

PROJECT MANUAL

for the

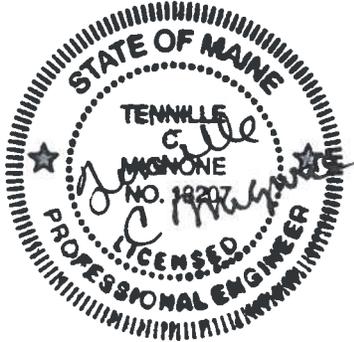
BUTTERFLY VALVE REPLACEMENT AT KENDUSKEAG PUMP STATION AND WASTEWATER TREATMENT PLANT



AECOM

250 Apollo Drive
Chelmsford, MA 01824

July 2016



JOHN M. THERIAULT, PE, PTOE
CITY ENGINEER

CATHERINE M. CONLOW
CITY MANAGER

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A. NOTICE TO CONTRACTORS

SECTION A

NOTICE TO CONTRACTORS

Bids are requested for the

**BUTTERFLY VALVE REPLACEMENT AT KENDUSKEAG PUMP STATION AND
WASTEWATER TREATMENT PLANT**

The project includes removing and replacing an existing butterfly valve at the Kenduskeag Pump Station and the removing and replacing an actuator valve on the existing butterfly valve at the Bangor Wastewater Treatment Plant. The work will need to be completed during dry weather and require maintenance of flows. The work will include electrical demolition, electrical work and wiring, field inspections and testing and acceptance of the butterfly valve and actuator valve.

All work is to be completed by February 28, 2017.

For consideration, the attached bid form sealed in an envelope, distinctly marked

**“BUTTERFLY VALVE REPLACEMENT AT KENDUSKEAG PUMP STATION AND
WASTEWATER TREATMENT PLANT”**

must be received at the Office of the City of Bangor Purchasing Agent by

2:00 PM, Wednesday, August 10, 2016.

at which time all proposals will be opened and read aloud.

A **pre-bid meeting** will be held on July 27, 2016 at 9:00 a.m. at the Bangor Wastewater Treatment Plant, 760 Main Street, Bangor, Maine. The pre-bid meeting will also include a walk-through at Kenduskeag Pump Station.

Bid security in the amount of 5% of the bid price will be required in the form of cash, a certified check, or bid bond.

The City reserves the right to waive any informalities in or to reject any or all bids submitted, or to accept any proposal considered to be the most advantageous to the City.

Specifications may be obtained at the Engineering Department, City Hall, 73 Harlow Street, Bangor, Maine 04401, for a seventy-five dollar **(\$75.00)** charge. If plans need to be mailed, an additional fee of thirty-five **(\$35.00)** will be charged.

B. INFORMATION FOR BIDDERS

SECTION B

INFORMATION FOR BIDDERS

BUTTERFLY VALVE REPLACEMENT AT KENDUSKEAG PUMP STATION AND WASTEWATER TREATMENT PLANT

The project includes removing and replacing an existing butterfly valve at the Kenduskeag Pump Station and the removing and replacing an actuator valve on the existing butterfly valve at the Bangor Wastewater Treatment Plant. The work will need to be completed during dry weather. The work will include electrical demolition, electrical work and wiring, field inspections and testing and acceptance of the butterfly valve and actuator valve.

Description of Work

The work contemplated under the terms of this contract consists of the following general items:

- Remove and replace actuator valve at WWTP
- Remove and replace butterfly valve at Kenduskeag Pump Station
- Perform other work as shown on plans, including electrical connections and maintenance of flows.
- Work to be conducted during dry weather; Kenduskeag Pump Station work possibly occurring at night, during low flow conditions.

Definitions

The following terms or, in the case of Owner, Engineer, or Contractor, the singular, masculine pronouns used in their place, shall have the following meanings within the context of this Contract:

Owner - The City of Bangor, Maine acting through its duly authorized representatives

Engineer - The Bangor City Engineer or his duly authorized representatives

Contractor - The individual, firm, or corporation to whom the contract has been awarded whether acting on his own or through subcontractors or employees

Contract - The Contract shall be deemed to include the Notice to Contractor, Information for Bidders, the Bid Form, the Contract Agreement, the Performance and Payment Bond(s), the Specifications and Plans, any addenda which may be issued to any of the foregoing, and all other provisions which may be required by law to be included in this contract whether actually included or not.

Bid Security

Each bidder must submit with his bid a certified check, bid bond or cash in the amount of 5% of his total bid price as his guarantee that the bidder will enter into the Contract, if awarded. Said check, bid bond, or cash will be returned to all except the two (2) lowest bidders immediately following the opening of bids, and the remaining sureties will be returned after the Owner and Contractor have executed the Contract. If the Contract has not been awarded within thirty (30) days of the bid opening the surety will be returned at any time thereafter to any bidder who so requests, so long as he has not been notified of the acceptance of his bid.

Withdrawal of Bids

The Owner may consider informal any bid not in accordance with the provisions hereof and may waive any informalities in, or reject, any or all bids. Any bidder may withdraw his bid prior to opening of the bids. Any bid received after the time and date specified will not be considered. No bidder may withdraw his bid within 30 days after the actual bid opening.

Bid Submitted

Bids must be submitted on the prescribed form and all blank spaces must be filled in, in ink, in both words and figures. The price quoted in the bid shall be for the total project, complete and shall include all labor, tools, materials, supplies, equipment, and all else necessary for or incidental thereto.

Qualified Bidder

The Owner may make such investigations as he may deem necessary to determine the ability of any bidder or bidders to perform the work, and the bidder(s) shall furnish to the Owner all such information and data pertinent to this investigation as the Owner may request. The Owner reserves the right to reject any bid after evidence submitted or investigation of the bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the Contract and to complete the work contemplated therein. Conditional bids will not be accepted.

Bidder's Obligation

At the time of the opening of the bids it will be presumed that each bidder will have inspected the site and will have thoroughly familiarized himself with the Contract documents, including the plans, specifications, and any addenda which may have been issued thereto. Failure of the bidder to receive and examine any form, instrument, or document, or to visit and examine the site itself will not in any way relieve the successful bidder from any obligation in respect to his bid or to the terms of this contract.

Bid Security Forfeited

Should the bidder to whom the Contract is awarded fail for any reason to execute the Contract and to furnish a satisfactory bond within the time specified, the Owner may determine that the

bidder has abandoned the Contract, that his bid shall be considered null and void and that the surety accompanying the bid shall be forfeited to and be retained by the Owner as liquidated damages, and the Contract may be awarded to another bidder. After the execution of the Contract and acceptance of the bond by the Owner, the surety accompanying the successful bidder's bid shall be returned.

Performance Bond and Labor and Materials Bond

Simultaneously with his delivery of the Contract to the Owner, the successful bidder shall deliver to the Owner an executed Performance Bond and an executed Labor and Materials Bond, each in the amount of 100% of the total bid price, as security for the faithful performance of the Contract and for the payment of all persons performing labor or furnishing materials in connection therewith. These bonds shall be on the prescribed forms and shall be furnished by a surety company or companies listed on the current Circular 570 of the U.S. Treasury Department which company or companies shall also have a record of service satisfactory to the Owner, shall be authorized to do business in the State of Maine and shall be independent of the Contractor.

Work Under City Engineer

All work under this project shall be under the direct supervision of the City Engineer. All decisions pertaining to the new construction shall be final and binding. If initial line and grade are requested by the Contractor, the engineering staff of the City of Bangor will establish one line of stakes or points with grades at no cost to the Contractor; however, it shall be the responsibility of the Contractor to establish and maintain such additional layout, including batter boards if so directed by the Engineer, as may be required to properly complete the work.

Questions During Bidding

No interpretation of the meaning of the plans, specifications or other Contract documents will be made to any bidder orally. Every request for such interpretation must be in writing and must be received no later than 4:30 p.m. on Wednesday August 3, 2016 at bids@bangormaine.gov, subject line BUTTERFLY VALVE REPLACEMENT AT KENDUSKEAG PUMP STATION AND WASTEWATER TREATMENT PLANT **Attn: Amanda Soucier.**

Any and all such interpretations and any supplemental instructions will be written addenda to the specifications which, if issued, will be mailed by registered mail with return receipt requested to all prospective bidders at least three (3) working days prior to the bid opening date. Failure of any bidder to receive any addenda or interpretation thus mailed will not relieve the bidder of his obligation under the bid submitted. All addenda so issued will become an integral part of the Contract documents.

Terms and Conditions

The bidder is hereby notified that the construction terms and conditions set forth in the Contract documents will be rigidly enforced, that it is the intention of the Owner to maintain full time inspection during the period of construction, and that only first quality materials and workmanship will be accepted. Neither the fact of such inspection, nor the omission thereof,

will imply acceptance by the Owner of any or all of the work performed under this contract or relieve the Contractor of any responsibility for the successful completion of all the terms of this Contract subject to final inspection and review by the Owner.

The City of Bangor is a municipal corporation duly organized under the laws of the State of Maine and therefore is not required to file proof of exemption to the Maine State sales tax.

Time of Completion

All work shall be completed by **February 28, 2017**. After which time **liquidated damages** will be assessed at **\$1,000.00** (one thousand dollars) per calendar day.

C. BID FORM AND BID BOND

SECTION C

BID FORM

To the City of Bangor, Maine, herein called the Owner, acting through its City Manager for the construction of the **BUTTERFLY VALVE REPLACEMENT AT KENDUSKEAG PUMP STATION AND WASTEWATER TREATMENT PLANT**, together with all related work specified in the specifications, and any other work necessary or incidental thereto.

The undersigned, as Bidder, herein referred to as singular and masculine, declares that the only parties interested in the bid as principals are named herein; that this bid is made without collusion with any other person, firm, or corporation; that no officer or agent of the Owner is directly or indirectly interested in this bid; that he has carefully examined the location of the proposed work, the annexed form of contract, and the plans and specifications therein referred to and he proposes and agrees that if this bid is accepted he will contract with the Owner, in the form of the copy of the Contract Agreement deposited in the office of the Engineer and attached hereto, to provide all necessary machinery, tools, apparatus, and other means of construction and to do all the work and furnish all the materials specified in this contract in the manner and time therein prescribed, and according to the requirements of the Engineer as therein set forth and that he will take in full payment for the work thereof the following unit prices.

Item No.	Estimated Quantity	Brief Description; Unit or Lump Sum Price Bid In Both Words and Figures	Total Price In Figures
1.	1	Mobilization/Demobilization (not to exceed 3% of bid) the Lump Sum Price of _____ Dollars per lump sum (\$_____) /LS	\$ _____
2.	1	Remove, Dispose, and Replace Actuator Valve at WWTP the Lump Sum price of _____ Dollars per lump sum (\$_____) /LS	\$ _____

Item No.	Estimated Quantity	Brief Description; Unit or Lump Sum Price Bid In Both Words and Figures	Total Price In Figures
3.	1	Remove, Dispose, and Replace Butterfly Valve at Kenduskeag Pump Station the Lump Sum price of _____ Dollars per lump sum (\$ _____)/LS	\$ _____

TOTAL BASE BID (IN FIGURES):\$ _____
TOTAL BASE BID (IN WORDS): _____

_____ Dollars
and _____ Cents

Amounts must be shown in both words and figures. In case of discrepancy, the amount in words will govern.

*I hereby acknowledge by my signature receipt of each numbered addendum:

Addendum Number 1. _____
Contractor's Signature

Addendum Number 2. _____
Contractor's Signature

*(Signature required to acknowledge receipt of each addendum as may be issued. Sign only upon receipt of written addendum.)

The foregoing prices shall include all labor, materials, equipment, overhead, profit, insurance, etc., to cover the finished work of the several kinds called for.

If this Bid is accepted by the Owner and the undersigned fails to contract as aforesaid and to give a bond in the sum of the full amount of the Bid, with surety satisfactory to the Owner, within 10 days (not including Sundays or legal holidays) to an address given herewith that the Contract is ready for signature, then the Owner may by option determine that the Bidder has abandoned the Contract and therefore the Bid and Acceptance shall be null and void, and the bid bond shall be forfeited to the Owner.

Business Name

Street Address

City, State, Zip Code Telephone

By: _____
Name (Printed or typed) Title

Residence Address

Signature Date

Date

BID BOND

Any singular reference to Bidder, Surety, Owner or other party shall be considered plural where applicable.

BIDDER *(Name and Address):*

SURETY *(Name and Address of Principal Place of Business):*

OWNER *(Name and Address):*

The City of Bangor
 73 Harlow Street
 Bangor, ME 04401

BID

Bid Due Date:

Description *(Project Name and Include Location):*

BUTTERFLY VALVE REPLACEMENT AT KENDUSKEAG PUMP STATION AND WASTEWATER TREATMENT PLANT

BOND

Bond Number:

Date *(Not earlier than Bid due date):*

Penal sum _____ \$ _____
 (Words) (Figures)

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

BIDDER

SURETY

 Bidder's Name and Corporate Seal (Seal) Surety's Name and Corporate Seal (Seal)

By: _____
 Signature

By: _____
 Signature (Attach Power of Attorney)

 Print Name

 Print Name

 Title

 Title

Attest: _____
 Signature

Attest: _____
 Signature

 Title

 Title

Note: Above addresses are to be used for giving any required notice. Provide execution by any additional parties, such as joint venturers, if necessary.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation shall be null and void if:
 - 3.1 Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
 - 3.2 All Bids are rejected by Owner, or
 - 3.3 Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from Bid due date without Surety's written consent.
6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after Bid due date.
7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

D. CONTRACT AGREEMENT

BUTTERFLY VALVE REPLACEMENT AT KENDUSKEAG
PUMP STATION AND WASTEWATER TREATMENT PLANT

SECTION D

CONTRACT AGREEMENT

CITY OF BANGOR

This agreement is made this _____ day of _____, **20** by and between

(hereinafter referred to as the "Contractor"),

and the City of Bangor, hereinafter referred to as the "Owner,")

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

ARTICLE 1 - Statement of the Work

The Contractor shall furnish the materials and perform the work for the Owner for the consideration set forth in the Bid and in strict accordance with the Contract, as the word "Contract" is hereinafter defined.

ARTICLE 2 - The Contract

The following shall be deemed to be part of this Contract:

- A. Notice to Contractor
- B. Information for Bidders
- C. Bid Form
- D. Contract Agreement
- E. Performance and Payment Bonds
- F. Specifications and Plans
- G. Addenda, if any, issued to any of the foregoing
- H. Any and all other provisions required by law to be included in this Contract, whether actually included or not.

All of the foregoing, taken as a whole, shall constitute the Contract document.
In case of conflict, the Articles of Section D will prevail.

ARTICLE 3 - Definitions

The following terms and/or the singular, masculine pronouns used in their place, shall have the following meanings within the context of this Contract:

- Owner - The City of Bangor, Maine acting through its duly authorized representatives.
- Engineer - The Bangor City Engineer or his duly authorized representatives.
- Contractor - The individual, firm, or corporation to whom the contract has been awarded whether acting on his own or through subcontractors or employees.

ARTICLE 4 - Obligations and Liability of the Contractor

The Contractor shall furnish all labor, materials, tools and appliances, except as may be otherwise specified herein, and all else necessary for or incidental to the proper performance and completion of all work required by this Contract in the manner and within the time herein specified. He shall complete the entire work subject to the direction of the Engineer and to the Engineer's complete satisfaction in accordance with the specifications and plans which are a part hereof, at the prices herein agreed upon and fixed therefore.

The Contractor shall conduct his work in such manner as to interfere as little as possible with private business and/or public travel and to protect both life and property. He shall, at his own expense, provide all necessary fences, barricades, lights, watchmen, flagmen, traffic directors, etc. and shall take any and all such other precautionary measures as common sense might dictate or as may be required by the Engineer. Safe access to each property must be maintained. The Contractor will be held solely liable for any and all damages occasioned in any way by his act or failure to act, or by any such action or negligence on the part of his agents, employees, suppliers, or workmen.

The Contractor shall take full responsibility for the work done under this Contract, for the protection of all such work, and for the prevention of injuries to persons and/or damage to property, including utilities, on or about the work site. He shall under no circumstances be relieved of his responsibility by any right of the Engineer to give permission or issue orders relating to any part of the work, or by any such permission given, or by the failure of the Engineer to issue any such orders. The Contractor shall bear any and all losses resulting to him or to the Owner on account of the amount or character of the work, or because the nature of the land in or on which the work is done is different from what was estimated or expected, or on account of the weather, elements, acts of God, or any other causes whatsoever. The Contractor shall assume the defense of any and all claims of any nature whatsoever against the Contractor or the Owner, and shall indemnify, save harmless, and insure the Owner and Owner's officers and/or agents against all claims arising out of injury or damage to persons, corporations, or property whether such claims arise out of negligence or not, or whether said claims are for unavoidable damage or not, and from all claims relating to labor and /or materials furnished for the work. The Contractor will not be required to indemnify the Owner against damage or claims occasioned by acts of the Owner.

ARTICLE 5 - Engineer's Authority

The Engineer will in all cases determine the amount, quality, acceptability and fitness of the several kinds of work and materials which are to be paid for under this contract. He will determine all questions in relation to said work and the construction thereof, and will in all cases decide every question of fact which may arise relative to the fulfillment of this contract on the part of the Owner and on the part of the Contractor. The estimate and decision will be final and conclusive upon all parties to this Contract.

Any differences or conflicts which may arise between the Contractor and other contractors of the Owner in regard to their work will be adjusted and determined by the Engineer.

The Engineer will make all necessary explanations as to the meaning and intent of the plans and specifications and will give all necessary orders and directions.

The order or sequence of execution of the work and the general conduct of the work will be subject to the approval of the Engineer and, should public necessity or welfare so require, to his direction. No such approval or direction will, however, in any way affect the responsibility of the Contractor in the conduct of the work.

ARTICLE 6 - Superintendence

The Contractor shall keep competent supervisory personnel at the site at all times during which work is in progress. He shall designate in writing, before commencement of work under this Contract, a project superintendent who shall be an employee of the Contractor and who shall have complete authority to represent and to act on behalf of the Contractor. The Engineer shall be notified in writing prior to any change in superintendent assignment.

The superintendent shall receive on behalf of the Contractor all communications from the Engineer. Communications of major importance will be confirmed in writing upon request from the Contractor.

ARTICLE 7 - Discrepancies, Errors and Omissions

The plans and specifications are intended to be explanatory of each other, but should any discrepancy appear or any misunderstanding arise as to the import of anything contained in either, the interpretation and decision of the Engineer will be final and binding on both parties to this contract.

Any correction of errors or omissions in plans and/or specifications may be made by the Engineer when such correction is necessary for the proper fulfillment of their intention as construed by him. Where said correction of errors or omissions, except as provided in the next two (2) paragraphs, adds to the amount of work to be done by the Contractor, compensation for said additional work will be made in accordance with ARTICLE 28 hereof regarding Extra Work except where the additional work may be classed under some item of work for which a unit price is included in the bid, in which case compensation will be made accordingly.

The fact that specific mention of a fixture, or of any part of the work, is omitted in the specifications, whether intentionally or otherwise, when the same is clearly shown or indicated on the plans or is

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usually and customarily required to fully complete such work as is specified herein, will not entitle the Contractor to consideration in the matter of any claim for extra compensation, but the said fixtures and/or work shall be installed or done the same as if called for by both the plans and specifications.

All work indicated on the plans and not mentioned in the specifications, or vice versa, and all work and material usual and necessary to make the work complete in all its parts, whether or not they are indicated on the plans or mentioned in the specifications shall be furnished and executed the same as if they were called for by both the plans and specifications and no extra compensation will be made therefore.

ARTICLE 8 - Insurance

The Contractor shall arrange insurance for the minimum limits indicated and shall maintain the below listed coverages throughout the period of performance.

- a. Workers' Compensation Insurance Statutory
 Employer's Liability Insurance \$100,000. each accident
 \$500,000. disease - policy unit
 \$100,000. disease - each employee

- b. Comprehensive General Liability (Public Liability) Insurance including:
 General Liability \$1,000,000. aggregate
 Products, Completed Operations \$1,000,000. aggregate
 Personal & Advertising Injury \$ 500,000.
 Each Occurrence \$ 500,000.
 Fire Damage \$ 50,000. any one fire
 Medical Expense \$ 5,000. any one person

- c. Automobile Liability Insurance (owned, hired & non-owned):
 Bodily Injury & \$1,000,000 combined
 Property Damage single limit

- d. The Contractor shall provide a waiver of any rights of subrogation which the Contractor may have against the Owner, its agents or its employees.

- e. Before any of the work is started under the contract, the Contractor shall file with the Purchasing Department of the City a certificate of insurance containing the following information in respect to all insurance carried:
 - (1) Name of insurance company, policy number and expiration date;
 - (2) The coverages required and the limits on each, including the amount of deductible or self-insured retentions (which shall be for the account of the Contractor);
 - (3) A statement indicating that the Owner shall receive thirty (30) days' notice of cancellation or significant modification of any of the policies which may affect the Owner's interest; and
 - (4) The Owner as an additional insured (except Workers' Compensation Insurance).

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- f. If any of the work performed under the contract includes blasting, excavating, pile driving or caisson work; moving, shoring, underpinning, razing or demolition of any structure or removal or rebuilding of any structural support thereof, or any subsurface or underground work, the Comprehensive General Liability Insurance policy shall include coverage for the explosion, collapse and underground hazards.

ARTICLE 9 - Patents

The Contractor shall indemnify and save harmless the Owner, and all persons acting for or on behalf of the Owner, from all claims and liability of any nature or kind including costs and expenses arising from or occasioned by any infringement or alleged infringement of patent rights on any invention, process, article or apparatus, or any part thereof, furnished and installed by said Contractor or arising from or occasioned by the use or manufacture thereof, including their use by the Owner.

ARTICLE 10 - Compliance with Laws

The Contractor shall keep himself fully informed of all existing and future state and national laws and municipal ordinances and all regulations in any manner affecting those engaged or employed in the work, or the materials used in the work, or in any way affecting the conduct of the work, and of all such orders and decrees of bodies or tribunals having any jurisdiction or authority over the same. If any discrepancy or inconsistency is discovered in the plans, specifications, or elsewhere in this Contract in relation to any such law, ordinance, regulation, order or decree, he shall forthwith report the same to the Engineer in writing. He shall at all times himself observe and comply with, and cause all his agents and employees to observe and comply with, all such existing and future laws, ordinances, regulations, orders, and decrees; and shall protect and indemnify the Owner and all officers and agents of the Owner against any claim arising from or based upon violation of any such laws, ordinances, regulations, orders or decrees, whether by himself or his employees.

ARTICLE 11 - Permits

The Contractor shall, at his own expense, obtain all necessary permits from the county, municipal, and/or other public authorities; he shall give all notices required by law or ordinances; and he shall post all bonds and pay all fees and charges incident to the due and lawful prosecution of the work covered by this Contract.

ARTICLE 12 - Contractor Not to Sublet or Assign

The Contractor shall give his personal attention constantly to the faithful prosecution of the work, shall keep the same under his personal control, and shall not assign by power of attorney or otherwise, nor sublet the work or any part thereof without the previous written consent of the Owner, and shall not either legally or equitably assign any of the moneys payable under this agreement, or his claim thereto, unless by and with the like consent of the Owner and the surety on the bond(s).

ARTICLE 13 - Time of Beginning Work

Except as herein provided, the Contractor shall commence work at such points as the Engineer may direct or approve. Such time of starting may be postponed but only by written agreement between the Owner and Contractor and then only because of expected delays in receipt of materials and equipment, or if the season be unsuitable for commencement of the work, or because of other contingency clearly beyond the control or responsibility of the Contractor.

ARTICLE 14 - Delay by Owner

The Owner may delay the beginning of the work or any part thereof if the necessary lands or rights-of-way for such work shall not have been obtained by the Owner or if necessary materials or equipment to be furnished by the Owner are not delivered. The Contractor shall have no claim for damages on account of such delay, but shall be entitled to so much additional time wherein to perform and complete this contract as the Engineer shall certify in writing to be just.

ARTICLE 15 - Time of Completion

The rate of progress shall be such that the whole work shall be performed in accordance with the terms of this Contract within the number of calendar days stipulated in the bid unless and except as any part may be delayed under the provisions of this Contract. All work shall in any case be complete on or before any specific date of completion which may be specified elsewhere herein.

It is agreed that the rate of progress herein required has been purposely made low enough to allow for ordinary delays incident to construction work of this character. No extension of time will be made for ordinary delays, inclement weather and/or accidents and the occurrence of such will not relieve the Contractor from the necessity of maintaining this rate of progress.

If delays are caused by acts of God, acts of Government or State, strikes, extra work, floods or other contingencies clearly beyond the control or responsibility of the Contractor, the Contractor will be entitled to so much additional time wherein to complete this Contract as the Engineer shall certify in writing to be just.

The time in which work under this Contract is to be performed and completed is of the essence.

All work shall be completed by February 28, 2017.

ARTICLE 16 - Liquidated Damages

In case the Contractor fails satisfactorily to complete the entire work, or any phase of the work, contemplated and provided for under this Contract on or before the date of completion determined as described elsewhere herein, the Owner shall deduct from the payments otherwise due the Contractor each month the sum of one thousand dollars (\$1,000.00) for each calendar day, excluding only Sundays and legal holidays, of delay, which sum is agreed upon not as a penalty but as fixed and liquidated damages for each day of such delay to be paid in full and subject to no deduction. If the payments otherwise due the Contractor are less than the amount of such liquidated damages, said

damages shall be deducted from any other moneys due or to become due the Contractor, and in case such damages shall exceed the amount of all moneys due or to become due the Contractor then the Contractor or his surety shall pay the balance to the Owner.

ARTICLE 17 - Night and Sunday Work

No night work requiring the presence of the Engineer or inspector will be permitted except in the case of emergency and then only to such an extent as is absolutely necessary and with written permission of the Engineer. In the case of a regular gang organized specifically for regular and continuous night work this clause may be waived but only when so specified elsewhere herein or when such work shall be deemed necessary and/or beneficial to the Owner by the Engineer, provision for night time inspection and payment therefore has been made and agreed upon by the Contractor and the Engineer, and the foregoing has been certified in writing by the Engineer.

No Sunday work will be permitted except in the case of great emergency and then only with the written consent of the Engineer and only to such an extent as he may judge necessary. **See Section E, Special Provisions for special night-time work hours.**

ARTICLE 18 - Contractor to Employ Competent Workers

The Contractor shall employ only competent workers and whenever the Engineer shall notify the Contractor in writing that any person or persons employed under this Contract are, in his opinion, incompetent, unfaithful, disorderly, or in any other way unsatisfactory or not employed in accordance with the provisions of this Contract, then such person or persons shall be discharged from work under this Contract and shall not again be employed under this Contract except by written consent of the Engineer.

ARTICLE 19 - Contractor to Employ Sufficient Labor and Equipment

If, in the opinion of the Engineer, the Contractor is not employing sufficient labor or equipment to complete this Contract satisfactorily and within the time specified, the Engineer will so notify the Contractor in writing and the Contractor shall, immediately upon receipt of such notice, employ such additional labor and/or equipment as may be deemed necessary by the Engineer.

ARTICLE 20 - Intoxicating Substances

The Contractor shall neither permit on site nor suffer the introduction or use on site of alcoholic beverages, drugs, or other controlled substances which might in any way impair the judgment, alertness, or efficiency of any person or persons employed under this Contract or which might be used in violation of any State or Federal law or local ordinance.

ARTICLE 21 - Access to Work

The Owner, the Engineer, and their agents and employees shall be permitted access to all parts of the work site at all times throughout the duration of this Contract, and the Contractor shall at all times provide safe and proper facilities therefore.

ARTICLE 22 - Examination of Work

The Engineer shall be furnished with every reasonable facility for ascertaining that all work is in accordance with the requirements and intent of this Contract, even to the extent of uncovering or taking down portions of finished work.

Should the work thus exposed or examined prove satisfactory, the uncovering or taking down and the replacement material and rebuilding of the work shall be considered as extra work, as defined and provided for elsewhere herein, unless the original work was done in the absence of the Engineer or his inspector without the Engineer's written authorization. In the latter case, and/or if unsatisfactory work should be so uncovered, then all such uncovering, taking down, replacement, and rebuilding, together with the repair or replacement of any and all such unsatisfactory work as may have been so uncovered, will be at the Contractor's sole cost and expense.

ARTICLE 23 - Defective Work

Inspection of the work by the Engineer and/or his agents shall neither imply that all such work will prove acceptable to the Owner nor will it relieve the Contractor from any obligations or responsibility whatsoever under the terms of this Contract. Any and all defective work and/or materials shall be replaced by the Contractor, at his sole expense, at any time prior to final acceptance of the work as such may be discovered, regardless of whether such work has previously been inspected and/or included in estimates for partial payment. Any material furnished by the Contractor which shall be judged by the Engineer, at any time, to be defective and/or not in conformance with the specifications shall be immediately removed from the site and replaced at the Contractor's sole cost and expense, as shall any materials or goods furnished by the Owner which have been, in the opinion of the Engineer, damaged by the Contractor, his agents or employees.

ARTICLE 24 - Protection Against Water and Storm

The Contractor shall take all necessary precautions to prevent damage to the work by storms or by water entering the work site directly or through the ground. In case of damage by storms or water, the Contractor shall make such repairs and/or replacements or rebuild such parts of the work as the Engineer may require in order that the finished work shall be completed in full accord with the plans and specifications.

The Engineer may prohibit the carrying out of any work at any time that, in his judgment, the conditions are not suitable or the proper precautions are not being taken, whatever the whether or season may be.

ARTICLE 25 - Mistakes of the Contractor

The Contractor shall pay to the Owner all expenses, losses, and/or damages, as determined by the Engineer, incurred in consequence of any defect, omission, or mistake of the Contractor, his agents or employees, or the making good thereof.

ARTICLE 26 - Right to Materials

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Nothing in this Contract shall be construed as vesting in the Contractor any right of property in the materials used after they have been attached or affixed to the work or the soil, but all such materials shall, upon being so attached or affixed, become the property of the Owner.

ARTICLE 27 - Alterations

The Engineer may make alterations in the line, grade, plan, form, dimensions or materials of the work or any part thereof, either before or after the commencement of construction. If such alterations increase or diminish the quantity of work to be done, adjustment for such increase or decrease shall be made at the unit prices stipulated for such work under this contract, except that if unit prices are not stipulated for such work, compensation for increased work will be made under the provisions for Extra Work made elsewhere herein, and for decreased work the Contractor shall allow the Owner a reasonable credit as determined by the Engineer. If such alterations diminish the quantity of work to be done, they shall not warrant any claim for damages or for anticipated profits on the work that is dispensed with.

ARTICLE 28 - Extra Work

The Contractor shall do any work incidental to the proper completion of the Contract not otherwise provided for when and as so ordered, in writing, by the Engineer, either (a) at a price agreed upon before the work is commenced and named in the written order for the work, or (b) if the Engineer so elects, for the reasonable cost of said work, as determined by the Engineer, plus fifteen (15) percent of such cost. No extra work will be paid for unless specifically ordered as such by the Engineer in writing.

The Contractor shall, when so requested by the Engineer, furnish itemized statements of the cost of the work ordered, and shall give the Engineer access to the accounts, bills, and vouchers relating thereto.

The Engineer shall include in the cost of extra work under (b) above the reasonable cost to the Contractor of all materials used, of all labor common and skilled and of foremen, and the fair rental of all machinery used upon the extra work for the period of such use.

The fair rental for all machinery shall be based upon the most recent edition of "Compilation of Rental Rates for Construction Equipment" as published by the Associated Equipment Distributors, rental rates established by the Maine State Department of Transportation, or similar publication approved by the Engineer. Rental for machinery which was upon the work site immediately before, or which will be required by or used upon the work after the extra work is done, shall be based upon an appropriate fraction of the approved monthly rate schedule. If said work requires the use of machinery not upon the work site or otherwise to be used upon the work, then the cost of transportation, not exceeding a total round trip distance of 150 miles, of such machinery to and from the work shall be added to the fair rental as accepted by the Engineer.

The Engineer shall include in the cost of extra work the cost to the Contractor of additional premiums paid on the required insurance on account of such extra work, and the cost of Social Security and/or other direct assessment upon the Contractor's payroll by Federal or other properly authorized public agencies. The Engineer shall not include in the cost of extra work any cost or rental of small tools,

buildings, or any portion of the time of the Contractor or his superintendent, or any allowance for use of capital or the premium on the bond as assessed upon the amount of extra work, these items being considered as being covered by the fifteen (15) percent added to the reasonable cost.

ARTICLE 29 - Extension of Time on Account of Extra Work

When extra work ordered at any time during the progress of the work is such as to require, in the opinion of the Engineer, an unavoidable increase in the amount of time necessary for completion of the Contract, then a suitable extension of time will be added to the completion date.

ARTICLE 30 - Changes not to Affect Bond

It is distinctly agreed and understood that any changes made in or to the plans and/or specifications, whether the amount of work to be done under this Contract should thereby be affected or not, or any change or changes in the manner or time of payments made by the Owner to the Contractor, shall in no wise annul, release, or affect the liability and/or surety on the bond or bonds provided by the Contractor.

ARTICLE 31 - Claims for Damages

If the Contractor claims compensation for any damages sustained by breach of Contract or otherwise, be the same based on claims that due and full credit has not been given the Contractor for work performed or materials furnished in accordance with the terms of the Contract or for any other cause, he shall, promptly after the sustaining of any such damage, make a written statement to the Engineer of the nature of the damage sustained and shall, on or before the fifteenth day of the month following that in which the damage shall have been sustained, file with the Engineer an itemized statement of the details and amount of such damage. Unless such statement is made in such time and manner as thus required his claim for compensation will be forfeited and invalidated and he will not be entitled to payment on account of any such damage.

ARTICLE 32 - Abandonment of Work

If the work to be done under this Contract shall be abandoned, or if this Contract or any part thereof shall be sublet without the previous written consent of the Owner, or if the Contract or any claim thereunder shall be assigned by the Contractor otherwise than as herein specified, or if at any time the Engineer shall be of the opinion, and shall so certify in writing, that the conditions herein specified as to the rate of progress of work under this Contract are not fulfilled, or that the work or any part thereof is unnecessarily or unreasonably delayed, or that the Contractor has violated any of the provisions of this Contract, the Owner may notify the Contractor by a written order with a copy to the home office of the surety to discontinue all work or any part thereof, and thereupon the Contractor shall discontinue such work or such part thereof as the Owner may designate, and the Owner may thereupon, by contract or otherwise, as the Owner may determine, complete the work or any part thereof, and charge the entire expense of completing such work or part thereof to the Contractor; and for such completion the Owner, or such contractors as the Owner may employ, may take possession of and use or cause to be used in the completion of the work or part thereof, any of such materials, equipment, machinery, implements and tools of every description as may be found at the location of said work.

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Any and all costs or expenses, including liquidated damages as specified elsewhere herein, incurred by the Owner under this article shall be deducted and paid out of any moneys then due or to become due the Contractor under this Contract, or any part thereof; and in such accounting the Owner shall not be held to obtain the lowest figures for the work of completing the Contract or any part thereof, or for insuring its proper completion, but all sums actually paid therefor shall be charged to the Contractor. If the aforementioned costs and expenses so incurred, coupled with payments already made to the Contractor, shall exceed the amount which would have been payable under this Contract if the same had been completed by the Contractor, then the Contractor or the Contractor's surety shall pay the full amount of any such excess to the Owner.

ARTICLE 33 - Prices for Work

The Owner will pay and the Contractor shall accept the prices stipulated in the bid as full and just compensation for everything furnished and done by the Contractor, and for any and all expenses of any nature incurred by the Contractor in completing properly and to the entire satisfaction of the Owner all work under this Contract, including any losses or damages incurred by the Contractor as a result of work under this Contract and excepting only such expenses, losses, etc. for which other provisions are specifically made elsewhere herein.

ARTICLE 34 - Money may be Retained

The Owner may keep any moneys which would otherwise be payable at any time hereunder, and may apply the same, or so much as may be necessary therefor, to the payment of expenses, losses or damages incurred by the Owner and determined as herein provided, and may retain, until all claims are settled, so much of such money as, in the Owner's opinion, will be required to settle all claims filed with the Owner relating to this Contract.

ARTICLE 35 - Progress Estimates

Except as hereinafter provided, the Engineer shall, once in each month, make an estimate in writing of the total amount of the work done to the first of the month, and the amount earned by the Contractor. The Owner will retain ten (10) percent of such estimated value as part security for fulfillment of this Contract by the Contractor and shall deduct from the balance all previous payments and all sums to be retained under this and/or other provisions of this Contract. The Owner shall pay to the Contractor each month the balance not retained as aforesaid, except that such monthly payment may be withheld at any time if the work, in the opinion of the Engineer, is not proceeding expeditiously and in accordance with the Contract. The Owner may, if it is deemed expedient to do so, cause estimates and payments to be made more frequently than once a month.

Estimates of lump sum items will be based on the Engineer's estimate of the percentage of each such item completed, each such percentage to be applied to the appropriate lump sum price as set forth on the Bid Form.

Payment for materials will not be made unless and until such materials have been satisfactorily installed or otherwise incorporated into the work.

ARTICLE 36 - Final Estimate and Payment

The Engineer shall, as soon as practicable following the completion of work under this Contract, make a final estimate in writing of the total amounts of such work done under the various items contained in the bid and of the total amount of money due the Contractor for said work, and he shall also fix the date of substantial completion of such work and incorporate same into said final estimate.

The Owner will pay to the Contractor the entire sum so found to be due hereunder, including the ten (10) percent interim retainage withheld from previous payments, after deducting from said entire sum all previous payments, a retainage of two (2) percent as guaranty for a period of one year following the certified date of substantial completion unless said guaranty is specifically waived in writing by the Owner, and any and all other amounts as may be retained under the various provisions of this Contract. Such payment shall be made not later than fifteen (15) days after, but in no event before, the expiration of the time within which claims for labor performed and materials used or employed must be entered under the Lien Law, or if such time is not specified by law, the expiration of 30 days after the aforementioned date of substantial completion.

All prior progress estimates and payments shall be subject to correction in the final estimate and payment.

ARTICLE 37 - Liens

If, at any time before the expiration of the period within which claims must be entered under the Lien Law or, if not otherwise specified by law, within thirty (30) days after the certified date of substantial completion of all work under this Contract, any person, corporation, firm or other legal entity shall claim to have performed any of the work or to have furnished any of the materials under this Contract and shall file with the Owner suitable notice, the Owner will retain until discharge of such notice sufficient money to satisfy and discharge the amount claimed to be due in such notice together with the cost of any action or actions brought to enforce such lien created by the filing of such notice.

ARTICLE 38 - Waivers

Neither inspection by the Owner or any agents thereof, nor any orders, measurement or certificate by the Engineer, nor any order by the Owner for the payment of money, nor any payment for or acceptance of the whole or any part of the work performed under this Contract by the Owner, nor any extension of time nor any possession taken by Owner or agents thereof shall operate as a waiver of any provision of this Contract, or of any power herein reserved to the Owner, or any right to damages herein provided, nor shall any waiver of any breach of this Contract be held to be a waiver of any other or subsequent breach. Any remedy provided in this Contract shall be taken and construed as cumulative, that is, in addition to each and every other remedy herein provided, and in addition to all other suits, actions, or legal proceedings. The Owner shall also be entitled as of right to a writ of injunction against any breach of any of the provisions of this Contract.

ARTICLE 39 - Indemnification

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The Contractor shall indemnify, defend and hold harmless the Owner from and against all claims and actions, and all expenses incidental to such claims or actions, based upon or arising out of damage to property or injuries to persons or other tortious acts caused or contributed to by the Contractor or anyone acting under his direction or control or in his behalf in the course of his performance under this Contract, provided the Contractor's aforesaid indemnity and hold harmless agreement shall not be applicable to any liability based upon the sole negligence of the Owner.

The Contractor hereby expressly agrees that he will defend, indemnify and hold the Owner harmless from any and all claims made or asserted by the Contractor's agents, servants or employees arising out of the Contractor's activities under this Contract. For this purpose, the Contractor hereby expressly waives any and all immunity he may have under Maine's Workers Compensation Act in regard to such claims made or asserted by the Contractor's agents, servants or employees. The indemnification provided under this paragraph shall extend to and include any and all costs incurred by the Owner to answer, investigate, defend and settle all such claims, including but not limited to the Owner's costs for attorneys fees, expert and other witness fees, the cost of investigators, and payment in full of any and all judgments rendered in favor of the Contractor's agents, servants or employees against the Owner in regard to claims made or asserted by such agents, servants or employees.

ARTICLE 40 - Liability of Owner

No person, firm, corporation or other legal entity other than the Contractor now has any interest hereunder, and no claim shall be made or be valid, and neither the Owner nor any agent of the Owner shall be liable for or be held to pay any money except as herein provided. The acceptance by the Contractor of the payment of the final estimate shall operate as and shall be a release to the Owner, and every agent of the Owner, from all claim and liability to the Contractor for anything done or furnished for, or relating to the work performed under this Contract, and for any act or neglect of the Owner or of any person relating to or affecting said work except the claim against the Owner for the remainder, if any there be, of the amounts kept or retained as provided elsewhere herein.

ARTICLE 41 - Guaranty

The Contractor guarantees that the work to be done under this Contract and the materials to be furnished by him for use in the construction of same will be free from defects or flaws. This guaranty shall remain in effect for a period of one year from the certified date of substantial completion of all work under this Contract. It is agreed and understood, however, that this guaranty shall not include any repairs made necessary by any cause or causes other than defective work or materials furnished by the Contractor.

As surety of this guaranty the Owner will retain an amount equal to two (2) percent of the total final Contract amount at the time of payment of the final estimate. If at any time within said period of guaranty any part of the work constructed under this Contract shall require repairs because of, in the opinion of the Engineer, defective workmanship and/or materials, then the Owner may notify the Contractor in writing by certified mail, return receipt requested, of his obligation to make such repairs. Should the Contractor fail to make such repairs to the complete satisfaction of the Owner within ten (10) calendar days of receipt of such notice, then the Owner may elect to employ others to make said repairs and to pay for same out of the sum retained hereby for that purpose. Upon the expiration of the

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period of guaranty the Engineer will inspect the work, or cause same to be inspected, and upon his determination that the work is in good order the retainage, less any amount which may have been expended in the making of repairs, will be released upon receipt of invoice from the Contractor.

It is agreed and understood, however, that the Owner may keep the whole or any portion of the sum retained for settlement of any and all claims which may have arisen out of this Contract against the Owner or agents thereof, and for any and all expenses, losses, or damages incurred by the Owner by reason of said claims.

ARTICLE 42 - Legal Address of Contractor

Both the address given in the bid and the Contractor's temporary field office are hereby designated as places to which letters, notices and other communications to the Contractor may be mailed or delivered. The first named address may be changed at any time, in writing, by the Contractor.

ARTICLE 43 - Progress Schedule

The Contractor shall, within five (5) days of commencement of Work, prepare and submit to the Engineer for approval a practicable schedule showing the order in which the Contractor proposes to carry on the work, the date on which he will start the several salient features thereof, and the contemplated dates for completing the same. The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion at any time and shall be acceptable to the Engineer. If, in the opinion of the Engineer, the Contractor falls behind such schedule, the Contractor shall take any and all such steps as may be deemed necessary by the Engineer to improve his progress toward completion of the work and shall submit and maintain such supplemental schedules as the Engineer may deem necessary to demonstrate that all work under this Contract will be completed within the time and/or by such completion date as may be specified elsewhere herein. None of the foregoing shall result in any additional cost to the Owner.

ARTICLE 44 - Site Investigation

The Contractor acknowledges that he has satisfied himself as to the nature and location of the work, the general and local conditions including but not restricted to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads and uncertainties of weather, river stages, tides or similar physical conditions at the site, the conformation and condition of the ground, and the character of equipment and facilities needed preliminary to and during prosecution of the work. The Contractor further acknowledges that he has satisfied himself as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the Owner as well as from information presented by the plans and specifications hereof. Any failure by the Contractor to acquaint himself with the available information will not relieve him from responsibility for estimating properly the difficulty or cost of successfully completing the work. The Owner assumes no responsibility for any conclusions or interpretations made by the Contractor on the basis of the information made available to him.

ARTICLE 45 - Protection of Existing Utilities

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Existing utilities, structures, or other works that may be shown on the plans, reasonably located or anticipated by a site investigation, or marked on the ground or in any other way by the Owner or by the respective utility companies shall be protected from damage by the Contractor during construction operations and, if damaged, shall be repaired by the Contractor at his sole expense. It will be the Contractor's sole responsibility to contact the Dig Safe Center at 1-800-225-4977 and to assure that any and all utility companies in the project area have been notified, furnished with sufficient information, and have located on the ground their respective underground utilities in any area(s) where excavation will occur, all prior to commencement of any such excavation.

Materials below existing utilities which are removed or disturbed during excavation shall be replaced and thoroughly compacted to prevent future settlement and damage to the utility. Utilities damaged due to subsequent settlement of the backfill or of any materials disturbed by the Contractor shall be repaired by the Contractor, or as otherwise required by the utility company, at the Contractor's sole expense.

The locations of certain existing subsurface pipes and utilities are indicated on the plans to the best of the Owner's knowledge but they are approximate only and no guarantee is made either to the accuracy or completeness thereof. It is the Contractor's absolute responsibility to determine to his best ability the existence and location of any and all underground utilities prior to commencement of excavation and to exercise such precautions during excavation as may be necessary to compensate for any incompleteness or inaccuracy of such determination. Should the scope of work under this contract be substantially altered because of the existence of subsurface utilities not shown on the plans or reasonably anticipated by the Contractor at the time of bidding hereon, then the contract price may be adjusted accordingly by the Owner but the mere fact of damage by the Contractor to an existing utility, whether shown on the plans or not, shall under no circumstances result in extra compensation to the Contractor by the Owner, and all necessary repairs together with any and all related costs, damages, and/or claims related thereto or arising therefrom will be the Contractor's sole responsibility and shall be made and/or otherwise satisfied at the Contractor's sole expense.

ARTICLE 46 - Temporary Power and Water

The Contractor shall make all necessary applications and arrangements and shall pay all fees and charges for electrical power, light and water necessary for proper completion of this Contract during its entire progress. The Contractor shall provide and pay for all temporary wiring, switches, piping, connections, meters and all else that may be required in this regard.

ARTICLE 47 - Temporary Field Office and Storage Facilities

The Contractor shall provide and maintain a suitable temporary field office at the project site for his own use and the use of the Engineer, if deemed necessary for the project. It shall be provided with adequate heat, electric lighting, telephone, and desk for plan references. It shall be located at a site acceptable to the Engineer, shall be relocated at any time during the course of construction under this Contract if and as deemed necessary by the Engineer, and shall be removed from the site immediately upon completion of said construction.

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The Contractor shall provide and maintain such additional offices, storage sheds, and/or other temporary buildings and/or trailers at the site as may be required for his own use, all subject to the Engineer's direction and approval.

ARTICLE 48 - Time of Completion

All work shall be completed by **February 28, 2017**.

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IN WITNESS WHEREOF, the City of Bangor, Owner, has caused this instrument to be signed by its Purchasing Agent or its City Manager, hereunto duly authorized, and the Contractor has hereunto set his hand and has caused this instrument to be signed by his (Officer) _____ hereunto duly authorized to execute this instrument as of the date first written above.

WITNESS:

CITY OF BANGOR, OWNER

By: _____
Debbie A. Cyr
Purchasing Agent

Or by : _____
Catherine M. Conlow
City Manager

CONTRACTOR

WITNESS:

Name of Individual, Firm or Corporation

By: _____

Name: _____
Printed or Typed

Title: _____
Printed or Typed

E. SPECIAL PROVISIONS

SPECIAL PROVISIONS

Time and Material Payment

If, at any time during the construction of the project, a situation occurs where payment for work performed cannot be paid for under pay items in the Contract, then the Contractor may request payment on a time and materials basis. All labor and equipment rates, crew sizes, equipment and materials used, and other factors affecting the work shall be approved by the Resident Engineer before work commences. The Contractor and Engineer shall agree to and record hours worked, crew and equipment used, and all materials used at the end of each working day. Requests for time and materials payment after the fact may not be considered for payment if the Resident Engineer was not properly notified.

References

The apparent low Bidder shall furnish the City Engineer with references from at least three similar projects within three working days of the bid opening date. References must be for projects at wastewater treatment plants of similar size and projects of similar dollar value and scope of work to the project proposed herein. If, in the opinion of the City Engineer, the Contractor does not have prior work experience in successfully completing projects of this scope, then the City Engineer may recommend rejection of the bid and recommend award of the contract to the next qualified Bidder.

Housekeeping

At the conclusion of each working day, the contractor shall take necessary measures to leave the site in suitable condition, including but not limited to, sweeping, dust control, and removal of equipment or large construction debris that block normal access ways.

As-Built Drawings

The Contractor shall keep a set of "As-Built" drawings on the job site for the Resident Inspector's review that shall show all work up to one week prior to the date of inspection. The Resident Inspector

may examine the drawings on a weekly or monthly basis at his own discretion. **If the “As Built” drawings are not kept up to date as the work progresses, then the monthly payment requisition will not be processed for payment until the “As-Builts” have been brought up to date.**

Other Provisions

All contractors and subcontractors are hereby notified that the City of Bangor has entered into a Consent Decree with the United States and the State of Maine. For the purposes of the Consent Decree, contractors and subcontractors are deemed agents of the City. Any and all work performed by contractors and subcontractors must conform with the terms of the Consent Decree. Contractors must familiarize themselves with the contents of the document and must make the document available to all subcontractors. This document is available electronically at http://www.bangormaine.gov/filestorage/318/350/7758/ENV_ENFORCEMENT.PDF or in hard-copy in the City of Bangor’s Engineering Department.

Working Hours

Normal working hours shall be from 6:30 AM to 4:15 PM at the WWTP and Kenduskeag Pump Station will be open 24 hours (Contractor to have a key). The work at Kenduskeag Pump Station will be completed during night hours, when flows are the lowest.

Time of Completion

All work shall be completed by February 28, 2017.

F. NOTICE OF AWARD

Notice of Award

Date: _____, 2016

Project: BUTTERFLY VALVE REPLACEMENT AT KENDUSKEAG PUMP STATION AND WASTEWATER TREATMENT PLANT

Owner: The City of Bangor, Maine

Owner's Contract No.:

Contract:

Engineer's Project No.:

Bidder:

Bidder's Address:

You are notified that your Bid dated _____ for the above Contract has been considered. You are the Successful Bidder and are awarded a Contract for BUTTERFLY VALVE REPLACEMENT AT KENDUSKEAG PUMP STATION AND WASTEWATER TREATMENT PLANT

The Contract Price of your Contract is _____ Dollars and ____ Cents (\$_____).

_ copies of the proposed Contract Documents (except Drawings) accompany this Notice of Award.

0 sets of the Drawings will be delivered separately or otherwise made available to you immediately.

You must comply with the following conditions precedent within [15] days of the date you receive this Notice of Award.

1. Deliver to the Owner [6] fully executed counterparts of the Contract Documents.
2. Deliver with the executed Contract Documents the Contract security [Bonds] as specified in the Instructions to Bidders (Article 20), General Conditions (Paragraph 5.01), and Supplementary Conditions (Paragraph SC-5.01).
3. Other conditions precedent:

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within ten days after you comply with the above conditions, Owner will return to you one fully executed counterpart of the Contract Documents.

 City of Bangor, Maine
 Owner
 By: _____

 Authorized Signature
 City Manager

 Title

Copy to Engineer

G. NOTICE TO PROCEED

Notice to Proceed

Date: _____

Project: BUTTERFLY VALVE REPLACEMENT AT KENDUSKEAG PUMP STATION AND WASTEWATER TREATMENT PLANT

Owner: The City of Bangor

Owner's Contract No.: _____1

Contract:

Engineer's Project No.: _____1

Contractor:

Contractor's Address: [send Certified Mail, Return Receipt Requested]

You are notified that the Contract Times under the above Contract will commence to run on _____. On or before that date, you are to start performing your obligations under the Contract Documents. In accordance with the Agreement, the project must be completed on or before February 28, 2016.

Before you may start any Work at the Site, Paragraph 2.01.B of the General Conditions provides that you and Owner must each deliver to the other (with copies to Engineer and other identified additional insureds and loss payees) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents.

Also, before you may start any Work at the Site, you must:

_____ [add other requirements].

Owner

Given by:

Authorized Signature

Title

Date

Copy to Engineer

H. PERFORMANCE BOND

PERFORMANCE BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (*Name and Address*): SURETY (*Name, and Address of Principal Place of Business*):

OWNER (*Name and Address*):

CONTRACT

Effective Date of Agreement:

Amount:

Description (*Name and Location*):

BOND

Bond Number:

Date (*Not earlier than Effective Date of Agreement*):

Amount:

Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

Contractor's Name and Corporate Seal (Seal)

Surety's Name and Corporate Seal (Seal)

By: _____
Signature

By: _____
Signature (*Attach Power of Attorney*)

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

Note: Provide execution by additional parties, such as joint venturers, if necessary.

Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner for the performance of the Contract, which is incorporated herein by reference.

1. If Contractor performs the Contract, Surety and Contractor have no obligation under this Bond, except to participate in conferences as provided in Paragraph 2.1.

2. If there is no Owner Default, Surety's obligation under this Bond shall arise after:

2.1 Owner has notified Contractor and Surety, at the addresses described in Paragraph 9 below, that Owner is considering declaring a Contractor Default and has requested and attempted to arrange a conference with Contractor and Surety to be held not later than 15 days after receipt of such notice to discuss methods of performing the Contract. If Owner, Contractor, and Surety agree, Contractor shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive Owner's right, if any, subsequently to declare a Contractor Default; and

2.2 Owner has declared a Contractor Default and formally terminated Contractor's right to complete the Contract. Such Contractor Default shall not be declared earlier than 20 days after Contractor and Surety have received notice as provided in Paragraph 2.1; and

2.3 Owner has agreed to pay the Balance of the Contract Price to:

1. Surety in accordance with the terms of the Contract; or
2. Another contractor selected pursuant to Paragraph 3.3 to perform the Contract.

3. When Owner has satisfied the conditions of Paragraph 2, Surety shall promptly, and at Surety's expense, take one of the following actions:

3.1 Arrange for Contractor, with consent of Owner, to perform and complete the Contract; or

3.2 Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or

3.3 Obtain bids or negotiated proposals from qualified contractors acceptable to Owner for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by Owner and contractor selected with Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Contract, and pay to Owner the amount of damages as described in Paragraph 5 in excess of the Balance of the Contract Price incurred by Owner resulting from Contractor Default; or

3.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

1. After investigation, determine the amount for which it may be liable to Owner and, as soon as practicable after the amount is determined, tender payment therefor to Owner; or
2. Deny liability in whole or in part and notify Owner citing reasons therefor.

4. If Surety does not proceed as provided in Paragraph 3 with reasonable promptness, Surety shall be deemed to be in default on this Bond 15 days after receipt of an additional written notice from Owner to Surety demanding that Surety perform its obligations under this Bond, and Owner shall be entitled to enforce any remedy available to Owner. If Surety proceeds as provided in Paragraph 3.4, and Owner refuses the payment tendered or Surety has denied liability, in whole or in part, without further notice Owner shall be entitled to enforce any remedy available to Owner.

5. After Owner has terminated Contractor's right to complete the Contract, and if Surety elects to act under Paragraph 3.1, 3.2, or 3.3 above, then the responsibilities of Surety to Owner shall not be greater than those of Contractor under the Contract, and the responsibilities of Owner to Surety shall not be greater than those of Owner under the Contract. To the limit of the amount of this Bond, but subject to commitment by Owner of the Balance of the Contract Price to mitigation of costs and damages on the Contract, Surety is obligated without duplication for:

- 5.1 The responsibilities of Contractor for correction of defective Work and completion of the Contract;
- 5.2 Additional legal, design professional, and delay costs resulting from Contractor's Default, and resulting from the actions of or failure to act of Surety under Paragraph 3; and
- 5.3 Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of Contractor.

6. Surety shall not be liable to Owner or others for obligations of Contractor that are unrelated to the Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than Owner or its heirs, executors, administrators, or successors.

7. Surety hereby waives notice of any change, including changes of time, to Contract or to related subcontracts, purchase orders, and other obligations.

8. Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the Work or part of the Work is located, and shall be instituted within two years after Contractor Default or within two years after Contractor ceased working or within two years after Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

9. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the address shown on the signature page.

10. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

11. Definitions.

- 11.1 Balance of the Contract Price: The total amount payable by Owner to Contractor under the Contract after all proper adjustments have been made, including allowance to Contractor of any amounts received or to be received by Owner in settlement of insurance or other Claims for damages to which Contractor is entitled, reduced by all valid and proper payments made to or on behalf of Contractor under the Contract.
- 11.2 Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.
- 11.3 Contractor Default: Failure of Contractor, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.
- 11.4 Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract or to perform and complete or otherwise comply with the other terms thereof.

FOR INFORMATION ONLY – *(Name, Address and Telephone)*

Surety Agency or Broker:

Owner's Representative *(Engineer or other party)*:

I. PAYMENT BOND

PAYMENT BOND

Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

CONTRACTOR (*Name and Address*):

SURETY (*Name, and Address of Principal Place of Business*):

OWNER (*Name and Address*):

CONTRACT

Effective Date of Agreement:

Amount:

Description (*Name and Location*):

BOND

Bond Number:

Date (*Not earlier than Effective Date of Agreement*):

Amount:

Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

SURETY

Contractor's Name and Corporate Seal (Seal)

Surety's Name and Corporate Seal (Seal)

By: _____
Signature

By: _____
Signature (Attach Power of Attorney)

Print Name

Print Name

Title

Title

Attest: _____
Signature

Attest: _____
Signature

Title

Title

Note: Provide execution by additional parties, such as joint venturers, if necessary.

1. Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to Owner to pay for labor, materials, and equipment furnished by Claimants for use in the performance of the Contract, which is incorporated herein by reference.
2. With respect to Owner, this obligation shall be null and void if Contractor:
 - 2.1 Promptly makes payment, directly or indirectly, for all sums due Claimants, and
 - 2.2 Defends, indemnifies, and holds harmless Owner from all claims, demands, liens, or suits alleging non-payment by Contractor by any person or entity who furnished labor, materials, or equipment for use in the performance of the Contract, provided Owner has promptly notified Contractor and Surety (at the addresses described in Paragraph 12) of any claims, demands, liens, or suits and tendered defense of such claims, demands, liens, or suits to Contractor and Surety, and provided there is no Owner Default.
3. With respect to Claimants, this obligation shall be null and void if Contractor promptly makes payment, directly or indirectly, for all sums due.
4. Surety shall have no obligation to Claimants under this Bond until:
 - 4.1 Claimants who are employed by or have a direct contract with Contractor have given notice to Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.
 - 4.2 Claimants who do not have a direct contract with Contractor:
 1. Have furnished written notice to Contractor and sent a copy, or notice thereof, to Owner, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials or equipment were furnished or supplied, or for whom the labor was done or performed; and
 2. Have either received a rejection in whole or in part from Contractor, or not received within 30 days of furnishing the above notice any communication from Contractor by which Contractor had indicated the claim will be paid directly or indirectly; and
 3. Not having been paid within the above 30 days, have sent a written notice to Surety (at the address described in Paragraph 12) and sent a copy, or notice thereof, to Owner, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to Contractor.
5. If a notice by a Claimant required by Paragraph 4 is provided by Owner to Contractor or to Surety, that is sufficient compliance.
6. When a Claimant has satisfied the conditions of Paragraph 4, the Surety shall promptly and at Surety's expense take the following actions:
 - 6.1 Send an answer to that Claimant, with a copy to Owner, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.
 - 6.2 Pay or arrange for payment of any undisputed amounts.
7. Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by Surety.
8. Amounts owed by Owner to Contractor under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any performance bond. By Contractor furnishing and Owner accepting this Bond, they agree that all funds earned by Contractor in the performance of the Contract are dedicated to satisfy obligations of Contractor and Surety under this Bond, subject to Owner's priority to use the funds for the completion of the Work.

9. Surety shall not be liable to Owner, Claimants, or others for obligations of Contractor that are unrelated to the Contract. Owner shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

10. Surety hereby waives notice of any change, including changes of time, to the Contract or to related subcontracts, purchase orders, and other obligations.

11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by Paragraph 4.1 or Paragraph 4.2.3, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

12. Notice to Surety, Owner, or Contractor shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, Owner, or Contractor, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.

13. When this Bond has been furnished to comply with a statutory requirement in the location where the Contract was to be performed, any provision in this Bond conflicting with said statutory requirement shall be deemed deleted herefrom and provisions conforming to such statutory requirement shall be deemed incorporated herein. The intent is that this Bond shall be construed as a statutory Bond and not as a common law bond.

14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, Contractor shall promptly furnish a copy of this Bond or shall permit a copy to be made.

15. Definitions

15.1 Claimant: An individual or entity having a direct contract with Contractor, or with a first-tier subcontractor of Contractor, to furnish labor, materials, or equipment for use in the performance of the Contract. The intent of this Bond shall be to include without limitation in the terms “labor, materials or equipment” that part of water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Contract, architectural and engineering services required for performance of the Work of Contractor and Contractor’s subcontractors, and all other items for which a mechanic’s lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

15.2 Contract: The agreement between Owner and Contractor identified on the signature page, including all Contract Documents and changes thereto.

15.3 Owner Default: Failure of Owner, which has neither been remedied nor waived, to pay Contractor as required by the Contract, or to perform and complete or otherwise comply with the other terms thereof.

FOR INFORMATION ONLY – *(Name, Address, and Telephone)*

Surety Agency or Broker:

Owner’s Representative *(Engineer or other)*:

J. APPLICATION FOR PAYMENT

Contractor's Application for Payment No.

	Application Period:	Application Date:
To (Owner):	From (Contractor):	Via (Engineer):
Project:	Contract:	
Owner's Contract No.:	Contractor's Project No.:	Engineer's Project No.:

Application For Payment Change Order Summary

Approved Change Orders		
Number	Additions	Deductions
TOTALS		
NET CHANGE BY CHANGE ORDERS		

1. ORIGINAL CONTRACT PRICE..... \$ _____
2. Net change by Change Orders..... \$ _____
3. Current Contract Price (Line 1 ± 2)..... \$ _____
4. TOTAL COMPLETED AND STORED TO DATE
(Column F on Progress Estimate)..... \$ _____
5. RETAINAGE:
 - a. _____ Work Completed..... \$ _____
 - b. _____ Stored Material..... \$ _____
 - c. Total Retainage (Line 5a + Line 5b)..... \$ _____
6. AMOUNT ELIGIBLE TO DATE (Line 4 - Line 5c)..... \$ _____
7. LESS PREVIOUS PAYMENTS (Line 6 from prior Application)..... \$ _____
8. AMOUNT DUE THIS APPLICATION..... \$ _____
9. BALANCE TO FINISH, PLUS RETAINAGE
(Column G on Progress Estimate + Line 5 above)..... \$ _____

Contractor's Certification	
The undersigned Contractor certifies that to the best of its knowledge: (1) all previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with Work covered by prior Applications for Payment; (2) title of all Work, materials and equipment incorporated in said Work or otherwise listed in or covered by this Application for Payment will pass to Owner at time of payment free and clear of all Liens, security interests and encumbrances (except such as are covered by a Bond acceptable to Owner indemnifying Owner against any such Liens, security interest or encumbrances); and (3) all Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.	
By: _____	Date: _____

Payment of: \$ _____
(Line 8 or other - attach explanation of the other amount)

is recommended by: _____ (Date) _____
(Engineer)

Payment of: \$ _____
(Line 8 or other - attach explanation of the other amount)

is approved by: _____ (Date) _____
(Owner)

Approved by: _____ (Date) _____
Funding Agency (if applicable)

**Engineers Joint Documents Committee
Design and Construction Related Documents
Instructions and License Agreement**

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2. Make sure that you have the correct version for your software.

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2. Similarly, your software may change the font specification if the font is not available in your system. It will choose a font that is close in appearance. In this event, the pagination may not match the control set.
3. If you modify the document, you must follow the instructions in the License Agreement about notification.
4. Also note the instruction in the License Agreement about the EJCDC copyright.

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You should carefully read the following terms and conditions before using this document. Commencement of use of this document indicates your acceptance of these terms and conditions. If you do not agree to them, you should promptly return the materials to the vendor, and your money will be refunded.

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Term:

The license is effective until terminated. You may terminate it at any time by destroying **EJCDC Design and Construction Related Documents** altogether with all copies, modifications and merged portions in any form. It will also terminate upon conditions set forth elsewhere in this Agreement or if you fail to comply with any term or condition of this Agreement. You agree upon such termination to destroy **EJCDC Design and Construction Related Documents** along with all copies, modifications and merged portions in any form.

Limited Warranty:

EJCDC warrants the CDs and diskettes on which **EJCDC Design and Construction Related Documents** is furnished to be free from defects in materials and workmanship under normal use for a period of ninety (90) days from the date of delivery to you as evidenced by a copy of your receipt.

There is no other warranty of any kind, either expressed or implied, including, but not limited to the implied warranties of merchantability and fitness for a particular purpose. Some states do not allow the exclusion of implied warranties, so the above exclusion may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

EJCDC does not warrant that the functions contained in **EJCDC Design and Construction Related Documents** will meet your requirements or that the operation of **EJCDC Design and Construction Related Documents** will be uninterrupted or error free.

Limitations of Remedies:

EJCDC's entire liability and your exclusive remedy shall be:

1. the replacement of any document not meeting EJCDC's "Limited Warranty" which is returned to EJCDC's selling agent with a copy of your receipt, or
2. if EJCDC's selling agent is unable to deliver a replacement CD or diskette which is free of

defects in materials and workmanship, you may terminate this Agreement by returning EJCDC Document and your money will be refunded.

In no event will EJCDC be liable to you for any damages, including any lost profits, lost savings or other incidental or consequential damages arising out of the use or inability to use **EJCDC Design and Construction Related Documents** even if EJCDC has been advised of the possibility of such damages, or for any claim by any other party.

Some states do not allow the limitation or exclusion of liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you.

General:

You may not sublicense, assign, or transfer this license except as expressly provided in this Agreement. Any attempt otherwise to sublicense, assign, or transfer any of the rights, duties, or obligations hereunder is void.

This Agreement shall be governed by the laws of the State of Virginia. Should you have any questions concerning this Agreement, you may contact EJCDC by writing to:

Arthur Schwartz, Esq.
General Counsel
National Society of Professional
Engineers
1420 King Street
Alexandria, VA 22314

Phone: (703) 684-2845
Fax: (703) 836-4875
e-mail: aschwartz@nspe.org

You acknowledge that you have read this agreement, understand it and agree to be bound by its terms and conditions. You further agree that it is the complete and exclusive statement of the agreement between us which supersedes any proposal or prior agreement, oral or written, and any other communications between us relating to the subject matter of this agreement.

K. CERTIFICATE OF SUBSTANTIAL COMPLETION

Certificate of Substantial Completion

Project: BUTTERFLY VALVE REPLACEMENT AT KENDUSKEAG PUMP STATION AND WASTEWATER TREATMENT PLANT

Owner: _____ Owner's Contract No.: 1

Contract: _____ Engineer's Project No.: 1

This [tentative] [definitive] Certificate of Substantial Completion applies to:

“ All Work under the Contract Documents: “ The following specified portions of the Work:

Date of Substantial Completion

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Project or portion thereof designated above is hereby declared and is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below.

A [tentative] [definitive] list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance and warranties shall be as provided in the Contract Documents except as amended as follows:

“ Amended Responsibilities “ Not Amended

Owner's Amended Responsibilities:

Contractor's Amended Responsibilities:

GENERAL SPECIFICATIONS

SUMMARY OF WORK

PART 1 - GENERAL

1.1 REQUIREMENT INCLUDED

- A. The work to be performed under this Contract consists of furnishing all tools, labor, equipment, materials providing startup services, and for furnishing all transportation and services, including fuel, power, water, and essential communications, and for the performance of all labor, or other operations required for the fulfillment of the Contract in strict accordance with the specifications, drawings, and other Contract Documents as herein before defined, all of which are made a part hereof; and including such detail sketches as may be furnished by the Engineer from time to time during construction in explanation of said Contract Documents. The work shall be complete, and all work, materials, and services not expressly shown or called for in the Contract Documents which may be necessary for the complete and proper construction of the work in good faith shall be performed, furnished, and installed by the Contractor as though originally so specified or shown, at no increase in cost to the Owner.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The project includes removing and replacing an existing butterfly valve at the Kenduskeag Pump Station and the removing and replacing an actuator valve on the existing butterfly valve at the Bangor Wastewater Treatment Plant. The work will need to be completed during dry weather. The contractor will be responsible for measuring the valves prior to starting work. The work will include electrical demolition, electrical work and wiring, field inspections and testing and acceptance of the butterfly valve and actuator valve.

1. Remove and replace actuator valve at WWTP
2. Remove and replace butterfly valve at Kenduskeag Pump Station
3. Perform other work as shown on plans, including electrical connections
4. Work to be conducted during dry weather; Kenduskeag Pump Station work occurring at night, during low flow conditions.

1.3 CONTRACT METHOD

- A. The work will be constructed under unit prices as indicated in the Bid Schedule.
- B. The Contractor shall include the General Conditions of the Contract as a part of all of its subcontract agreements.

1.4 WORK BY OTHERS

- A. The Contractor's attention is directed to the fact that work may be conducted at the site

by other Contractors during the performance of the work under this Contract. The Contractor shall conduct its operations so as to cause a minimum of interference with the work of such other Contractors and shall cooperate fully with such Contractors to provide continued safe access to their respective portions of the site, as required to perform their respective contracts.

- B. Interference with Work on Utilities: The Contractor shall cooperate fully with all utility forces of the Owner or forces of other public or private agencies engaged in the relocation, altering, or otherwise rearranging of any facilities which interfere with the progress of the work, and shall schedule the work so as to minimize interferences with said relocation, altering, or other rearranging of facilities.

1.5 WORK SEQUENCE

- A. The Contractor shall construct work in phases or stages as required to accommodate Owner's occupancy requirements. The Contractor shall coordinate construction schedule and operations with Owner.

1.6 CONTRACTOR USE OF PROJECT SITE

- A. The Contractor's use of the project site shall be limited to its construction operations, including onsite storage of materials as needed for the immediate work, onsite fabrication facilities, and field offices.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.1 MAINTAIN EXISTING WORKS

- A. Existing Operations

- 1. The existing sewer must remain operable at all times during construction.

- B. Maintain Operation

- 1. State and Federal regulations require that at all times during construction work under this Contract, existing utilities remain operational until the new utilities are accepted and on line.

- 2. The responsibility of the Contractor shall be to provide, maintain and operate all temporary facilities such as bypass wastewater pumping equipment, dams, sewers, conduits, valves and all other labor and equipment necessary to intercept the sewage flow before it reaches the points where it would interfere with his work, and carry it past his work such that essential transport of wastewater remains operational and effective.

3. The Contractor's operations shall not hinder the delivery, storage and use of materials and supplies, nor hinder staff duties, nor disrupt utility service.
4. The Owner must have access to the existing facilities at all times unless a specific exception is granted by the Owner.

C. Minimize Interference

1. The Contractor shall conduct operations so as to interfere as little as possible with existing works. The Contractor shall develop a program, for review and approval by the Engineer and Owner, which shall provide for the construction and putting into service of the new works in the most orderly manner possible. This program shall be adhered to except as otherwise directed by Engineer.
2. It may be necessary to work outside of normal working hours to minimize interference. Work of connecting with, cutting into and reconstructing existing pipes or structures shall be planned to interfere with the operation of the existing facilities for the shortest possible time and when the demands on the facilities best permit such interference. Before starting work which will interfere with the operation of existing facilities, the Contractor shall do all possible preparatory work and shall see that all tools, materials, and equipment are made ready and at hand.
3. When making interconnections to active lines, perform such work at low flow times and in a manner to maintain flows. The Contractor is responsible for providing temporary bypass pumping or other means as necessary to ensure continuous wastewater flow.

D. Existing Wastewater Flows

1. Existing flows vary significantly from hour to hour and season to season. Peak flows are influenced by rain events and groundwater depths. The Contractor shall conduct operations to be prepared for these variable flow conditions. Contractor to conduct work during dry weather conditions and low-flow conditions at the Kenduskeag Pump Station.

3.2 CONSTRUCTION SEQUENCE

- A. The Contractor shall submit to the Owner for review and acceptance, a complete schedule of proposed sequence of construction operations prior to commencing work.

END OF SECTION

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 MEASUREMENT AND PAYMENT

- A. The following subsections describe the measurement of and payment for the work to be done under the items listed in the BID.
- B. The Contractor shall become acquainted with all Work associated with each Payment Item and shall have no claim for additional compensation due to unfamiliarity with the Work required to complete each Item in accordance with the Contract Documents.
- C. No Payment will be made for any item of Work until all documentation required by the Contract Documents has been reviewed and accepted by the Engineer.
- D. No payment will be made for additional materials that are not installed on the Project.
- E. Each unit or lump sum, stated in the BID shall constitute full compensation as herein specified for each item of work completed in accordance with the drawings and specifications. Each allowance price stated in the BID shall constitute an estimate of full compensation as herein specified for each item of work completed in accordance with the drawings and specifications. Actual compensation for allowance price bid items shall be in accordance with the measurement payment for each item.
- F. The prices bid shall constitute payment for all work incidental thereto. Unless identified within the individual item description, the price shall not include work specifically identified for payment under other items.

1.02 PAYMENT ITEMS

Basis of Award

<u>Item</u>	<u>Description</u>
1.	Mobilization/Demobilization
2.	Remove, Dispose and Replace Actuator Valve at WWTP
3.	Remove, Dispose, and Replace Butterfly Valve at Kenduskeag Pump Station

1.03 THE MEASUREMENT AND PAYMENT FOR THE BID ITEMS 1 THROUGH 5 ARE AS FOLLOWS:

ITEM 1 MOBILIZATION / DEMOBILIZATION

- A. General. The lump sum price for Item 1 shall constitute full compensation for initiating the contract, obtaining all permits, bonds and insurance, exclusive of the cost of materials, for mobilizing all machinery, tools, for furnishing and installing erosion control measures, for site restoration upon completion of the work, and all other equipment to carry on and complete the work.
- B. Measurement. Measurement for mobilization/demobilization shall be made based on the lump sum amount bid as approved by the engineer
- C. Payment. Payment for mobilization/demobilization shall be made at the lump sum price under this Bid Item. The amount of this lump sum shall not exceed THREE percent (3%) of the Contract amount, excluding Item 1, and no payment shall be made in excess of this amount. An amount of seventy-five (75) percent of the amount bid under Item 1 (exclusive

of normal Contract retainage) will be made when the Contractor has mobilized to the Project site(s) and is ready to start construction. The remaining twenty-five (25) percent (exclusive of normal Contract retainage) will be made following demobilization from the Project site.

ITEM 2 REMOVE, DISPOSE, and REPLACE ACTUATOR VALVE AT WWTP

- A. General. The lump sum price for Item 2 shall constitute full compensation for all labor, equipment, tools, expenses, freight, delivery and handling of materials, and materials necessary to complete the Work as specified which shall include: measuring of the existing valves prior to removing, removing and legally disposal of existing actuator valve and accessories, replacing with new actuator valve, all electrical demolition and legal disposal, and replacement of electrical connections as shown on the drawings, protection of surrounding processes from damage, including, but not limited to, existing pumps and valves, maintenance of flows, dust control, restoration of all areas disturbed by the Contractor's operations, all Work, as specified in the General Requirements, including Environmental protection.
- B. Measurement. Measurement shall be based on the removal, legal disposal, and replacement of the butterfly valve.
- C. Payment. Payment shall be made based the lump sum under this Bid Item. Seventy-five (75) percent of the price bid shall be paid upon installation of the actuator valve, the balance shall be withheld until such time as the actuator valve is tested and accepted by the Owner for incorporation into the existing treatment process.

ITEM 3 REMOVE, DISPOSE, and REPLACE BUTTERFLY VALVE AT KENDUSKEAG PUMP STATION

- A. General. The lump sum price for Item 3 shall constitute full compensation for all labor, equipment, tools, expenses, freight, delivery and handling of materials, and materials necessary to complete the Work as specified which shall include: measuring of the existing valves prior to removing, removing and legally disposing of existing butterfly valve and accessories, replacing with new butterfly valve and valve actuator, all electrical demolition and replacement of electrical connections as shown on the drawings, protection of surrounding processes from damage, including, but not limited to existing pumps and valves, maintenance of flows, dust control, restoration of all areas disturbed by the Contractor's operations, all Work, as specified in the General Requirements, including Environmental protection.
- B. Measurement. Measurement shall be based on the removal, legal disposal of, and replacement of the actuator valve.
- C. Payment. Payment shall be made based the lump sum under this bid item. Seventy-five (75) percent of the price bid shall be paid upon installation of the actuator valve, the balance shall be withheld until such time as the actuator valve is tested and accepted by the Owner for incorporation into the existing treatment process.

PART 2 PRODUCTS – Not Applicable

PART 3 EXECUTION – Not Applicable

END OF SECTION

SUBMITTALS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Submittal procedures.
- B. Construction progress schedules.
- C. Product Data.
- D. Shop Drawings.
- E. Design data.
- F. Test reports.
- G. Certificates.
- H. Manufacturer's instructions.

1.2 RELATED SECTIONS

- A. Section - Quality Control: Manufacturers' field services and reports.
- B. Section - Contract Closeout: Contract warranties, manufacturers' certificates, and closeout submittals.

1.3 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Engineer accepted form.
- B. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- C. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate.
- D. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- E. Schedule submittals to expedite the Project, and deliver to Engineer at business address.

Coordinate submission of related items.

- F. For each submittal for review, allow 14 days excluding delivery time to and from the contractor.
- G. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
- H. Provide space for Contractor and Engineer review stamps.
- I. When revised for resubmission, identify all changes made since previous submission.
- J. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- K. Submittals not requested will not be recognized or processed.

1.4 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial schedule in duplicate within 14 days after date of Owner-Contractor Agreement.
- B. Revise and resubmit as required.
- C. Submit revised schedules with each Application for Payment, identifying changes since previous version.
- D. Submit a horizontal bar chart with separate line for each major portion of Work or operation, identifying first work day of each week.
- E. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
- F. Indicate estimated percentage of completion for each item of Work at each submission.
- G. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and required by Allowances.

1.5 PRODUCT DATA

- A. Product Data For Review:
 - 1. Submitted to Engineer for review for the limited purpose of checking for Submittals

conformance with information given and the design concept expressed in the contract documents.

2. After review, provide copies and distribute in accordance with this Section and for record documents purposes described in Section - Contract Closeout.

B. Product Data For Information:

1. Submitted for the Engineer's knowledge as contract administrator or for the Owner.

C. Product Data For Project Close-out:

1. Submitted for the Owner's benefit during and after project completion.

D. Submit the number of copies which the Contractor requires, plus two copies which will be retained by the Engineer.

E. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

F. Indicate Product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

G. After review distribute in accordance with the Submittal Procedures article above and provide copies for record documents described in Section - Contract Closeout.

1.6 SHOP DRAWINGS

A. Shop Drawings For Review:

1. Submitted to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

2. After review, produce copies and distribute in accordance with Submittal Procedures article above and for record documents purposes described in Section - Contract Closeout.

B. Shop Drawings For Information:

1. Submitted for the Engineer's knowledge as contract administrator or for the Owner.

C. Shop Drawings For Project Close-out:

1. Submitted for the Owner's benefit during and after project completion.

D. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

E. Submit the number of opaque reproductions which Contractor requires, plus two copies which will be retained by Engineer.

1.9 DESIGN DATA

A. Submit for the Engineer's knowledge as contract administrator or for the Owner.

B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.10 TEST REPORTS

A. Submit for the Engineer's knowledge as contract administrator or for the Owner.

B. Submit test reports for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.11 CERTIFICATES

A. When specified in individual specification sections, submit certification by the manufacturer, installation/application subcontractor, or the Contractor to Engineer, in quantities specified for Product Data.

B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Engineer.

1.12 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Engineer for delivery to owner in quantities specified for Product Data.

B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

C. Refer to Section - Quality Control, Manufacturers' Field Services article.

1.13 ERECTION DRAWINGS

- A. Submit drawings for the Engineer's benefit as contract administrator or for the Owner.
- B. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
- C. Data indicating inappropriate or unacceptable Work may be subject to action by the Engineer or Owner.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

QUALITY CONTROL

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance and control of installation.
- B. References.
- C. Inspection and testing laboratory services.

1.2 QUALITY ASSURANCE/CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply fully with manufacturers' instructions, including each step in sequence.
- C. Comply fully with manufacturers' instructions. If in conflict with Contract Documents, request clarification from Engineer before proceeding.
- D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce workmanship of specified quality.
- F. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.3 REFERENCES

- A. Conform to reference standard by date of issue current on date of Contract Documents.
- B. Should specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.
- C. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or interference otherwise in any reference documents.

1.4 INSPECTION AND TESTING LABORATORY SERVICES

- A. Owner will appoint, employ, and pay for services of an independent firm to perform
Quality Control

inspection and testing if required, unless specifically noted otherwise in Contract Documents.

- B. The independent firm will perform inspections, tests, and other services specified in individual specification Sections and as required by the Engineer.
- C. Reports will be submitted by the independent firm to the Engineer, in duplicate, indicating observations and results of tests and indicating compliance or noncompliance with Contract Documents.
- D. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.
 - 1. Notify Engineer and independent firm 24 hours prior to expected time for operations requiring services.
 - 2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
- E. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Engineer. Payment for retesting will be the Contractor's responsibility.

END OF SECTION

MATERIAL AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Products.
- B. Transportation and handling.
- B. Storage and protection.
- D. Product options.
- E. Substitutions.

1.2 RELATED SECTIONS

- A. None.

1.3 PRODUCTS

- A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.

1.4 TRANSPORTATION AND HANDLING

- A. Transport and handle Products in accordance with manufacturers' instructions.
- B. Promptly inspect shipments to assure that Products comply with requirements, quantities are correct, and Products are undamaged.
- C. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.5 STORAGE AND PROTECTION

- A. Store and protect Products in accordance with manufacturers' instructions, with seals and labels intact and legible. Store sensitive Products in weathertight, climate controlled enclosures.

- B. For exterior storage of fabricated Products, place on sloped supports, above ground.
- C. Provide off-site storage and protection when site does not permit onsite storage or protection.
- D. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
- E. Store loose granular materials on solid flat surfaces in a well-drained area. Avoid mixing with foreign matter.
- F. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
- G. Arrange storage of Products to permit access for inspection. Periodically inspect to assure
Products are undamaged and are maintained under specified conditions.

1.6 PRODUCT OPTIONS

- A. Products Specified by Naming One or More Manufacturers with a Provision for
Substitutions: Submit a request for substitution for any manufacturer not named.

1.7 SUBSTITUTIONS

- A. Engineer will consider requests for Substitutions only within 14 days after date established in Notice to Proceed.
- B. Substitutions may be considered when a Product becomes unavailable through no fault of the Contractor.
- C. Document each request with complete data substantiating compliance of proposed
Substitution with Contract Documents.
- D. A request constitutes a representation that the Contractor:
 1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
 2. Will provide the same warranty for the Substitution as for the specified Product.

3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 4. Waives claims for additional costs or time extension which may subsequently become apparent.
- E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- F. Substitution Submittal Procedure:
1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
 2. Submit shop drawings, Product data, and certified test results attesting to the proposed Product equivalence.
 3. The Engineer will notify Contractor, in writing, of decision to accept or reject request.

END OF SECTION

CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Closeout Procedures.
- B. Final Cleaning.

1.2 RELATED SECTIONS

- A. None.

1.3 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's inspection.
- B. Provide submittals to Engineer that are required by governing or other authorities.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- D. Submit record drawings including all ties and elevation information recorded for underground facilities.

1.4 FINAL CLEANING

- A. Execute final cleaning prior to final inspection.
- B. Clean interior and exterior surfaces exposed to view; remove temporary labels, stains and foreign substances.
- C. Clean site; sweep paved areas, rake clean landscaped surfaces.
- D. Remove waste and surplus materials, rubbish, and construction facilities from the site.

END OF SECTION

ELECTRICAL/MECHANICAL
SPECIFICATIONS

SECTION 01610

DELIVERY, STORAGE AND HANDLING

PART 1 – GENERAL

1.01 GENERAL:

- G. This Section specifies the general requirements for the delivery handling, storage and protection for all items required in the construction of the work. Specific requirements, if any, are specified with the related item.

1.02 TRANSPORTATION AND DELIVERY:

- H. Transport and handle items in accordance with manufacturer's printed instructions.
- I. Schedule delivery to reduce long term on-site storage prior to installation and/or operation. Under no circumstances shall equipment be delivered to the site more than one month prior to installation without written authorization from the Engineer.
- J. Coordinate delivery with installation to ensure minimum holding time for items that are hazardous, flammable, easily damaged or sensitive to deterioration.
- K. Deliver products to the site in manufacturer's original sealed containers or other packing systems, complete with instructions for handling, storing, unpacking, protecting and installing.
- L. All items delivered to the site shall be unloaded and placed in a manner which will not hamper the Contractor's normal construction operation or those of subcontractors and other contractors and will not interfere with the flow of necessary traffic.
- M. Provide equipment and personnel to unload all items delivered to the site.
- N. Promptly inspect shipment to assure that products comply with requirements, quantities are correct, and items are undamaged. For items furnished by others (i.e. Owner, other Contractors), perform inspection in the presence of the Engineer. Notify Engineer verbally, and in writing, of any problems.

1.03 STORAGE AND PROTECTION:

- A. Store and protect products and equipment in accordance with the manufacturer's instructions, with seals and labels intact and legible. Storage instruction shall be studied by the Contractor and reviewed with the Engineer by him. Instructions shall be carefully followed and a written record of this kept by the Contractor for each product and pieces of equipment.

- B. Arrange storage of products and equipment to permit access for inspection. Periodically inspect to make sure products and equipment are undamaged and are maintained under specified conditions.
- C. Provide protective maintenance during storage consisting of manually exercising equipment, inspecting mechanical surfaces for signs or corrosion or other damage, lubricating, applying any coatings as recommended by the equipment manufacturer necessary for its protection and all other precautions to assure proper protection of all equipment stored and for compliance with manufacturers' requirements related to warranties.
- D. Store loose granular materials on solid flat surface in a well-drained area. Prevent mixing with foreign matter.
- E. Cement and lime shall be stored under a roof and off the ground and shall be kept completely dry at all times. All structural, miscellaneous and reinforcing steel shall be stored off the ground or otherwise to prevent accumulation of dirt or grease, and in a position to prevent accumulations of standing water and to minimize rusting. Beams shall be stored with the webs vertical. Precast concrete shall be handled and stored in a manner to prevent accumulations of dirt, standing water, staining, chipping or cracking. Brick, block and similar masonry products shall be handled and stored in manner to reduce breakage, cracking and spalling to a minimum.

END OF SECTION

SECTION 15101

BUTTERFLY VALVES AND APPURTENANCES

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide and test butterfly valves and appurtenances as indicated and in compliance with Contract Documents.

- 1. Provide sizes and capacities as indicated and specified.

1.02 REFERENCES:

- A. American Society for Testing and Materials International (ASTM):

- 1. A126: Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
 - 2. A536: Standard Specification for Ductile Iron Castings.

- B. American Water Works Association (AWWA):

- 1. C504: Rubber-Seated Butterfly Valves.

1.03 SUBMITTALS:

- A. Submit the following:

- 1. Data, regarding valve characteristics and performance including Cv.
 - 2. Shop drawing data for accessory items.
 - 3. Manufacturer's literature as needed to supplement certified data.
 - 4. Operating and maintenance instructions and parts lists.
 - 5. If Manufacturer is not listed, submit the following:
 - a. Listing of reference installations as specified with contact names and telephone numbers.
 - b. The latest ISO 9001 series certification or quality system plan.
 - 6. Valve shop test results.

7. Qualifications of field service technician.
 8. Shop and Field inspections reports.
 9. List of recommended spare parts other than those specified.
 10. Recommendations for short and long term storage.
 11. Special tools.
 12. Number of service technician days provided and per diem field service rate.
 13. Manufacturer's product data and specifications for shop painting.
 14. Provide a layout drawing, plan and section showing orientation of plug, gate, check, ball valves and actuators and nearest obstructions for each valve.
 15. Manufacturer's product data and specifications for shop painting.
 16. Material Certification:
 - a. Provide certification from the equipment manufacturer that the materials of construction specified are recommended and suitable for the service conditions specified and indicated. If materials other than those specified are proposed based on incompatibility with the service conditions, provide technical data and certification that the proposed materials are recommended and suitable for the service conditions specified and indicated including an installation list of a minimum of five (5) installations in operation for a minimum of five (5) years. Provide proposed materials at no additional cost to the Owner.
 - b. Where materials are not specified, provide technical data and certification that the proposed materials are recommended and suitable for the service conditions specified and indicated.
- B. A copy of this specification section with addenda and all referenced specification sections with addenda, with each paragraph check-marked to indicate specification compliance or marked to indicate requested deviations and clarifications from the specified requirements.
1. If deviations and clarifications from the specifications are indicated, therefore requested by the Contractor, provide a detailed written justification for each deviation and clarification.
 2. Failure to include a copy of the marked-up specification sections and or the detailed justifications for any requested deviation or clarification will result in

submittal return without review until marked up specification and justification are resubmitted with the entire package.

1.04 SPARE PARTS:

- A. Provide One (1) spare set of packing.

1.05 QUALITY ASSURANCE:

- A. Provide enclosures for the area classifications specified and indicated.
- B. Services of Manufacturer's Representative as specified herein.
- C. Manufacturer of valve shall have a minimum of five (5) operating installations with valves of the size and type specified and in the same service as specified operating for not less than five (5) years.
- D. If equipment proposed is different laying length or requires more operating space than specified and indicated; provide all structural, architectural, mechanical, electrical and plumbing revisions at no additional cost to the Owner.

1.06 DELIVERY, STORAGE AND HANDLING:

- A. Provide as specified.

PART 2 – MATERIALS

2.01 BUTTERFLY VALVES:

- A. Manufacturers:
 - 1. DeZurik
 - 2. Val-Matic
 - 3. Crispin
 - 4. Mosser
- B. System Description:
 - 1. Valve Service: Raw Wastewater
 - 2. Size: 48 Inch

3. Internal Pressure: 10 psi (Gravity)
 4. Submergence: 8 feet
 5. Service: Modulating
 6. Area Classification: Class 1 , Div 1 Group D
- C. Provide valves conforming to AWWA Standard C504 for Rubber Seated Butterfly Valves except as modified herein.
- D. Valves utilizing: Continuous rubber lining on the internal body surfaces and extending over the flanges, or a disk which sits at an angle to the axis of the pipe are not acceptable.
- E. Valve Bearings: Self-lubricating, nonmetallic material to effectively isolate the disc-shaft assembly from the valve body. Cast or ductile iron thrust or journal bearing surfaces are NOT acceptable.
- F. Class 150B valves.
- G. Valve Body: ASTM A126 Class B cast iron or ASTM A536 ductile iron.
1. Flanged short body valve.
- H. Valve Seats:
1. Molded neoprene, Buna-N or other synthetic elastomer resistant to oil and grease.
 2. Provide seat mounted on disc or in body.
 3. Provide seats offset from shaft and field replaceable for all valves.
 4. Provide seats mounted on disc, mechanically fastened to disc with Type 316 stainless steel hex head screws. Provide rubber seat reinforced with stainless steel retaining ring. Seats vulcanized or bonded to the disc are not acceptable.
- I. Mating surfaces for valves with seat on disc: Type 316 stainless steel.
1. Provide mating surface mechanically retained in body and sealed with O-ring.
- J. For valves with seats mounted on body provide the seats clamped or mechanically secured with Type 316 stainless steel fasteners.
- K. Mating surfaces for valve with seat in body: Type 316 stainless steel or plasma applied nickel-chromium material containing 80 percent nickel, 20 percent chrome.

- L. Plated or sprayed on mating surface material is not acceptable.
- M. Seat Placement:
 - 1. If seat on disc provide disc of ASTM A126 Class B cast iron or ductile iron.
 - 2. If seat in body, provide disc of ASTM A126 Class B cast iron, ASTM A536 ductile iron or Type 316 stainless steel. Type 316 Stainless steel edge on cast or ductile-iron discs secured with Type 316 stainless steel threaded fasteners, heat shrunk on disc, a welded-on overlay, or a plasma applied nickel-chrome material.
- N. Shaft: Type 316 stainless steel. Either one piece extending completely through disc or stub shafts inserted into valve disc stubs.
- O. Shaft seal of the self-adjusting V type. Seal replaceable without disassembly of valve.
- P. Provide gear operator with extension stem, 3” Type 316L stainless steel enclosing tube and motor operated floorstand as indicated. Gear operator to be designed for submerged service and totally enclosed with gasketed Type 316 stainless steel covers with Type 316 stainless steel fasteners for access to the gears.
- Q. Electric Motor Operator: Provide in accordance with Section 15109.

2.02 FLOORSTANDS:

- A. Type: Non-Rising Stem (NRS).
- B. Materials:
 - 1. Pedestal: Cast Type 316 stainless steel.
 - 2. Mounting Bracket and Hardware: Type 316 stainless steel
 - 3. Couplings: Type 316 stainless steel.
- C. Manufacturer: Trumbull or equal
- D. Floorstands fabricated by welding flanges to pipe are not acceptable.

2.03 EXTENSION STEMS:

- A. Provide where indicated and required for operation of all valves
- B. Material:

1. Stems: Type 316L solid stainless steel bar or Schedule 40 Type 316L Pipe
 - a. Size: in accordance with AWWA C504.
 - b. Slenderness ration <200
2. Connectors, thrust relief assemblies, torque tube assemblies (when shown), universal joints and operating nuts: Type 316 or Type 316L stainless steel
3. Miter gears where indicated or required: Cast iron with 2 part epoxy coating

2.04 ELECTRIC MOTOR ACTUATORS:

- A. Provide in accordance with Section 15109.

2.05 SHOP PAINTING:

- A. Provide fusion bonded epoxy on the internals and externals of the valve body and disk.
- B. Process Valve Color: Manufacturers standard color.

PART 3 – EXECUTION

3.01 INSTALLATION:

- A. Prior to installation, protect stored valves and appurtenances from damage.
- B. Clean all foreign material from inside of piping before placing valves in place.
- C. Erect and support valves in respective positions free from distortion and strain on appurtenances during handling and installation.
- D. Inspect material for defects in workmanship and material.
- E. Clean out foreign material from valve openings, cavities and seats.
- F. Test operating mechanisms to check function, and check nuts and bolts for tightness.
- G. Repair valves and other equipment which do not operate easily or are otherwise defective at no additional cost to the Owner.
- H. Install as indicated and in accordance with Manufacturers printed instructions.

3.02 FLOORSTAND OPERATORS AND STEM EXTENSIONS:

- A. Set floorstand operators and stem extensions so stems run smoothly in true alignment. Check distances and verify required stem lengths and adjust as needed to suit actual conditions of installation.

3.03 FIELD TESTING:

- A. Pressure test valves with pipeline pressure testing unless otherwise directed by the engineer.
- B. Test functions of each valve.
- C. Make all adjustments necessary to place valves in specified working order at time of above tests.
- D. Remove all replace valves and appurtenances at no additional cost to the Owner with equipment that will meet all requirements specified and indicated if unable to demonstrate to the satisfaction of the Engineer that valves will perform the service specified, indicated and as submitted and accepted.

3.04 FIELD TOUCH-UP PAINTING:

- A. After installation and accepted testing by the Engineer, apply touch-up paint to all scratched, abraided and damaged shop painted surfaces. Coating type and color shall match shop painting.

3.05 CONTRACT CLOSEOUT:

- A. Provide as specified.

END OF SECTION

SECTION 15109

ELECTRIC MOTOR ACTUATORS AND APPURTENANCES

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Provide electric motor actuators and appurtenances as indicated and in compliance with Contract Documents.

1. Actuators for all valves to be the product of one manufacturer.

B. Kenduskeag Pump Station:

1. Provide new electric actuator for new butterfly valve as specified and indicated

2. Valve: Specified in Section 15101

C. WWTP:

1. Remove existing electric actuator and extension stem and replace with new extension stem as specified in Section 15101 and actuator as specified and indicated, existing butterfly valve to remain in service

2. Provide all adaptors to mount new actuator on existing support

a. Sandblast and refinish existing support with 2 part epoxy paint

1.02 REFERENCES:

A. American Society for Testing and Materials International (ASTM):

1. B117: Standard Practice for Operating Salt Spray (Fog) Apparatus.

B. FM Global (FM):

1. 3615: Explosion proof Electrical Equipment General Requirements.

C. Institute of Electrical And Electronics Engineers (IEEE):

1. 802.15.4: Standard for Information Technology.

1.03 SUBMITTALS:

A. Submit the following:

1. Certified shop and erection drawings.
 - a. Drawings shall be in conformance with all other requirements as specified in this specification.
2. Data, regarding actuator and motor characteristics and performance.
3. Actuator and Valve set-up for each application: Position or torque seating
4. Shop drawing data for accessory items.
5. Manufacturer's literature as needed to supplement certified data.
6. Operating and maintenance instructions and parts lists.
7. Listing of reference installations as specified with contact names and telephone numbers.
8. Actuator shop test results.
9. Motor shop test results.
10. Qualifications of field service engineer.
11. Schematic control and power wiring diagrams.
12. Shop and Field inspections reports.
13. Recommended spare parts other than those specified.
14. Recommendations for short and long term storage.
15. Special tools.
16. Shop and field testing procedures and equipment to be used.
17. Torque capability and settings for each actuator.
 - a. Provide a listing of operating torque, safety factor applied and actuator torque capability and actuator safety factor as specified for each valve.
18. Number of service person days provided and per diem field service rate.
19. Manufacturer's product data and specifications for shop painting including statement of compliance for compatibility with field painting.

20. Provide a listing of the materials recommended for each service specified and indicated.
 21. ISO 9001 certification.
 22. Material Certification:
 - a. Provide certification from the equipment manufacturer that the materials of construction specified are recommended and suitable for the service conditions specified and indicated. If materials other than those specified are proposed based on incompatibility with the service conditions, provide technical data and certification that the proposed materials are recommended and suitable for the service conditions specified and indicated including an installation list of a minimum of five (5) installations in operation for a minimum of three (3) years. Provide proposed materials at no additional cost to the Owner.
 - b. Where materials are not specified, provide technical data and certification that the proposed materials are recommended and suitable for the service conditions specified and indicated.
- B. A copy of the contract mechanical process, electrical and instrumentation drawings, with addenda that are applicable to the equipment specified in this section, marked to show all changes necessary for the equipment proposed for this specification section. If no changes are required, mark all drawings with "No changes required".
1. Failure to include all drawings or a statement application to the equipment specified in this section will result in submittal return without review until a complete package is submitted.
- C. A copy of this specification section with addenda and all referenced specification sections with addenda, with each paragraph check-marked to indicate specification compliance or marked and indexed to indicate requested deviations and clarifications from the specified requirements.
1. If deviations and clarifications from the specifications are indicated, therefore requested by the Contractor, provide a detailed written justification for each deviation and clarification.
 2. Failure to include a copy of the marked-up specification sections and or the detailed justifications for any requested deviation or clarification will result in submittal return without review until marked up specifications and justifications are submitted in a complete package.

1.04 SPARE PARTS:

- A. Provide as specified.
- B. Provide for each Actuator:
 - 1. Two fuses of each size
- C. Provide spare parts that are identical to and interchangeable with similar parts installed.
 - 1. One set of all special tools
 - 2. Supply each actuator with a start-up kit consisting of installation instructions, electrical wiring diagrams and two sets of cover screws and seals.

1.05 QUALITY ASSURANCE:

- A. Provide as specified herein.
- B. Actuators for all valves to be the product of one manufacturer.
 - 1. Contractor to coordinate with valve supplier.
- C. Actuators to be manufacturer's standard cataloged product and modified to provide compliance with the specifications and the service conditions specified and indicated.
- D. Shop tests as specified.
- E. Provide Services of Manufacturer's Representative as specified herein.
- F. Provide services of factory-trained Service Technician, specifically trained on type of equipment specified:
 - 1. Service Technician must be present on site for all items listed below. Person-day requirements listed are exclusive of travel time, and do not relieve Contractor of the obligation to place equipment in operation as specified.
 - 2. Installation: Inspect setting, alignment, field erection; coordination of , electrical and miscellaneous utility connections:
 - a. 1/2 person-day per actuator.
 - 3. Functional Testing: Calibrate, check alignment and perform a functional test. Tests to include all items specified.

- a. 1/2 person-day per actuator.
 - 4. Field Performance Testing: Field performance test equipment specified.
 - a. 1/2 person-day per actuator.
 - 5. Vendor Training: Provide classroom and field operation and maintenance instruction including all materials, slides, videos, handouts and preparation to lead and teach classrooms sessions.
 - a. 1 person-days.
 - 6. Credit to the Owner, all unused service person-days specified above, at the manufacturer's published field service rate.
 - 7. Any additional time required of the factory trained service engineer to assist in placing the equipment in operation or to correct deficiencies in installation, equipment or material shall be provided at no additional cost to the Owner.
 - G. Manufacturer of actuators must have at least five (5) operating installations with actuators of the type and size specified and in the same service as specified operating for not less than five (5) years.
- 1.06 DELIVERY, STORAGE AND HANDLING:
- A. Provide as specified

PART 2 - PRODUCTS

2.01 ELECTRIC ACTUATORS:

- A. Manufacturers:
 - 1. Rotork IQ
- B. Each actuator shall include electric motor, reduction gearing, reversing starters, thermal overloads, controls transformer, limit controls, non-intrusive local controls as a complete integrated package to ensure proper coordination, compatibility, and operation of the system.
 - 1. Provide actuators capable of setting of torque, turns, and configuration of indication contacts, through the use of a non-intrusive infra-red setting tool without the necessity to remove any electrical compartment covers. The setting tool must be the means for adjustment. The use of control knobs for programming the actuator is not acceptable.

2. Provide actuators with torque capability 150 percent above the maximum operating torque required by each valve.
3. Provide actuators with a minimum of 25 feet of moisture proof cables
4. Enclosure:
 - a. Provide explosion proof Class 1, Division 1, Groups C, D, E, F, & G. NEMA 7 FM (Factory Mutual) certified to FM3615.
 - b. Provide actuator capable of being submerged without damage or loss of operation.
 - (1) Rating: 23 feet for 72 hours
5. Provide an internal watertight compartment to protect switches, contacts, motor and internal electronics from ingress of moisture and dust when the external terminal cover is removed.
6. Breathers, drains and or heaters are not permitted, enclosure must be totally sealed.
7. Provide each actuator with a handwheel for manual operation. Provide a hammerblow device which permits motor to come up to speed before picking up load and unseating valve.

C. Motors:

1. Electrical Service: 460V, 3 phase, 60 Hz
2. Modulating service
3. Insulation: Class H with a 30 minute duty rating.
4. Motor: Low inertia, high torque type, specifically designed for use with motor actuators, to prevent over travel.

D. Provide internal clutch that cannot engage handwheel operating mechanism and motor-operating mechanism at the same time. Friction type declutching is not acceptable.

1. Provide handwheel with arrow and the word CLOSE or SHUT cast on handwheel to indicate turning direction to close.
2. Handwheel must not rotate during power operation.
3. Provide handwheel and low gear ratio combined to give maximum rate of movement possible with 80 lb rim pull.

E. Drive Unit:

1. Metal worm wheel and worm shaft type.
2. Provide an oil filled drive housing. Grease lubrication is not acceptable.
3. Worm shaft to operate in ball or roller bearings and be machine cut, ground, and highly polished, hot rolled steel, hardness 50-60 Rockwell Scale C bronze worm wheel with large contact area. Provide mating surfaces of dissimilar metals to prevent galling. Cast metals or gears manufactured from non-metallic materials are not acceptable.
4. Worm and shafts: Heat treated steel and accurately machined. Output or driving shaft to operate in bronze bearing or in ball or roller bearings.
5. Make provisions to take thrust in both directions.
6. Worm and wheel to be oil lubricated at all times.
7. Drive housing: Cast iron or aluminum depending on size of actuator offered, all thrust or torque bearing components shall be ductile iron.
8. Provide drive bushing as part of a detachable thrust base making for easy retrofit.

F. Fully wire electric motor operators at factory and furnish complete with terminal strips for external power and control connections. Wiring: copper with tropical grade PVC cover. Internal wiring to remain in a water tight compartment with external cover removed.

G. Provide control as indicated and specified.

H. Operating Speed:

1. Valves: Provide actuator to open/close and modulate the valves under the working pressures indicated and specified.

I. Manual Control: Provide the following Control, Status, Alarm and Diagnostic capabilities locally, at the actuator:

1. Control:

- a. Open/Stop/Close.
- b. Desired Valve Position Control 0-100 percent.

2. Status:
 - a. Motor Running Open Direction.
 - b. Motor Running Close Direction.
 - c. Fully Open.
 - d. Fully Closed.
 - e. Percentage Open 0-100 percent in 1 percent increments.
 - f. Percentage Output Torque 0-100 percent in 1 percent increments.

3. Alarms:
 - a. Remote Control Communications Failure.
 - b. Actuator Alarm.
 - c. Valve Alarm.
 - d. Battery Low Alarm.

4. Diagnostics:
 - a. Provide an integral diagnostic module, which will store and enable download of historical actuator data to permit analysis of changes in actuator or valve performance. Access to data shall be via a non-intrusive an IrDA \cup port to an appropriate device capable of standard IRDA communications i.e. Notebook PC, Windows CE based "Personal Digital Assistant (PDA)" or an IrDA \cup compatible cellular telephone.
 - b. Provide diagnostic software from actuator manufacturer to allow configuration and diagnostic information to be reviewed, analyzed and reconfigured. Provide diagnostic status screens capable of showing multiple functions simultaneously so troubleshooting can be affected rapidly and efficiently.

J. Provide capability to receive 4-20 mA signal.

K. Provide each actuator fitted with four (4) hard-wired configurable contacts. Each Contact shall be rated at 5A, 250VAC, 30VDC and able to provide any one of the following:

1. Status:
 - a. Valve Fully Open.
 - b. Valve Fully Closed.
 - c. Valve Opening or Closing.
 - d. Valve Moving (Continuous or Pulsing).
 - e. Local Stop Selected.
 - f. Local Selected.
 - g. Remote Selected.
 - h. Open or Close Interlock Active.
 - i. ESD Active.

2. Alarms:
 - a. Motor Tripped on Torque in Mid-Travel.
 - b. Motor Tripped on Torque Going Open.
 - c. Motor Tripped on Torque Going Closed.
 - d. Pre-Set Torque Exceeded.
 - e. Valve Jammed.
 - f. Actuator Being Operated by Handwheel.
 - g. Lost Main Power Phase.
 - h. Customer 120V AC Supply Lost.
 - i. Battery Low.
 - j. Internal Failure Detected.
 - k. Thermostat Tripped.

- L. Provide a back-up power source integral to the actuator to ensure that in the event of a main power supply loss or failure that the LCD display indication contacts must remain operational for a minimum of 24 hours and still function on change of status.
- M. Provide contacts and operating parts made of non-corrodible metal and suitable for a sea atmosphere and for contact with H₂S.
- N. Control:
 - 1. Provide non-intrusive selectors on actuator electrical controls cover. One for Local/Stop/Remote selection, pad-lockable in each position and the other for local Open/Close control. Switches penetrating the housing are not acceptable.
- O. Starters/transformers: Consists of two relay contactors, 3-pole, mechanically interlocked, reversing with suitable arc suppressors.
 - 1. Electrical Service:
 - a. 460V, 3-phase, 60 Hertz.
 - 2. Provide inverse time element overload relays.
 - 3. Provide a control transformer capable of generating 110VAC.
 - 4. Provide electromechanical starter capable of OPEN/CLOSE sixty starts per hour or solid state starter for modulating service capable of 1200 starts per hour.
 - 5. Provide replaceable fuses to protect wiring, fuses must be locally available.
 - 6. Provide automatic phase correction.
- P. Limit Controls:
 - 1. Type: Positive in action ensuring tight seating and full openings.
 - 2. Position Setting Range: 2.5 to 100,000 turns, with resolution of 7.5 degrees of one actuator output revolution.
 - 3. Provide mechanism designed to minimize drift or over-travel and to open or close valve to fixed, predetermined limits of opening and closing travel.
 - 4. Provide controls that disconnect driving mechanism from stem utilizing Hall effect magnetic pulse system or similar technology. Measurement of torque shall be by direct measurement of force at the output of the actuator. Methods of measuring torque derived from the motor such as motor speed, current, flux, are not acceptable. Position and torque sensor shall accurately measure and control the

position of the actuator without the use of mechanical gears. Potentiometers for position transmission are not acceptable.

5. Provide torque switches for both directions of travel.
 - a. Sensing to be independent of voltage fluctuation.
 - b. Provide torque protection to prevent repeated starting in the same direction.
 - c. The initial unseating hammer blow shall not cause overtorque.
 - d. Provide torque switch settings independent of OPEN/CLOSE position switches.
 - Q. Provide output drive coupling to accept rising stem for rising spindle valves and include roller and ball type thrust bearings.
 - R. Provide actuator sized to close valve against required differential. Size actuator motor to seat and unseat valve and ensure torque switch trip at maximum valve torque when supply voltage is 10 percent below normal. Size motor to open or close valve to satisfy the process dynamics.
 - S. All fasteners and hardware: Type 316 stainless steel.
 - T. Secondary Gear Boxes:
 1. Secondary gearing shall be provided for multi turn or quarter-turn applications where operating times, thrust or torque considerations require. Secondary gearing shall be bevel or spur, totally enclosed in a cast iron housing, fully sealed and suitably lubricated for the service intended.
 2. Each gear assembly shall be manufacturer's standard selection or combination of as detailed in published product literature. Each gearbox shall be provided with a removable output drive coupling suitably sized for the specified service.
 3. Quarter-turn gearboxes shall be equipped with adjustable mechanical stops (at 0 and 90 degrees +/- 5 percent) to permit limiting open and closed travel during manual operation.
- 2.02 SHOP TESTS:
- A. Motor Test:

1. Give each motor a standard commercial test in the shop of the motor manufacturer, and submit certified copies of the test results to the Engineer for review prior to installation of the motors.

B. Actuator Testing:

1. Test performance of each actuator. Provide individual test certificates at no additional cost to the Owner simulate a typical valve load and record the following parameters:
 - a. Current a maximum torque setting.
 - b. Torque at maximum torque setting.
 - c. Test voltage and frequency.
 - d. Flash test voltage.
 - e. Actuator output speed or operating time.
2. Test housing oil tightness, 30 psi for 2 minutes.
3. Insulation test on motor and control circuit.
4. In addition, record details of specification on the test certificate, such gear ratios for both manual and automatic drive, closing direction, wiring diagram code number, and when applicable remote transmitter resistance and interposing relay voltage.

C. In event that specified tests indicate that motor or actuator will not meet specifications, Engineer has the right to require complete witnessed tests for all motors and actuators at no additional cost to the Owner.

1. Repeat tests until specified results are obtained.
2. Correct or replace promptly all defects or defective equipment revealed by or noted during tests at no additional cost to the Owner.

2.03 SHOP PAINTING:

A. Paint Finish: Baked on polyester powder coating 70 microns thick and must have passed ASTM B117 35 degrees C Salt Spray Test for 1,000 hours.

1. Provide materials for touch-up of all damaged or abraided surfaces due to installation.

2. Ferrous surfaces obviously not to be painted shall be given a shop applied coat of grease or rust resistant coating.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Install items in accordance with manufacturer's printed instructions and as indicated and specified.

3.02 FIELD TESTING:

- A. After installation of equipment, and after inspection, operation, testing and adjustment have been completed by manufacturer's field service engineer, conduct running test for each actuator in presence of Engineer to determine its ability to operate without vibration or jamming and to operate at the speeds specified. During tests, observe and record, motor inputs. Promptly correct or replace all defects or defective equipment revealed by or noted during tests, at no additional cost to the Owner, and repeat tests until specified results and results acceptable to the Engineer are obtained. Contractor to provide all labor, equipment, and materials necessary for conducting tests.
- B. Make all adjustments necessary to place equipment in specified working order at time of above tests.
- C. Remove and replace equipment at no additional cost to the Owner with equipment that will meet all requirements specified and indicated if unable to demonstrate to satisfaction of the Engineer that units will perform the service specified and indicated.

3.03 FIELD TOUCH-UP PAINTING:

- A. After installation and accepted testing by the Engineer. Contractor shall apply touch-up paint to all scratched, abraded and damaged shop painted surfaces. Coating type and color shall match shop painting.

3.04 CONTRACT CLOSEOUT:

- A. Provide as specified.

END OF SECTION

SECTION 16050

ELECTRICAL WORK – GENERAL

PART 1 – GENERAL

1.01 DEFINITIONS:

- A. Owner: City of Bangor, Bangor, Maine including all authorized representatives.
- B. Engineer: Designated technical representative of the Owner.

1.02 DESCRIPTION:

- A. Remove, install, and test electrical distribution equipment, as indicated and specified. The Electrical Contractor shall perform the work in accordance with the Work shown on the Contract Drawings.
- B. The Electrical Contractor shall install and test the electrical work in accordance with the Manufacturer's instructions and the requirements of these specifications.
- C. Demolish existing power and instrumentation raceways and wiring associated with the existing actuator installations from the Screen Room to panels in the Electrical Room at both facilities. Reuse existing raceways only when found in excellent condition **and** when approved by the Owner and /or Engineer. Grout any existing openings no longer to be used and core drill new openings along route of new raceways as required. Provide conduit seals at all openings.

1.03 SUBMITTALS:

- A. Submit electronic copies of a complete engineered submittal as indicated below to the Owner and Engineer of all materials for review prior to release for fabrication.
 - 1. Data sheets and manufacturers, bulletins of material and components including circuit breaker curves.
 - 2. Drawings of existing motor control centers showing all new work.

1.04 QUALITY ASSURANCE:

- A. Install all electrical work in conformance with the latest rules and requirements of National Fire Protection Association Standard No. 70 (National Electrical Code), and all state and local codes in effect at the time of contract award.

1.05 INTERFERENCE AND ERRONEOUS LOCATIONS:

- A. Locations of new actuators, electrical equipment, conduit layout, equipment enclosures and 480VMotor Control Center modifications are identified on the Contract Drawings, are

approximate only. Exact locations are to be determined by detailed field measurement of the existing installation by the Electrical Contractor prior to the fabrication of any equipment.

- B. Verify, in field, any additional dimensions or existing conditions required to perform all work, and final locations of equipment to allow acceptable installation of the equipment.

1.06 APPROVAL AND EQUIPMENT IDENTIFICATION:

- A. Provide UL listed and labeled devices and materials.
- B. Where Underwriters' Laboratories listing is not available for equipment, submit test reports of an independent testing laboratory, approved by the Owner, indicating that the equipment is in conformance with applicable codes and standards.
- C. Provide all specified tests and inspections required for approval of the equipment installation.

1.07 TESTING AND ACCEPTANCE:

- A. Perform all field and functional testing as specified herein and in accordance with Part 3.

1.08 WORK PERMITS AND INSPECTIONS:

- A. Obtain all required work permits from the local authorities having jurisdiction.
- B. Pay all fees associated with permitting.
- C. Coordinate all inspections and approvals by local code enforcement inspectors.

PART 2 - PRODUCTS:

2.01 MOTOR CONTROL CENTER STAB-IN CIRCUIT BREAKER COMPARTMENTS

- A. Provide two circuit breaker stab-in compartments with doors and operating handles for existing General Electric Series 7700 motor control centers as detailed in the Contract Drawings.
- B. Provide blank fill-in doors where required to seal openings.
- C. Provide services of representative of General Electric Company to visit the two sites and inspect the existing motor control centers and to verify compatibility of new compartments with the existing equipment
- D. New circuit breakers shall have same ratings as existing.

2.02 CONDUITS AND WIRING – SEE OTHER SPECIFICATION SECTIONS

PART 3 - EXECUTION

3.00 PROTECTION OF ELECTRICAL EQUIPMENT DURING STORAGE AND CONSTRUCTION:

- A. Cable bus systems shall be shipped to the project site and stored in accordance with Manufacturer's instructions.
- B. All electrical equipment is considered "in storage" regardless of location until first energized. Manufacturer's recommendations for storage precautions, conditions, and care shall be followed.

3.01 TESTING:

A. GENERAL:

- 1. Provide testing in accordance with Section 16950.

END OF SECTION

SECTION 16110

ELECTRICAL RACEWAY SYSTEMS

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide complete raceway systems, with matching accessories, fittings, boxes, and other hardware, as indicated and specified. When non-metallic raceway systems are specified, provide green insulated grounding conductor sized per NEC requirements.
- B. All raceway runs are indicated diagrammatically to outline general routing of raceway. Unless specifically identified for installation in concrete walls or slabs, raceways shall be run exposed with raceway supporting systems. Avoid interfering with pipes, ducts, structural members, or other equipment. Any installation deviations from the contract requirements shall be corrected at no cost to Owner.
- C. Provide raceway systems in accordance with the following:
 - 1. In NEMA 7, NEMA 12 or NEMA 1 areas, use galvanized rigid steel raceway systems.
 - 2. In NEMA 4 areas, and where subject to wetting or wash down, use galvanized rigid steel raceway systems.
 - 3. In exterior building applications, use galvanized rigid steel raceway systems.
- D. All raceway systems shall be installed in accordance with the criteria described in this section. Any proposed deviations from these requirements shall be submitted to the Engineer in writing for review and disposition.
 - 1. Use stainless steel support systems for exterior application and in NEMA 4 areas.
 - 2. All NEMA 1 and NEMA 12 areas shall use hot dipped galvanized steel support systems.
- E. Aluminum conduit and boxes are not acceptable products.

1.02 REFERENCES:

- A. National Electrical Manufacturers Association (NEMA):
 - 1. RN-1: Polyvinylchloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit

2. TC-2: Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80)
 3. TC-3: Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing
- B. National Fire Protection Association (NFPA):
1. 70: National Electrical Code (NEC).
- C. Occupational Safety & Health Act (OSHA).
1. Regulation 1910.7
- D. Underwriter's Laboratories, Inc. (UL):
1. 1: Electrical Flexible Metal Conduit
 2. 6: Rigid Metal Electrical Conduit
 3. 94: UL Standard for Safety Tests for Flammability of Plastic Materials for Parts in Devices and Appliances
 4. 360: Electrical Liquid-Tight Flexible Steel
 5. 651: Schedule 40 and 80 PVC Conduit
 6. 886: Electrical Outlet Boxes and Fittings for Use in Hazardous Locations, Class 1, Groups A, B, C, and D and Class 11, Groups E, F, and G
 7. 1242: Intermediate Metal Conduit
 8. 1684: UL Standard for Safety Reinforced Thermosetting Resin Conduit (RTRC) and Fittings
- 1.03 SUBMITTALS:
- A. Submit shop drawings in accordance with Section 26 05 10 Electrical Work – General.
- 1.04 QUALITY ASSURANCE:
- A. Provide all material as specified.
 - B. Items provided under this section shall be listed and labeled by UL or other Nationally Recognized Testing laboratory (NRTL).
 1. Term “NRTL” shall be as defined in OSHA Regulation 1910.7.

2. Terms “listed” and “labeled” shall be as defined in NFPA 70, National Electrical Code, Article 100.

C. Regulatory requirements:

1. National Electrical Code (NEC): Components and installation shall comply with National Fire Protection Association (NFPA) 70.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

A. Rigid Metal Conduit, intermediate metal conduit and polyvinylchloride-coated rigid steel conduit.

1. Triangle/PWC, Inc.
2. Perma-Cote Industries.
3. Republic Steel Corporation.
4. Robroy Industries.
5. Allied Tube and Conduit.

B. Flexible Conduit:

1. American Flexible Conduit Company.
2. Anamet, Inc.
3. Electri-Flex Company.
4. International Metal Hose Company.

C. Boxes and Fittings:

1. O.Z./Gedney Company.
2. Crouse-Hinds Electrical Construction Materials.
3. Appleton Electric Company.

D. Support Systems:

1. Michigan Hanger Co., (O-Strut).
2. Thomas & Betts (Superstrut).
3. Unistrut Corp.

2.02 MATERIALS AND COMPONENTS:

A. Rigid Metal Conduit:

1. Provide galvanized rigid metal conduit, each with a coupling on one end and thread protector on other end.
2. Hot-dip galvanize rigid steel conduit over entire length, along interior and exterior surfaces, including threads. Conduit shall conform to UL 6.

B. Flexible-Metal Conduit:

1. Provide flexible-metal conduit for use in dry areas and match fittings, size, and material to rigid conduit to which it is connected. Flexible-metal conduit shall conform to UL 1.
2. Provide liquid-tight flexible-metal conduit for use in damp areas consisting of flexible-metal conduit, with liquid-tight, sunlight-resistant jacket extruded over the conduit. On larger than 1-1/4 inch (30 mm), furnish separate external ground wire. Liquid-Tight flexible-metal conduit shall conform to UL 360.

C. Boxes:

1. In NEMA 1 and NEMA 12 areas, provide standard, sheet-metal, outlet and junction boxes constructed of code-gauge, galvanized sheet steel. Size each box as required by the NEC.
2. Provide boxes containing fixture studs for hanging fixtures. Use concrete-tight boxes for installation in concrete. Do not use shallow boxes unless building construction is such that it is impossible to use standard-depth boxes.
3. Provide outlet boxes and fittings for hazardous locations conforming to UL 886 for class, group, and division indicated.
4. Provide cast boxes with covers or device plates suitable for the area classification. Use cover screws of stainless steel or high brass for iron boxes.

D. Fittings:

1. Provide cast-iron fittings of malleable iron or a mixture of gray iron and cast steel.

2. Provide suitable expansion fittings where conduits cross expansion joints. Equip these fittings with grounding straps, clamps, and copper bonding jumpers.
3. Provide cast sealing fittings with epoxy for NEMA 7 applications.

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Perform all work in accordance with the National Electric Code.
- B. Use no conduit less than 3/4-inch (20 mm) in diameter, unless otherwise indicated.
- C. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's printed instructions.

3.02 INSTALLATION OF FITTINGS:

- A. Install expansion fittings wherever conduits cross structural expansion joints. Keep the fittings in line with conduit, and install with regard to temperature so that full working range of expansion is available.
- B. Do not install fittings to replace elbows and pull boxes, unless space or other problems make use of fittings necessary. Use oversize fittings whenever large cable is installed, in order to maintain proper bending radius.
- C. Terminate ends of all floor conduits installed for future use with couplings and readily removable plugs set flush with finished floor surface. Cap spare wall conduits at wall where they enter building.
- D. Equip ends of all conduits with conduit fittings. Fit conduits terminating at motor control center or power distribution equipment, or in box above or below, with grounding type bushings, or solidly ground by locknuts or other acceptable fittings. Connect each grounding bushing to ground bus by a bare or green-covered copper wire. Do not use ground wire smaller than 12 AWG. Install ground wire larger than 12 AWG when required by NEC. Where conduits terminate in unprotected areas or where bonding is required over expansion joint, flexible conduit or equivalent; use ground wires 6 AWG. copper or larger.
- E. Terminate conduits entering gasketed sheet-metal boxes or gasketed sheet-metal equipment enclosures with gasketed hubs.
- F. Terminate conduits entering nongasketed sheet-metal boxes or enclosures with double locknuts and insulated bushings, or with acceptable equivalent.

- G. Join raceways with fittings listed for the purpose. Make joints tight. Use raceway fittings compatible with raceway and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, except as otherwise indicated.
 - 1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
 - 2. Use insulating bushings to protect conductors.
 - 3. Tighten set screws of threadless fittings with suitable tool.

3.03 INSTALLATION OF RACEWAYS:

- A. Install exposed raceways parallel or at right angles to walls and ceiling beams. Make all changes in directions with listed bends, elbows, and pull boxes. Space parallel runs uniformly throughout. Secure in place by hangers and fasteners. Ground raceways by connection to properly grounded enclosures, bonding, or other means, to obtain permanent low resistance path to ground throughout installation. Ensure that raceway sections in single run and in parallel runs are of same type and finish.
 - 1. Run parallel or banked raceways together, on common supports where practical.
 - 2. Install raceways level and square and at proper elevations. Provide minimum 7 feet (2 m) headroom.
- B. Support raceways concealed above suspended ceilings from slab above ceiling in same manner as exposed raceways. Do not support raceways from ceiling supports.
- C. Support conduits by hangers or pipe straps spaced according to NEC, but in no case more than 10 feet (3 m) on centers.
- D. Provide hot-dipped galvanized supports for galvanized conduit.
- E. Provide sleeves passing through exterior walls and slabs which are wall entrance seals of watertight construction. For new construction, furnish watertight seal between slab and sleeve, and between sleeve and conduit or cable similar to O.Z./Gedney Type "FSK". For existing construction, furnish watertight seal for use in core bit drilled holes that provides seal between concrete and conduit or cable similar to O.Z./Gedney Type "CSM1". Use wall-entrance seals of malleable iron with watertight sealing gland which may be tightened any time after installation.
- F. Do not use dissimilar metals in conjunction with each other. Use an insulation between adjoining surfaces so as to eliminate direct contact and any resultant electrolysis. Maintain electrical continuity of system. Use bituminous impregnated felt, heavy bituminous coatings, nonmetallic separators or washers, or other acceptable materials as insulation.

- G. Install fittings to match raceway being used.
 - H. Install expansion fittings wherever conduits cross structural expansion joints at connections between buildings. Keep fittings in line with conduit, and install with regard to temperature so that full working range of expansion is available.
 - I. Provide separate raceways for all low voltage instrumentation raceways (50 volts and below) from control and power raceways.
 - J. Terminations: Where raceways are terminated with locknuts and bushings, align the raceway to enter squarely, and install the locknuts with dished part against the box; use two locknuts, one inside and one outside the box.
 - K. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box, and tighten the chase nipple so no threads are exposed.
 - L. Install pull wires in all empty raceways. Use 14 AWG zinc-coated steel or monofilament plastic line having not less than 200 lb (75 kg) tensile strength. Leave not less than 12 inches (300 mm) of slack at each end of the pull wire.
 - M. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot water pipes. Install horizontal raceway runs above water and steam piping.
 - N. Complete raceway installation before beginning conductor installation.
 - O. Use temporary closures to prevent foreign matter from entering raceway.
 - P. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.
 - Q. Where metal conduits rise through floor slabs in wet areas, coat conduits for a distance of 6 inches (150 mm) above and below slab grade with brush coat of waterproof bituminous cement before pouring cement.
- 3.04 BENDS:
- A. Make all bends carefully to prevent distortion of circular cross section. Field bend conduit shall have an inside radius of not less than nine diameters.
 - B. Where bends of less than nine diameters are necessary, use standard factory elbows. Size conduit to permit cable-bending radius within the factory elbow of at least eight times cable diameter.

- C. Allow no conduit greater than 50 feet (15.2 meters) to have more than two 90 degree bends or equivalent thereof between pulling points. For conduits less than 50 feet (15.2 meters) in length, allow only three 90 degree bends between pulling points.

3.05 CUTTING, THREADING AND CONNECTING:

- A. Make all field cuts in conduits squarely, file cut ends, ream to remove rough edges and thread in accordance with NEC. No running thread permitted. Make all connections mechanically strong and tight, and with acceptable connectors. Where conduit surface coating is damaged or removed in the cutting, threading or reaming process, restore the surface to its original condition.

3.06 CONDUIT CLEANING:

- A. Clean all conduit carefully before and after installation, ream ends free of burrs, and free inside surfaces from all imperfections likely to injure cable.
- B. After installation of each complete new conduit run, snake the run with band to which is attached a tube cleaner with cylindrical mandrel of a diameter not less than 85 percent of nominal diameter of conduit. Remove and replace all conduit through which mandrel will not pass.
- C. Use a sponge with steel brush to clean steel conduit and use a sponge with nylon brush to clean PVC conduits.
- D. After cleaning, protect ends of all conduit with standard caps to prevent entrance of water, concrete, debris, or other foreign substance.

3.07 CONDUIT DRAINAGE:

- A. Where practicable, pitch conduit to drain to outlet boxes, or install so as to avoid trapping moisture. Where dips are unavoidable in exposed conduits, install fitting with drain hole at low point.

3.08 INSTALLATION OF BOXES:

- A. Unless otherwise indicated, install sheet metal boxes only in dry, accessible locations. Install cast-metal boxes in exterior concrete or masonry walls, in floor slabs, in basements, all other below grade locations and elsewhere as indicated. Cast metal boxes shall be used (unless otherwise indicated) where vapor-tight fixtures are required, for all surface mounting of wall switches and receptacles and for all outdoor use. Install pull boxes for motor control centers and large ceiling hung boxes where indicated.

- B. Install boxes in conformance with all the requirements of NEC. Install boxes designed for type of construction involved. Support boxes in same manner as required for conduit. Size boxes to provide bending radius for wire or cable of at least eight times diameter or in accordance with NEC, whichever is larger.
- C. Center all outlets in panels, or spaces and adjust to structural finish. Where specific locations are not indicated, locate outlets with respect to equipment served.
- D. Place all outlet boxes, junction boxes and pull boxes, in accessible locations when they are installed above or behind plastered ceilings, furred spaces, or suspended ceilings. Install access panels of suitable size. Mark all access panels for all boxes so panels can be readily located in future. Mark, using metal tabs or plastic buttons which cannot mark ceilings or walls, appropriate for type of construction being used.
- E. Assemble cast-metal boxes with threaded conduit hubs in such manner that conduit connections and gasketed covers are watertight. Close all unused threaded openings with pipe plugs and compound.
- F. Provide cast boxes with covers and device plates suitable for the area classification. Install screws of stainless steel or high brass for iron boxes.

3.09 FLEXIBLE CONNECTIONS:

- A. At electrically operated equipment to which conduit connections are made, install with a complete connection between end of conduit and terminal box of motor or other equipment.
- B. Make connections between rigid raceway and equipment subject to vibration and adjustment using flexible conduit. Make each connection with at least one quarter bend so that no vibration can be transmitted beyond flexible connection.
- C. Install flexible metal conduit, fittings, and accessories in dry areas in accordance with requirements of NEC.
- D. Install liquid-tight flexible metal conduit. Locate conduit to reduce the possibility of damage to the exterior coating. Use fittings that screw into flexible conduit and provide gaskets.

3.10 PROTECTION:

- A. Provide protection and install in accordance with manufacturer printed instructions. The conduit and raceway equipment manufacturers, to ensure that coatings, finishes, and enclosures are without damage or deterioration at completion of project.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

2. Repair damage to PVC or paint finishes with matching touch-up coating recommended by the manufacturer.

3.11 FINAL SYSTEM ACCEPTANCE:

- A. Upon completion of installation of system, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions and at no additional cost to the Owner.

END OF SECTION

SECTION 16120

ELECTRIC WIRES AND CABLES

PART 1 - GENERAL

1.01 DESCRIPTION:

- A. Provide wires and cables for complete electrical systems as indicated and specified.

1.02 REFERENCES:

- A. American Society for Testing and Materials International (ASTM):

- 1. B3: Soft or Annealed Copper Wire.
- 2. B8: Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft.
- 3. B33: Tinned Soft or Annealed Copper Wire for Electrical Purposes.

- B. Insulated Cables Engineers Association, Inc. (ICEA)/National Electrical Mfg's Association (NEMA):

- 1. S-61-4021/WC 5: Thermoplastic Insulated Wire & Cable.
- 2. S-66-524/NEMA WC 7; Cross-Linked-Thermosetting-Polyethylene Insulated Wire and Cable.
- 3. S-68-516/WC 8: Ethylene-Propylene-Rubber-Insulated Wire & Cable.

- C. National Fire Protection Association (NFPA):

- 1. 70: National Electrical Code (NEC).

- D. American National Standards Institute (ANSI)/Telecommunications Industry Association (TIA)/Electronic Industries Association (EIA):

- 1. ANSI/TIA/EIA-568-B; Commercial Building Telecommunications Cabling Standards.

- E. Underwriters Laboratories, Inc. (UL):

- 1. 44: Thermoset-Insulated Wires and Cables.
- 2. 83: Thermoplastic-Insulated Wires and Cables.

3. 854: Service Entrance Cables.

1.03 SUBMITTALS:

A. Submit the following shop drawings in accordance with Division 1:

1. Submit shop drawings and manufacturer's product data in accordance with the requirements of Section 16050.

1.04 DELIVERY STORAGE AND HANDLING:

A. Deliver wire and cables in full reels protected against injury. Deliver reels with factory attached UL approved tags showing the manufacturers name and the type of insulation, size, and length of wire in each coil or reel.

B. Accept wire and cable on site in manufacturer's packaging. Inspect for damage

C. Store and protect in accordance with manufacturer's instructions.

D. Protect from weather. Provide adequate ventilation to prevent condensation.

1.05 DESIGN CRITERIA:

A. Wire for three phase circuits shall be Type XHHW.

B. Service conductors shall be 600V rated type RHW.

C. Single conductor wire for control, indication and metering shall be Type THWN/THHN No. 12 or 14 AWG, stranded.

D. Multi-conductor control cable shall be used for the underground system and shall be No. 12 or 14 AWG, stranded with overall jacket.

E. Wire for process instrumentation shall be twisted shielded pairs No. 16 AWG, 600V rated, stranded with overall jacket.

F. Ground wires shall be Type THW, green. Bare ground wires shall be soft drawn copper, 98 percent conductivity.

PART 2 - PRODUCTS

2.01 MANUFACTURERS:

1. Okonite.

2. Southwire.
 3. American Insulated Wire.
- B. Control and Metering Wire:
1. Belden Wire and Cable.
 2. Alpha Wire.
 3. Coleman Cable.

2.02 MATERIALS AND COMPONENTS:

- A. Furnish copper conductors. Material and stranding of conductors to conform to ASTM B3, ASTM B33, and to ASTM B8, for the appropriate class.
- B. Uncoated, soft or annealed copper wire conforming to ASTM B3.
- C. Wires and Cables for Maximum 600-Volt Power Circuits: For No. 8 AWG gauge and smaller provide type THWN/THHN or RHW. Where used in lighting or receptacle branch circuits provide No. 12 AWG gauge and No. 10 AWG gauge as solid conductor. Provide other wire with Class C stranding. Provide No. 6 AWG gauge and larger as XHHW-2 with Class B stranding. Provide wires and cable conforming to UL 83.
- D. Wires and Cables for Control, Indicating, Metering, or Alarm Circuits: Single and multi-conductor control cable, copper conductors, Class B or C stranding. Insulation; 600-volt polyethylene, polyvinylchloride, or EPR. Continuous rating of 90C dry and 75C wet. Color coding conforming to Table K-2, ICEA/NEMA S-61-4021/WC 5.
- E. Shielded Cable for Instrumentation Wiring: 7-strand copper conductors, size No. 16 AWG. Insulate conductors individually with color coded polyethylene or polyvinylchloride. Twist pairs with varying lay (if more than one pair) and cover with cable tape and copper or aluminum coated Mylar shielding tape and tinned copper drain wire. Jacket: polyvinylchloride. Cables: rated 600 volts and 90 degrees C.
- F. Category 5e Cable: Category 5e cable shall consist of 4 twisted pairs of different lay and ground wires, enclosed by an overall conductive mylar backed aluminum foil shield. This shall be enclosed by an overall thermoplastic jacket. The cable shall meet the applicable requirements of ANSI/TIA/IEA-568-B.

PART 3 - EXECUTION

3.01 GENERAL:

- A. Perform work in accordance with the National Electrical Code.
- B. Provide power cable identification as follows:

System Voltage	Neutral	Phase A	Phase B	Phase C
208/120V	White	Black	Red	Blue
240/120V	White-Gray Stripe	Black-Blue Stripe	Red-Blue Stripe	None
480/277V	Gray	Brown	Orange	Yellow

- C. Use green to identify insulated ground conductors.

NOTE: Colored insulation, tapes or sleeves may be used to provide color coding. Insulated ground conductors must have green covering.
- D. Permanently post means of identification of grounded and ungrounded conductors for each nominal voltage system at each panelboard and motor control center.
- E. In power and multiconductor cables manufactured without a grounding conductor identify one of the multiconductors as the equipment grounding conductor at each cable end and at every point where the conductors are accessible.

3.02 INSTALLATION OF WIRING:

- A. Unless otherwise indicated, use no conductor smaller than No. 12 AWG for power, No. 14 AWG for control, and No. 16 AWG for shielded applications.
- B. Number and sizes of wires and conduits indicated are a guide only and are not necessarily correct for the actual equipment installed. Install as many wires and conduits as necessary for complete electrical system, and provide adequately for the equipment actually installed.
- C. Install conductors continuous from outlet to outlet and make no splices except within outlet or junction boxes.
- D. Install cable in underground raceway system without splices. There shall be no splices between connection points unless otherwise indicated.
- E. Draw all conductors contained within a single conduit at the same time.

- F. Apply wire pulling compound to conductors being drawn through conduits. Use pulling compound, Minerallac No. 100, Y-er-Eas, Yellow 77, High Performance Polywater Cable Lubricant or acceptable equivalent.
- G. Use no cable bend with radius of less than eight times its diameter.
- H. Wires and cables installed without prior submittal review are subject to removal at no additional expense.

3.03 CONDUCTOR IDENTIFICATION:

- A. Label each wire at both termination points. Carry individual conductor or circuit identification throughout, with circuit numbers or other identification clearly stamped on terminal boards and printed on directory cards in distribution cabinets and panelboards.
- B. Identify each wire in junction boxes, cabinets, and terminal boxes where total number of control, indicating, and metering wires is three or more and no terminal board is provided, including all power wire. Where no termination is made use a plastic-coated, self-adhesive, wire marker and where termination is made use a, plastic, pre-printed sleeve wire marker.
- C. In cases similar to above where terminal boards are provided for the control, indicating, and metering wires, identify all wires including motor leads and other power wires too large for connection to terminal boards, by sleeve wire markers as specified above.
- D. In manholes and handholes, identify each power wire by laminated plastic tag located so it is easily seen. Control wires to be bundled and marked as listed in conduit and wire schedule.

3.04 CONNECTORS, TERMINAL LUGS AND BOARDS:

- A. For wiring of circuits consisting of No. 10 or No. 12 AWG solid wires, such as for lighting branch circuits, use self-insulated pressure type connectors for all splices or joints.
- B. Terminate all wires connected to terminal boards, terminal blocks, or to other similar terminals by means of ring and tongue, nylon self-insulated, tin-plated copper pressure terminals.
- C. Terminal boards shall be 600 volts and rated for 125 percent of the ampacity of the connected circuit. They shall have screw terminals, with white marking strips for wire identification, of the 4-, 6-, 8-, or 12-pole type, as necessary.
- D. Wire connections for which terminals are not supplied, for example, at solenoids or motor terminal junction boxes:

1. 10 AWG and smaller: Use self insulated pressure-type connectors.
 2. 8 AWG and larger: Use insulated, mechanical type with set screw or follower bearing directly on the wire. Split bolt connectors are not acceptable.
- E. Clearly and permanently mark terminal strips with ink or indelible pencil. Mark each wire consistently throughout entire system, using notation of wires given on manufacturer's wiring diagrams wherever possible.
- 3.05 FIELD TESTING:
- A. Submit results of all cable tests on forms indicating cable size, voltage, and date with name of tester and witness in accordance with Section 16950.

END OF SECTION

SECTION 16949

ELECTRICAL DEMOLITION OF EXISTING ELECTRICAL EQUIPMENT

PART 1 – GENERAL

1.01 DESCRIPTION:

- A. Provide labor to remove items defined by Contract Drawings, provide materials and hardware for patching, plugging and refurbishing equipment intended for re-use.
- B. Perform bus and enclosure modifications at existing equipment where required for the installation of the new cable bus systems.

1.02 REFERENCE STANDARDS:

- A. National Electrical Manufacturers Association - NEMA.
- B. National Electrical Code.
- C. State and Local Codes.
- D. UL: Underwriter's Laboratories Inc., Pfingsten Road, Northbrook, IL
- E. OSHA: Occupational Safety & Health Administration, North St., Boston, MA.

1.03 QUALITY ASSURANCE:

- A. Provide the services of a licensed electrician skilled in the voltage levels and materials used within the electrical demolition work.
- B. Disconnect all electrical equipment indicated to be removed, relocated or demolished.
- C. All reconnection or temporary wiring required by the demolition shall be done by licensed electrical craftsmen in accordance with the NEC and all state and local codes as required by the local wiring inspector.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

3.01 ELECTRICAL DEMOLITION:

- A. The Electrical Contractor shall submit a demolition plan to the Owner for review fourteen days prior to any demolition. The demolition plan shall indicate the extent of equipment being removed or disconnected and the period of time the facility will remain in operation with reduced capability including outage durations. No demolition shall take place without the written acceptance of the demolition plan from the Owner.
- B. Erect temporary dust and mist tight barriers prior to the start of demolition in areas where electrical equipment is to remain energized.
- C. Dispose of the demolished equipment and materials by hauling off-site and disposing of at a state licensed facility with the exception of the temporary cables and bus duct assembly which shall be turned over to the Owner. Receipts for any hazardous material showing transportation carrier, and ultimate destination shall be turned over to the Owner for permanent record.
- D. Extent of Demolition:
 - 1. Demolition includes de-energizing and disconnecting all electrical equipment within the areas to be demolished as indicated. The Electrical Contractor is required to examine the Contract Drawings, visit the site, and discuss these areas with the Owner prior to the start of work.
 - 2. The removal of electrical equipment after de-energization and disconnection will be the responsibility of the Electrical Contractor.
- E. Ensure that all equipment and hardware items are on hand before attempting any demolition or remedial work.
- F. Provide any temporary connections that may be required for plant operations.

END OF SECTION

SECTION 16950

FIELD INSPECTION AND ACCEPTANCE TESTS

PART 1 – GENERAL

1.01 DESCRIPTION:

- A. After electrical installation is complete, perform tests to demonstrate that entire system is in proper working order and in accordance with drawings and specifications. Do not perform tests less than those outlined hereafter, unless requested in writing and approved by Engineer. Tests are in addition to, and no substitution for, tests of individual items at manufacturer's plant. Perform insulation and ground resistance tests before operating tests. Determine proper phasing before permanent connections are made.
- B. Pay all costs for tests including expenses incident to retests occasioned by defects and failures of equipment to meet specifications.
 - 1. Replace wiring and equipment found defective, or failing to meet specified requirements, at no additional cost, unless written acceptance for repair is given by Engineer.
 - 2. Furnish three copies of all test results to Engineer.
 - 3. Unless otherwise specified, Owner will supply electric current for tests.

1.02 REFERENCES:

- A. NEMA: National Electrical Manufacturers Association, 2101 L Street, Northwest, Washington D.C.
- B. IEEE: Institute of Electrical and Electronic Engineers, 345 East 47th Street, New York, NY.

1.03 SUBMITTALS:

- A. Submit the following in accordance with Division 1:
 - 1. Submit data sheets for the insulation resistance testing of conductors prior to performing operating testing.
 - a. Provide space on data sheets to enter the results of testing, instruments used with serial numbers, and name of personnel performing testing.

2. Submit data sheets for ground system testing in accordance with paragraph 3.02 of this specification section.

PART 2 – PRODUCTS

2.01 TESTING EQUIPMENT:

A. Calibration:

1. Make openings in circuits for testing instruments and place and connect all instruments, equipment, and devices, for the tests. Upon completion of tests, remove instruments and instrument connections and restore all circuits to permanent condition.
2. Other sections of specifications require services of one or more manufacturer's representatives, to ensure that equipment supplied has been installed properly and adjusted to proper working order. Advise representative of applicable tests in this Section, so that work will be coordinated, and tests combined where feasible.

2.02 TESTING:

A. Coordination:

1. Coordinate activities, and cooperate with others on project, to ensure that systems are energized when required, loads applied, and other requirements of Section are carried out on timely, coordinated basis.

B. Preparation:

1. Make up no connections at service entrance equipment and generator permanently until correct phase rotation of all equipment is determined. Install and insulate these connections temporarily, if necessary, while determining proper rotation. Make permanent connections after proper rotation has been established and subsequent to completion of insulation resistance and dielectric tests.
2. Verify conductors are properly labeled or tagged to ensure correct phase and rotation connection of the power system.

PART 3 - EXECUTION

3.00 INSTALLATION VERIFICATION:

A. Open all electrical equipment enclosures for inspection by the Engineers.

B. Remedy all installations which do not conform to NEC criteria or show evidence of poor workmanship.

3.01 INSULATION RESISTANCE TESTS OF CIRCUITS, 600 VOLTS AND BELOW:

- A. Do not subject conductors rated 600 volts and below to high potential dielectric tests. Test each complete feeder and branch circuit of 600 volts or below with everything but power supply and power-consuming equipment, connected thereto, and have an insulation resistance between conductors and between each conductor and ground of not less than 1,000,000 ohms, unless otherwise accepted by Engineer.
- B. Determine insulation resistance values with switchboards, panelboards, fuseholders, switches, receptacles, and overcurrent devices in place.
- C. Use megohmmeter having output of at least 500 volts to determine insulation resistance value for 600 volt rated conductors.
- D. List each circuit and measured resistance as test data on data sheets as described in paragraph 1.03.
- E. Maintain written record of all insulation resistance values. Identify conductor, or equipment, date that value was taken and resistance value. Arrange information in suitable neat tabular form and submit to Engineer in triplicate.

3.02 GROUND RESISTANCE:

- A. Test each ground rod in accordance with IEEE Std. 142, and submit tabulation of results to Engineer. Include identification of electrode, date of reading and ground resistance value in results.
- B. Test each entire grounding system for continuity of connections and for resistance. Ensure that ground resistance of conduits, equipment cases, and supporting frames does not vary appreciably from that of system as whole and does not exceed 5 Ohms.

3.03 OPERATING TESTS:

- A. Operate switches, circuit breakers and control devices to verify correct operation.
- B. Where tests of any of above-referenced equipment included in other Sections of specifications, coordinate testing, as directed by Engineer, to avoid duplication and conflict between tests.
- C. Perform above tests in addition to, and not in substitution for required manufacturer's factory tests of individual items.

END OF SECTION