system shall include the specified software, materials, equipment, and installation required to implement a complete and operational SCADA system along with any associated panel or field mounted instrumentation.

B) In order to achieve a single graphical interface and control topology which will interface with the existing and new control equipment to the greatest extent possible, like items of equipment provided hereunder shall be the end products of one (1) manufacturer. It shall be the responsibility of the contractor to coordinate all equipment integration with the integrator, such that it shall operate as a complete system.

C) Requirements for the electrical work associated with the installation of the SCADA system and associated instrumentation equipment are as specified in DIVISION 16 ELECTRICAL.

D) It shall be the integrators responsibility to prepare and provided system schematic control panel diagrams to interface with all panel. Integrator shall coordination with equipment manufacture.

1.03 RESPONSIBILITY FOR COMPLETE SYSTEM

A) The system integrator shall be responsible for and shall provide for the design, supply, delivery, installation, software configuration, testing and startup, owner training, and warranty of a complete coordinated system which shall perform the specified functions.

B) The Owner and the Engineer will review system technical information as submitted by the system integrator for software; operating system, database, control strategies and the graphical user interface, i.e. report and log formats, graphics, trends, alarming, etc. for complete compliance with these specifications.

C) The system integrator shall provide the Owner with all services and hardware to ensure that proper communications are established with off-site remote locations which are to be monitored and controlled. This work shall include, but not be limited to:

(1) System Integrator shall provide new radio transceivers which will interface with the existing radio transceivers. System Integrator shall perform a radio propagation path analysis and provide a hardcopy to the Engineer. The radio propagation path analysis will be based on the use of the existing frequency to determine suitability for use, required antenna heights, and use and location of repeater units, if needed. The radio system shall be designed for 98% or better reliability for each station.
(2) An FCC radio license is not required with the existing well radios.
(3) Provide and install all radio, antenna, antenna supports, antenna grounding, antenna cable, surge arrestors and other hardware necessary for the radio system.

1.04 SUBMITTALS

A) Hardware Submittals:

Before any components are fabricated, and/or integrated into assemblies or shipped to the job site, furnish to the Engineer for their review submittal documents. Submittals shall include full details, shop drawings, catalog cuts and such other descriptive matter and documentation as may be required to fully describe the equipment and to demonstrate its conformity to these specifications.

1.05 ON SITE SUPERVISION

A) The system Integrator shall provide experienced personnel to supervise, perform, and coordinate the installation, adjustment, testing, and startup of the SCADA system. The personnel shall be present on-site as required to affect a complete and operating system.

1.06 TESTING AND STARTUP

A) All elements of the SCADA system shall be tested to demonstrate that the total system satisfies all of the requirements of this Specification. The Contractor shall coordinate and schedule all of his testing and startup work with the Owner.

1.07 TRAINING

A) At the conclusion of the system start-up, a four (4) hour training program will be provided. The training program shall educate plant personnel with the required levels of system familiarity to provide a common working knowledge concerning all significant aspects of the system being supplied.

B) Six months after the system start-up, a four (4) hour training program will be provided. This training program shall provide plant personnel the opportunity to focus on areas that need attention as they developed after the initial start-up.

C) The Integrator shall provide all instructional course material, equipment and manuals to conduct the training program. Owner shall provide facilities for the training.

1.08 OPERATION AND MAINTENANCE MANUALS

A) The Contractor shall provide three (3) complete sets of hard-covered ring bound loose-leaf O&M manuals. In addition to "as-built" system drawings, the manuals shall include internal wiring diagrams and operating and maintenance literature for all components provided under this section.

B) The submitted literature shall be in sufficient detail to facilitate the operation, removal, installation, programming and configuration, adjustment, calibration, testing and maintenance of each component and/or instrument.

C) The contents of the O&M manuals shall be generally organized as follows:

(1) System Hardware/Installation
(2) Operation
(3) Maintenance and Troubleshooting

1.09 DEFINITION OF ACCEPTANCE

A) System acceptance shall be defined as that point in time when the following requirements have been fulfilled:

(1) All O&M documentation has been submitted, reviewed and approved.
(2) The complete SCADA system has successfully completed all testing requirements specified herein and have successfully been started up.
(3) All Owner's staff personnel system start-up training programs have been completed.

2. PRODUCTS

2.01 GENERAL

A) The functions and features specified herewith are the minimum acceptable requirements for the SCADA system. The provided system shall equal or exceed each requirement.

B) Major equipment, component, and software items are specified; however, the system Integrator shall provide all appurtenant items necessary to achieve the required operation as hereinafter specified.

2.02 FUNCTIONAL REQUIREMENTS

A) Hardware Requirements

(1) Install new plant MP-1 control panel to communicate vie ethernet with existing equipment, new filter and softener transfer control panels, and existing well site panels via radio or as specified in these specifications or plans. Provide 50 amp 208V to panel.
(2) Remove and relocate existing controls and telemetry equipment.
(3) MP-1 shall provide power to FTP-1, FTP-2, and STP-1. Provide overcurrent protection 30 amp 110V to each panel from MP-1.

B) Control Requirements

(1) The new plant MP-1 panel shall communicate and control the old well sites and the high service pumps all based on the level of the elevated tower and aerator tank pressure.

C) Input / Output Requirements

See Drawings for Existing I/O System Integrator to provide new filter equipment I/O.

2.03 COMPONENT SPECIFICATIONS

A) General

(1) Remote and Master PLC enclosures shall be corrosion resistant welded NEMA Type 4 for outdoor locations, NEMA Type 12 for indoor locations. Enclosures shall be fabricated from a minimum of 14 gauge cold rolled steel with a baked enamel finish in the manufacturer's standard color. Units shall include a single gasketed front door. Full height hinges, locking hasp and door clamping hardware shall be included. All enclosures shall be UL listed.

(2) Controls shall operate from a source of 120 volts, 1 phase, 60 Hz. All controls shall be protected from lightning or other transient voltages by a power arrestor.

(3) Condensation protection shall be provided. Enclosure shall have a heater which operates continuously to prevent condensation build-up. A freeze protective heater and thermostat shall also be provided at those outdoor locations containing hydraulics or sensitive electronic equipment subject to freezing conditions.

(4) All power supplies required for operation shall be provided. Power supplies shall be sized to have a minimum of 40% spare capacity providing increased reliability and allowing for the addition of future equipment.

(5) All wiring shall be in complete conformance with the National Electric Code, state, local and NEMA electrical standards. All incoming and outgoing wires shall be connected to numbered terminal blocks and all wiring neatly tied and fastened to chassis as required. For ease of servicing and maintenance, all wiring shall be color coded and uniquely numbered. The wire number shall be clearly shown on the drawings, with each wire's number indicated

B) Battery Back Up System

(1) Provide a UPS battery backup system that shall be of sufficient capacity to provide a minimum of four 30 minutes of backup in the event of a failure of the main power source.

C) UL Labeling 508A

SERIALIZED UL LABEL REQUIREMENT (508A)

(1) Panels provided under this section shall be constructed in compliance with Underwriter's Laboratories Inc. category 508A standards - Enclosed Industrial Control Panels listing and following-up. The control panel(s) shall bear the Underwriter's Laboratories serialized label for "Enclosed Industrial Control Panel".

(2) While the use of U.L. listed components is encouraged, their use alone will not be considered an acceptable or satisfactory alternate to the "Enclosed Industrial Control Panel" serialized label specified above. Upon request from the Engineer, the panel manufacturer shall supply documentation to the owner proving they are a U.L. recognized manufacturing facility for the type of equipment required. Only the labeled products of U.L.508A/"Enclosed Industrial Control Panel" recognized panel manufacturer shall be considered acceptable for use on this project.

D) PLC Control/Telemetry System

(1) General:

i. The main site and each remote location shown on the plan drawings and as described herein shall be of the PLC type with adequate memory and instruction sets required to make the unit perform all of the functions required by this specification. Units shall communicate with the Main PLC MP-1 over the previously specified telemetry medium. Systems using a PC for master communications shall not be acceptable.

ii. The PLC system shall be based on a scalable modular multi-use open architecture platform that can be efficiently applied to perform the necessary functions at each location. Each controller/telemetry unit shall be a modular hardware style PLC consisting of a CPU with adequate memory and instructions, power supply, local and remote input/output modules, communications ports, and all other components required to make the unit perform all of the functions required in this specification.

iii. It is required that the same model PLC device be used throughout the SCADA system including; RTU, MTU and IRTU (repeaters) sites providing a complete solution with one common technology. This is to insure complete system continuity, compatibility between like devices, enhancing overall system efficiency by the reduced need to learn, maintain, support and carry spare parts for multiple technologies.

(2) Hardware:

i. The PLC system shall include a real time of day time clock w/battery backup for time stamping of data log records and scheduling of periodic time of day based events. Clock shall not require reset after a site power failure has occurred
ii. The PLC shall store system parameters including, logic configuration, setpoints, time delays, alarm and event data, counters and totalizers, etc. in field programmable (FLASH) non-volatile memory.
iii. Sufficient non-volatile memory must be provided to protect the system wide variables. This data shall be unaffected by power interruptions through the use of the battery backup system previously specified.
iv. The PLC shall be furnished with a minimum of 4 communication ports with true multitasking and allow simultaneous support of all ports. Ports can be configured for local I/O, Operator Interface/display support, LAN/WAN, etc. v.

The PLC processor shall meet the following as a minimum:

(a) CPU - True 32 Bit running at 50 MHz.
(b) 16 MB – 32-bit Dynamic RAM
(c) 16 MB FLASH
(d) 512 KB Static RAM
(e) 1 (One) Ethernet 10/100 BaseT port (RJ45)
(f) 1 (One) RS-232 Serial Communications (115 KB PS) (RJ45)
(g) 1 (One) RS485 Serial Multi-Drop Communications
(h) 1 (One) RS232 Operator Terminal Face Local I/O port
(i) On-Board input/output support of twelve (12) discrete inputs (DI), eight (8) discrete outputs (DO) and six (6) analog inputs (AI)

vi. The PLC shall not require any specialized tools for removal of the unit. System components including PLC, power supplies, etc. shall be DIN rail mounted. Terminations shall be via plug in connectors facilitating quick field replacement.
vii. The PLC shall operate from a 10-30 VDC power source.

(3) Software:

i. The PLC shall have a high-performance open source software architecture that utilizes a true multitasking operating system running a combination of standard and specially designed for water and wastewater application software modules. The system provided shall utilize an integrated system approach providing a comprehensive common configuration tool for all components within the system including I/O, Processor, Communications, and Operator Interface Display. The architecture shall permit all system components to be configured, simulated, tested and downloaded from one terminal to all system components.

ii. The operating system shall be multitasking and allow a minimum of two separate programs to run simultaneously without affecting each other.

iii. To provide for and insure multiple source support, the PLC system shall utilize industry standard programming language certified by the PLC open committee for all five languages supported by the IEC 61131-3 standard including; Sequential Function Chart, Ladder Diagram, Structured Text, Instruction List and Function Block Diagram. All five languages must be included. The programming software must be Windows based.

iv. PLC's provided under this specification shall be capable of performing the necessary logic to control the system as previously defined. These capabilities shall include, but not be limited to the following:

(a) Discrete input/output
(b) Analog input
(c) Analog output
(d) Timers
(e) Pump Controller
(f) Pump Alternation
(g) Mathematical Function Blocks
(h) Stage Blocks
(i) Trending
(j) Latch/unlatch relays
(k) Counters
(l) Comparators
(m) Ladder logic
(n) Flow Totalization/Integration
(o) Intrusion Detection
(p) Time of Day Control w/ Lockout
(q) Ramp Blocks
(r) Data Logging

v. PLC's shall be capable of performing diagnostic functions. CPUs shall continuously monitor the functionality of the system and record errors and specific system events. A diagnostic buffer shall retain fault and interrupt events.

vi. Communications between the Main PLC MP-1 and the computer shall be accomplished using standard off-the-shelf drivers allowing use of standard Windows DDE and or OPC software drivers. Communications between the SCADA PC,e Main PLC Mp-1 unit, treatment packaged systems, and other shall be via Ethernet using MODBUS TCP/IP protocol.

vii. Each PLC shall have memory protected built in historical archiving/data logging of system alarms & events and process variables. Data logger shall be able to log data based on time or an event. PLC shall have enough memory allocated to allow 200,000 time and date stamped discrete and/or analog values to be archived.

(4) Communications:

i. The telemetry system must be able to simultaneously support multiple communications protocols. The system supplied, as a minimum shall be able to supply Modbus RTU/ASCII (Remote/Slave) output data via RS-232, 485 & Ethernet format thus insuring a primary means of interfacing with non-related equipment.

ii. The PLC system shall allow telemetry operations over multiple (LAN/WAN) communication media affording the most efficient and reliable solution including; DC metallic wire pair, dedicated leased voice grade phone line, standard dial up phone line, wireless cellular dial up system, cable TV, Fiber optics, Ethernet 10/100 BaseT, VHF Radio, UHF Radio, Dedicated Microwave Radio, and Ethernet Wireless.

iii. The system shall support multiple modes of telemetry operation allowing highest possible system reliability and real-time response including; standard polling cycles, peer-to-peer, quiescent (Report on exception), store and forward (Repeater).

(5) I/O Systems:

i. The PLC system shall have I/O resources to support a wide variety of applications without needing to depend upon alternate technologies to meet various system data requirements. Each PLC shall be supplied with the required I/O to meet the specified requirements and allow for a minimum of 20% spare capacity for future expansion.

ii. The PLC system shall support a wide variety of modular I/O with various configurations to permit the most efficient use of I/O hardware and panel space. Each I/O module shall be DIN rail mounted. Each module shall include diagnostic LEDS indicating module operational and I/O status.

iii. Ethernet I/O modules shall be connected to the PLC by on board Ethernet 10/100 BaseT connection port. Ethernet I/O modules shall support multiple communications including TCP/IP and Modbus ASCII and RTU allowing connection to any device supporting these protocols.

iv. Master & Remote PLCs shall be IntraLink LC2000A as manufactured by Evoqua formerly Siemens Control System or Allen Bradley Micrologix 1400.

(6) Panel Mounted HMI Computer

i. A 15" Color Touchscreen HMI Computer shall be provided with the Water Treatment Main MP-1 Control Panel . The display manufacturer shall be Phoenix Contact running Wonderware Intouch 1K with I/O or Maple Systems using InduSoft and using the latest version.

ii. B 15" Color Touchscreen HMI Computer shall be provided with the Filter and Softener Control Panels . The display manufacturer shall be Phoenix Contact running Wonderware Intouch 1K with I/O or Maple Systems using InduSoft and using the latest version.

(7) Cellular Auto Dialer

i. An Internet based human machine interface portal which communicates to the PLC utilizing a readily available commercial cellular network. The system shall be:

(a) Totally integrated, fully automated control and monitoring solution suitable for standalone local functionality and have simultaneous Internet based remote access.

(b) The solution shall include the required Internet based interface software, Internet wireless terminal.

ii. The cellular connection capability shall allow any authorized user to securely connect to the system from anywhere with an Internet connection. The Link2Site Flex or Topview system shall be accessed utilizing a standard web browser software package, which shall function as a traditional SCADA system software interface including the following functions:

(a) Interface functionality such as pump start/stop set point adjustments, remote on/off control, and alarm set point adjustment shall be included as a minimum.

(b) Remote site access security and controller configuration security shall be implemented via user entered passwords. Configuration changes and facility site access shall be recorded as time-and date-stamped events. These events shall then be reported and recorded over the wireless cellular connection.

(c) Alarm acknowledgement and alarm silencing capability shall be incorporated in the Link2Site or Topview system interface package.

(d) An "Update Now" function shall allow an authorized user to update the entire system automatically on demand from the Link2Site or Topview system.

iii. The Link2Site or Topview system shall provide immediate notification of facility operational and security alarms utilizing the following Owner furnished communication methods:

(a) E-mail account notification.
(b) Designated phone call.
(c) Text Messages
(d) All three methods at once.

Advanced callout scheduling functionality shall ensure the appropriate person and/or persons are called in the event of a specific alarm type. Acknowledging alarms shall be handled by the authorized Owner personnel using either the telephone or Internet interface.

The Link2Site or Topview system shall be user-friendly, configurable, and flexible. Access to the Link2Site or Topview system shall be through a secure Login Home page.

E) Radio System

(1) General

i. The telemetry signals shall be transmitted/received over an efficient radio system operating in Ethernet on a UHF FM unlicensed 900MHZ radio transceiver. The radio equipment shall be capable of operating on a 450-490 902-928 MHz. System shall use a single or dual frequency as required and be capable of either point to point or point to multipoint modes of operation.

(2) Transceiver

i. The existing radios shall be replaced with Ethernet based spread spectrum radios. Radios shall be Cal-Amp model Viper Phantom II.

(3) Antenna, Cable, Masts and Poles

i. The system Integrator shall provide the antenna for each site as required to achieve the overall communications requirements of the system. Antennas shall be directional or omnidirectional as required and suitable for outdoor environments. They shall be of all aluminum construction and rated to withstand as least 100 MPH winds with 1/2-inch radial ice.

ii. Adequate lengths of LDF4 Heliax cable for the well site or LDF5 for the elevated tank Heliax cable shall be provided for connection of the antenna to the radio transceiver at each site. The transmission line shall be terminated only in connectors rated for the required service. A lightning arrestor shall be placed between the transceiver and coaxial cable.

iii. Unless specifically stated, the antennas shall be attached to existing or new structures, such as tanks, tower, or buildings. Particular attention shall be given to the correct installation of the antennas to give adequate protection from nearby lightning strikes by providing a low resistance dc path to ground.

iv. Contractor shall furnish all mounting masts or poles as required to support the antennas at the elevations and orientations required. Masts and poles shall be suitable for outdoor environmental conditions, provide adequate support and protection for transmission lines and be provided complete with all necessary mounting accessories.

Minimum acceptable technical and physical specifications of the antenna shall be as follows:

<u>Directional Antenna</u>
Type --- 7 element Yagi, with a forward gain of at least 12 dB Lightning protection ----------
Direct ground
Antennas shall be TY900 as manufactured by Antenna Specialists, Cellwave or approved equal.

END OF SECTION

SECTION 16950 SUPERVISORY CONTROL SYSTEM

1. GENERAL

1.01 RELATED DOCUMENTS

A) The Contractor shall provide a qualified Systems Integrator to provide the integration labor-only portion of this project. Those services include: Control Panel Design, I/O Listing and Detail Sequence of Operations, SCADA Mapping, PLC Programming, HMI software configuration, and Operational Testing and Debugging. The Contractor shall provide and install all materials and provide all software for the project, including, but not limited to, Control Equipment, Computers, Software and Instrumentation. It shall be the responsibility of the Electrical Contractor to provide start-up assistance to the System Integrator to verify all field wiring and proper operation of all field devices and instrumentation.

1.02 SUMMARY

A) As an overview, PLCs will provide control for individual pieces of equipment as diagrammed. The SCADA system shall reside in the new Water Treatment plant. It will be directly connected to the local PLCs via Ethernet Network. The new water treatment plant will be the central point of operations and data collection.

B) Work under this Section includes:

(1) Furnish and install computers (installation of all software, configuring database tags, installing and debugging programs, installing and testing all peripheral equipment, configuring printers, and testing for proper operation to be performed by the System Integrator).
(2) Furnish and install networks (includes installing network equipment, installing interconnecting cables, testing, and debugging).
(3) Furnish and install Control Panels (programming and configuration of PLCs, PLC ladder logic, coordinating programming of PLCs provided by other equipment manufacturers, and testing PLCs for control, monitoring, and alarm functions to be performed by System Integrator).
(4) Furnish and install UPSs.
(5) Furnish SCADA software (installation of software, report formatting, developing HMI screen graphics to be performed by System Integrator).
(6) Provide assistance as needed to complete Start-up and Testing of the entire control system. Responsibilities include but are not limited to troubleshooting field wiring, instrument configuration, and other tasks as identified by the Owner and Engineer.
(7) Provide minimum 120 hours of documented wiring check out with Integrator / Electrical Contractor to verify all sensors and input output devices are wired properly. No start-up will be done until this documented checkout is submitted in writing with a check list of every device with status NO, NC and energized, Denergized and confirmed on the PLC. Once this is done a Green tag will be affixed to the device.

C) Main Computer and Peripherals

(1) Main computer hardware system shall consist of a CPU, RAM memory, hard disk storage drive, DVD R/W, Network Adaptors, Keyboard, Mouse, and one (1) Monitor. Unit shall contain auxiliary microprocessors which handle all data manipulations and memory allocations. A video monitor and printer shall be included to view and print data.
(2) All necessary communications and power cabling and/or cords between the PC, Master PLC, UPS and all peripheral equipment shall be included. Provide surge protected power bar(s) as required.

D) CPU

(1) Computer shall be the latest version of Dell Windows 10 (64 bit). CPU shall be an Intel i7 1.8GHz or better. 4 GB SDRAM. Data bus width shall be 64 bit.

(2) Included shall be a detached, industry standard keyboard.

(3) An optical mouse shall be provided to operate in conjunction with the Main Video Display to allow the selection of operational tasks, eliminating most typing functions, and saving operator time. Mouse shall be a serial two button type, Microsoft or approved equal.

(4) Computer shall be manufactured by Dell.

E) Disk System

(1) Computer shall have an integrally mounted fixed disk system, 48x CD-ROM, 48x CD RW, and controller card to interface the drives to the CPU.

(2) Hard disk shall contain as a minimum 1 TB of formatted data storage with a single partition of memory. Raid 1 configuration

F) Video Display

(1) Two (2) 24” color LCD monitors shall be provided. Screen shall be designed to minimize glare and increase contrast; operator adjustable controls shall include brightness and screen contrast.

(2) One (1) 55” color LED Digital Smart Television shall be provided. Hardware shall be provided to wall mount the unit at any location within the existing status panel office area of the Water Treatment Plant. The television shall communicate and mirror a user defined programmable screen from the SCADA PC. The television shall provide connectivity by the following, Wi-Fi, LAN Ethernet, 2 USB, RCA, HDMI, and RF Antenna.

1.03 OPERATING SYSTEM

A) Operating system provided for the main computer shall be commercially available, 64-bit and capable of taking full advantage of the protected mode multitasking capabilities of an Intel-Core microprocessor. System shall be designed to perform advanced memory management functions.

B) System shall offer virtual memory capabilities, multiple virtual machines, and provide true pre-emptive multitasking. Any error messages displayed by the operating system shall be descriptive and in plain English, minimizing the need for reference manuals or tables.

C) Operating system shall be MS Windows 10 with MS Office 2019 full suite or latest versions of each.

1.04 SYSTEM SOFTWARE

A) General

Software shall employ a graphical user interface (GUI) as the human-machine interface (HMI). This native 64-bit graphical user interface shall allow operating personnel to perform all system functions without any knowledge of operating system commands.

System configuration shall be protected from unauthorized changes by a password security system. An on-line help facility to assist operating personnel shall be provided. HMI software shall be Wonderware InTouch latest version.

B) DDE I/O Server Interfaces

(1) DDE I/O Server Interfaces provided shall be standalone Windows programs capable of communicating via DDE link to any other Windows based program in the system. Servers must be available for all major brands of programmable controllers and I/O devices.

(2) Only data points which change on screen, alarm points, historically logged points or points in background logic shall be polled. In addition, to optimize communication performance, report by exception. Polling lists shall be dynamically configurable with all configuration menu driven.

C) Graphics

System shall be capable of providing both dynamic and static graphic displays. Dynamic graphics shall provide real-time system information displays on the monitor. Alarms, status, and analog data depicted on the screen shall be updated as data is made available to the computer.

(1) System Integrator shall create displays representing system processes and instrumentation as described hereunder. These displays shall be built with object oriented graphic elements such as ovals, rectangles, lines, arcs, circles and text. The graphics program shall utilize the software's GUI and include pull down menus and dialog boxes (or equivalent) to facilitate the display creation process. Graphic displays to be provided under this contract shall include:

i. System location diagram (map) identifying physical location of each station. Diagram shall be generated via an actual mapping program, then modified to fit this project.

ii. Individual graphic display for each site in the system. Displays shall include such items as digital and/or barograph indication of analog process variables, and alarm and status indications for each piece of monitored equipment.

(2) Displays shall use the color capabilities of the video display system to visually indicate status, level and alarm conditions of major components in the system. As the status of the actual components change, the color of the displayed symbol for the components shall change to denote their current status. Setpoints and control points shall be modifiable when displayed on the screen by an operator who has been assigned access to this function.

(3) Means shall be provided to allow the operator to print graphic displays

D) Trending

(1) Analog graphic real time and historical trend charts shall be available for all monitored analog process variables in the system. These shall be displayed in strip chart style with the vertical axis depicting the variable value and the horizontal axis representing time. Each display shall be scaled in appropriate coordinates for the specific variable being monitored. Chart time frame shall be operator selectable from a minimum of one minute to one year.

(2) System shall be capable of displaying up to four (8) analogs on a single chart. Color shall be used to differentiate between analogs. When multiple analogs are displayed, the vertical axis shall be scaled to a percentage of the operating range.

(3) Ability to print both real-time and historical trends shall be provided.

(4) Analog variable for each chart shall be automatically sampled and the value stored on the system hard drive. It shall be possible to import/export historical data in a CSV format to/from spreadsheets, other databases and editors.

E) Alarming

(1) When an alarm condition occurs, the following sequence shall be provided:

i. The alarm shall be added to the Event Log.
ii. A telephone dialer shall be signaled.

(2) Alarming capabilities shall include:

i. HighHigh/High/Low/LowLow
ii. Major/Minor deviation.
iii. Eight (8) hierarchical alarm groups w/16 subgroups per group.
iv. Viewing all alarms or subsets as a summary or a history.

v. Selectable formats for display, archiving or printing.
vi. Rate of change.

F) Report Generation System

(1) A report generation system shall be included to print standard and custom reports, lists, tables and graphic charts. Report generation shall be invoked either on demand by the operator, by a monitored event, or automatically on a daily, weekly, monthly or yearly basis.

(2) Report generation system shall be capable of producing daily, weekly, monthly and/or yearly reports. It shall be possible to configure the reports to meet management and government requirements as specified herein. Reports shall be printed using actual or calculated values from either the system's real-time database, the historical database, or manually entered data.

(3) A Run Total Flow Report shall be included as a report.

(4) The system shall utilize Microsoft™ InSQL Server to hold report data and shall allow data to be shared by dynamically linking to XCEL to send or receive, manipulate, display or print graphs and reports.

G) Database

(1) System shall utilize a Real-Time Database which stores current system values and status, annunciates alarm conditions and status changes, totalization and running time accumulation and provides control logic for outputs based on information contained in the database. Analog data points shall be capable of having their values sampled for chart displays and reports, plus they shall be used in comparisons for alarm and setpoint control.

(2) System shall utilize an Historical Database to periodically collect information from the Real-Time Database. The data shall be filed on the computer hard disk. Period between collections shall be adjustable from one day to one year, selectable by data point.

(3) Data from the both the Real-Time and Historical Databases shall be available for displays and reports. Data shall be capable of being exported to third party spreadsheets, text files or any DDE program.

(4) The Historical Database shall be Wonderware Historian Express , 100 tag, latest version.

H) Remote Diagnostics/Remote Terminal

(1) Remote Access shall be provided via the Internet by use of the LogMeIn software or by an approved equal and by Evoqua Link2Site Flex.

(2) Each site-specific display shall include a templated graphical representation of site equipment and shall have a system status box including for presentation of analog signals (levels, pressures, flows, and totals) and discrete status and alarm points. A

trend display box shall also be built in to each display depicting recent process history of local measured parameters. Graphical screens with pump or valve control shall be interactive using graphic based operators for Pump/Motor H-O-A and Manual Speed Control or Valve O-C-A and Manual Position, allowing remote operation. The following sites shall be graphic representation:

i. Overview
ii. Water Treatment Plant
iii. Wells and Tower
iv. Alarms
v. Trends
vi. Screens for control and setpoints

(3) The system shall allow remote access and adjustment of process setpoints including on/off points, alarm level and cutoff/restore points. Setpoint parameters shall be displayed on one common display. Each setpoint shall be identified with a specific identification tag allowing a user to easily identify the setpoint parameter. Systems that use cryptic and or abbreviated descriptors shall not be acceptable. The following system setpoints shall be remotely configurable:

i. All Tank High Level Alarms
ii. All Tank Low Level Alarms

(4) System alarm summary displays for current/active alarms and historical non-active alarms shall be built in. Each alarm screen shall display date and time of alarm and definition of alarm parameter. System memory shall allow the storage of not less than 30 days with up to 30,000 time and date stamped alarm points.

(5) The system shall provide trending of system data (analog and discrete) for up to 32 parameters. These parameters shall be viewable in groups of 1 to 4 points that can be assigned on line via operator selection. The system shall support a minimum of 8 trend screens allowing display of all available trend points. Each data trend point shall be assignable to one of two operator configurable data sampling rate groups. Each group shall be configurable with a minimum of 7 operator selectable data sampling rates for optimal resolution including: 30 Seconds, 1 Minute, 2 Minute, 3 Minute, 5 Minute, 10 Minutes, and 15 Minutes. Each trend display shall allow up to 4 points of trend data at 30 second resolution for up to 24 hours. A minimum of 30 days of trend data shall be available for each trended data point. The following system data points shall be trended:

i. All Tank Levels

(6) A Level report shall be automatically generated for display or, transmission via e-mail delivery. E-mail delivery of the report shall be available on demand based (LAN) or automatically scheduled for delivery (Dial Up) or LAN through a report scheduler. The system shall allow configuration of a minimum of two reports with 10 points each for a total of 20 levels. Each report shall display the Current Level, Daily Minimum and Maximum with time of occurrence. The following Levels shall be configured for report display:

i. All Tank Levels

(7) A Pressure report shall be automatically generated for display or, transmission via e-mail delivery. E-mail delivery of the report shall be available on demand based (LAN) or automatically scheduled for delivery through a report scheduler. The system shall allow configuration of a minimum of two reports with 10 points each for a total of 20 pressures. Each report shall display the Current Pressure, Daily Minimum and Maximum with time of occurrence. The following Pressures shall be configured for report display:

i. All Inlet & Outlet Pressure

(8) A Run Time report shall be automatically generated for display or, transmission via e-mail delivery. E-mail delivery of the report shall be available on demand based (LAN) or automatically scheduled for delivery and LAN through a report scheduler. The system shall allow configuration of a minimum of three reports with 10 points each for a total of 30 run times. Each report shall display the Daily Total, Monthly Total and Cumulative Total for piece of equipment monitored. The following Run Times shall be configured for report display:

ii. All High Service Run Times

(9) A system report scheduler shall be provided to allow for automatic report transmission via e-mail messaging. The scheduler shall be easily operator configurable while on line allowing day of week and time of day selection transmission of all system reports as identified above. Day selection fields shall be available for each day of the week. Time of day selection fields shall be available for each hour of the day. The system shall be configured in a matrix type format allowing operator selection of 1 to 168 scheduled transmissions per week. System reports shall be formatted as CSV files for easy viewing by Excel™ or Access™ application software.

(10) The system shall integrate the three existing control systems, and integrate the new telemetry requirements into one viewable control system.

(11) General

i. Coordinate all work with the engineer/owner to avoid conflicts, errors, delays and unnecessary interference with operation of the existing system during installation, testing, cutover and startup.
ii. Install all new equipment in accordance with the manufacturer's instructions and approved submittals.

(12) Installation

i. Contractor to install all new enclosures, provide conduit and wiring as required, mount and install antennas, towers, antenna cables, and connectors. Contractor to install and wire all equipment modifications to existing master control panel as indicated on drawings.

1.05 REFERENCES

A) International Electrotechnical Commission (IEC):
   (1) IEC 529 – Classification of Degrees of Protection by Enclosures.
B) National Electric Manufacturers Association (NEMA):
   (1) NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum).
C) National Fire Protection Association (NFPA):
   (1) NFPA 70 – National Electric Code® (NEC).
D) Underwriters Laboratories (UL):
   (1) UL 486A–Wire Connectors and Soldering Lugs for Use with Copper Conductors.
   (2) UL 486B – Wire Conductors for Use with Aluminum.
   (3) UL 508 – Industrial Control Equipment.

1.06 DEFINITIONS

A) HOA switch: Hand-off-auto selector switch.
B) FOFO: First on, first off.
C) FOLO: First on, last off.
D) LOFO: Last on, first off.
E) LOLO: Last on, last off.
F) LOR switch: Local-off-remote selector switch.
G) MCP: Master control panel.
H) P&ID(s): Piping & instrument drawing(s).
I) PLC(s): Programmable logic controller(s).
J) SCADA: Supervisory control and data acquisition.
K) HMI: Human Machine Interface
L) UPS(s): Uninterruptible power supply (ies).

1.07 SUBMITTALS

A) Product Data:

   (1) Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.
   (2) Manufacturer's warranty.

B) Drawings:

   (1) Drawings from manufacturer detailing equipment assemblies and indicating dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
   (2) Equipment wiring diagrams detailing wiring for power and control systems and differentiating between manufacturer-installed wiring and field-installed wiring.

C) Closeout Submittals:

   (1) Operations and maintenance manuals. O&M manuals by the System Integrator shall include the name, address, and telephone number of the system integrator and

the Contractor. With a comprehensive index, the O&M manual shall include a complete hardware list as well as approved shop drawings, software documentation, functional and operational descriptions, principals of operating logic, and safety considerations.

(2) Provide fully documented PLC ladder logic programs in electronic format. No PLC program shall be password protected or have access restricted for future monitoring and/or editing in any way.

(3) Loop drawings for field mounted instrumentation with terminal block locations. (By System Integrator).

1.08 QUALITY ASSURANCE

A) Qualifications: The systems integrator for this Project shall be selected by the contractor. Qualified system integrator shall have a minimum of 10 years of experience with automated control systems including a minimum of 10 projects of similar size and complexity.

B) Regulatory Requirements:

(1) Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL.

(2) Listing and Labeling: Provide electrically operated components specified in this Section that are listed and labeled as defined in the NEC, Article 100.

1.09 PROJECT CONDITIONS

A) The existing and temporary water treatment plant operations shall be maintained during the installation of the new Water Treatment System. Any Revisions or Work required on the existing Water Treatment Plant shall be performed via Change Order.

1.10 SCHEDULING

A) Coordinate control system installation and programming with actual equipment installation.

2. PRODUCTS

2.01 SOFTWARE

A) General: Software provided for control shall be the products of one manufacturer (except as provided herein) for single-source responsibility. The software used shall be commercially available with the benefit of numerous independent systems integrators having expertise in the use and programming of the software.

B) Alarm Notification Software: An Internet based human machine interface portal (Link2Site Flex™ system) which communicate utilizing a readily available commercial cellular network. The system shall be:

C) Microsoft Excel to allow for direct connectivity to the HMI Historical and Real time Databases, with automated report generation into Microsoft Excel Reports.

D) Office Tools Software: Integrated software suite that includes word processing, spreadsheet, presentation graphics, Internet browser, electronic mail, and database software. Office tools software shall be Office 2019 Full Suite manufactured by Microsoft Corporation or latest version. A copy shall be installed on the SCADA computer.

3. EXECUTION

3.01 INSTALLATION

A) The description provided in this Section, together with the other applicable Sections and the Contract Drawings (specifically the P&IDs) comprise the functional design criteria for this Project.
B) The P&IDs represent the basic concept of the instrumentation and controls. The control system descriptions further supplement these drawings.
C) When a field located HOA switch is selected in the *OFF* position, all controls shall be disabled.
D) All HOA switches shall include contact blocks for discrete PLC input indicating switches are in *HAND* or *AUTO* mode.
E) When a field located HOA switch is selected in the *HAND* position (*HAND* mode), the equipment shall be energized.
F) When a field located HOA switch is selected in the *AUTO* position (*AUTO* mode), energizing of the equipment shall be determined by the control programming.
G) The SCADA computer display shall provide clear indication and precise status of equipment.
H) A software controller (single variable or multi-variable) shall have *START/STOP* (*OPEN/CLOSE*) function command and analog output function command, such as speed, flow, or level.
I) Discrete status changes shall be logged in the plant database. Alarms shall be logged and annunciated on the SCADA computer display. Acknowledgment of the alarm shall also be logged.
J) Analog values shall be displayed and recorded. Trending of analog parameters shall also be displayed.
K) Motorized equipment shall have runtimes displayed and totaled (in tenths of an hour).

3.02 CONTROL SYSTEM DESCRIPTIONS

A) This document describes the major control philosophy for the water treatment plant processes and supporting systems. The major components include treatment process and operations, chemical feed, pumps, water sampling, and security. It is assumed that the plant PLC system will monitor all instrumentation and control all major motors. All instrumentation and control wiring shall run to and from the PLC system. It is intended that the plant will be started in the presence of an operator but can run automatically and shut down automatically. Remote access connection capability shall be provided to allow operators to determine status of the plant at all times and to be notified immediately of any alarm conditions. The plant control shall be a MicroLogix 1400 with a Wonderware Intouch operator interface (HMI).

END OF SECTION