SPECIFICATIONS AND CONTRACT DOCUMENTS

FOR

LOGAN WELL FIELD GENERATOR

CITY OF LOGAN, IOWA

JUNE 2023

VEENSTRA & KIMM INC.

SPECIFICATIONS AND CONTRACT DOCUMENTS
FOR
LOGAN WELL FIELD GENERATOR

LOGAN, IOWA

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

Signed: Dated:

6-22-23

Chad P. Kehrt, P.E.
Iowa License No. 19150
My license renewal date is December 31, 2023

Detailed parts covered by this seal:

Prepared by
VEENSTRA & KIMM, INC.
Sergeant Bluff, Iowa

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LOGAN, IOWA

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NOTICE OF PUBLIC HEARING ON PROPOSED PLANS, SPECIFICATIONS, FORM OF CONTRACT AND ESTIMATE OF COST FOR THE LOGAN WELL FIELD GENERATOR PROJECT FOR THE CITY OF LOGAN, IOWA.

Notice Is Hereby Given: That at 6:00 p.m. at the City Hall, 108 W. 4th Street, Logan, Iowa, on July 24, 2023, the City Council of the City of Logan, Iowa (the "City") will hold a public hearing on the proposed plans and specifications, form of contract and estimate of cost (the "Contract Documents") for the proposed Logan Well Field Generator Project.

The improvements to be constructed in connection with the Project shall generally consist of the following:

LOGAN WELL FIELD GENERATOR

Project consists of providing a new fully functional standby generator to operate the City's well field. Project includes all labor, materials, and equipment necessary to supply new generator to the site, PCC generator pad, supply and install 1,000-gallon propane tank, PCC propane tank pad, grading, connecting generator to existing system, mobilization, miscellaneous work, and cleanup.

Detailed information regarding the physical elements of the Project is available for inspection at the office of the City Clerk. A copy of the proposed Contract Documents is also on file for public inspection in the office of the City Clerk.

At said hearing any interested person may file written objections or comments and may be heard orally with respect to the subject matter of the hearing.

This notice is given by order of the City Council of the City of Logan, Iowa.

Angela Winther,
City Clerk/Administrator

NOTICE TO BIDDERS

LOGAN WELL FIELD GENERATOR
LOGAN, IOWA

Sealed bids for the work comprising of the improvements as stated below must be filed before 1:00 PM on July 20, 2023, in the office of the City Clerk at City Hall, 108 W. 4TH Street, Logan, Iowa. Bids received after the deadline for submission of bids as stated herein shall not be considered and shall be returned to the late bidder unopened.

Sealed proposals will be opened and tabulated at 1:00 PM on July 20, 2023, in the office of the City Clerk at City Hall, 108 W. 4th Street, Logan, Iowa for consideration by the City Council at its meeting on July 24, 2023. Consideration of the award of contract would subsequently occur by the Logan City Council at the same meeting, at 6:00 P.M. on July 24, 2023, at City Hall, presided over by the Mayor.

The Notice to Proceed will be issued upon approval of the contract by the Council and be completed as stated below.

The Work will include but is not limited to the following improvements:

LOGAN WELL FIELD GENERATOR

Project consists of providing a new fully functional standby generator to operate the City's well field. Project includes all labor, materials, and equipment necessary to supply new generator to the site, PCC generator pad, supply and install 1,000-gallon propane tank, PCC propane tank pad, grading, connecting generator to existing system, mobilization, miscellaneous work, and cleanup.

Copies of the bid documents including project drawings and technical specifications will be on file and may be inspected at the Office of the City Clerk at City Hall, 108 W. 4th Street, Logan, Iowa. Electronic copies of the project documents will be available at www.QuestCDN.com. Downloads of the project documents require the user to register for a free membership at www.QuestCDN.com. Please contact QuestCDN.com for assistance with free membership registration. A complete paper set of bid documents, including the Plans and Specifications, may be obtained from the Engineer, Veenstra & Kimm, Inc., 203 Sergeant Square Drive, Suite B, Sergeant Bluff, IA 51054, email nwiowa@v-k.net, phone (712) 943-5055.

All bids must be filed at City Hall on or before the time herein set. All bids shall be made on forms furnished by the City and obtained from Veenstra & Kimm, Inc., 203 Sergeant Square Drive, Suite B, Sergeant Bluff, IA 51054, (712) 943-5055 and must be enclosed in a separate sealed envelope and plainly identified.

Each bidder shall accompany its bid with bid security as defined in Iowa Code Section 26.8, as security that the successful bidder will enter into a contract for the work bid upon and will furnish

after the award of contract a corporate surety bond, in a form acceptable to the City of Logan, for the faithful performance of the contract, in an amount equal to 100% of the amount of the contract. The bidder's security shall be in the amount fixed in the Instruction to Bidders and shall be in the form of a cashier's check or a certified check drawn on an FDIC insured bank in Iowa or on an FDIC insured bank chartered under the laws of the United States; or a certified share draft drawn on a credit union in Iowa or chartered under the laws of the United States; or a bid bond on the form provided in the contract documents with corporate surety satisfactory to the City of Logan. The bid shall contain no condition except as provided in the specifications.

The Certified Check, Certified Share Draft or Cashier's Check may be cashed, or the Bid Bond forfeited, and the proceeds retained as liquidated damages if the bidder fails to execute a contract or file acceptable performance bonds or provide an acceptable certificate of insurance within ten (10) days after the acceptance of his proposal by resolution of the City.

The City of Logan reserves the right to defer acceptance of any bid for a period of sixty (60) calendar days after receipt of bids and no bid may be withdrawn during this period.

Each successful bidder will be required to furnish a corporate surety bond in an amount equal to 100% of its contract price. Said bond shall be issued by a responsible surety approved by the City of Logan and shall guarantee the faithful performance of the contract and the terms and conditions therein contained and shall guarantee the prompt payment of all material and labor, and protect and save harmless the City of Logan from claims and damages of any kind caused by the operations of the contract and shall also guarantee the maintenance of the improvement caused by failures in materials and construction for a period of two years from and after acceptance of the contract. The guaranteed maintenance period for new paving, if applicable, shall be four years.

All Contractor(s) and subcontractor(s) are required to obtain tax exemption certificates from the City of Logan, Iowa for this project. These tax exemption certificates are only for use on this specific project as covered under the Contract.

Contractor shall fully complete the project no later than the date proposed on the proposal form in their sealed bid. Should the contractor fail to complete the work in this timeframe, liquidated damages of $500.00 per calendar day will be assessed for work not completed within the designated contract term. Contractor shall put forth a consistent effort to continually move the project forward. While it is understood that weather delays are unavoidable, Contractor's absence beyond these times shall not be acceptable.

By virtue of statutory authority preference will be given to products and provisions grown and coal produced within the State of Iowa and to Iowa domestic labor.

In accordance with Iowa statutes, a resident bidder shall be allowed a preference as against a nonresident bidder from a state or foreign country if that state or foreign country gives or requires any preference to bidders from that state or foreign country, including but not limited

to any preference to bidders, the imposition of any type of labor force preference, or any other form of preferential treatment to bidders or laborers from that state or foreign country. The preference allowed shall be equal to the preference given or required by the state or foreign country in which the nonresident bidder is a resident. In the instance of a resident labor force preference, a nonresident bidder shall apply the same resident labor force preference to a public improvement in this state as would be required in the construction of a public improvement by the state or foreign country in which the nonresident bidder is a resident.

Failure to submit a fully completed Bidder Status Form with the bid may result in the bid being deemed nonresponsive and result in the bid being rejected.

Award of contract will be made after an evaluation of the most responsive, responsible bid for the total bid price of construction as selected by the City. The City of Logan reserves the right to reject any or all bids, to waive informalities, and to enter into such contract, or contracts, as it shall deem to be in the best interest of the City.

This notice is given by authority of the City of Logan, Iowa,

By: Angela Winther

Title: City Clerk / Administrator

Posted on the Construction Update Online Plan Room website at www.mbionline.com and on the City's website at www.loganiowa.com

SECTION 00100

INSTRUCTIONS TO BIDDERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Definition of Terms (1.02)
B. Bidding and Contract Documents (1.03)
C. Examination of Work (1.04)
D. Qualifications of Bidders (1.05)
E. Pre-Bid Conference (1.06)
F. Contract Time (1.07)
G. Liquidated Damages (1.08)
H. Substitute and “Or Equal” Items (1.09)
I. Subcontractors, Suppliers and Others (1.10)
J. Method of Bidding (1.11)
K. Preparation and Submission of Bids (1.12)
L. Bid Security (1.13)
M. Iowa Reciprocal Preference (1.14)
N. Evaluation of Bids (1.15)
O. Withdrawal of Bids (1.16)
P. Opening of Bids (1.17)
Q. Notice of Award (1.18)
R. Execution of Contract (1.19)
S. Contract Termination (1.20)
T. Taxes (1.21)
U. Preference for Labor and Materials (1.22)
V. Payment (1.23)
W. Period of Guarantee and Bond (1.24)
X. Permits (1.25)

1.02 DEFINITION OF TERMS

A. "OWNER" and “City” shall mean the City of Logan, Iowa, acting through the City Council or an authorized representative of the City Council.

B. "Person" shall mean any individual, partnership, society, association, joint stock company, corporation, estate, receiver, trustee, assignee or referee, whether appointed by a court or otherwise, and any combination of individuals.

C. "Bidder" shall mean any person who submits a Proposal to furnish the work described in the Contract Documents.

D. The term "Successful Bidder" means the lowest, qualified, responsible and responsive Bidder to whom OWNER (on the basis of OWNER'S evaluation as hereinafter provided) makes an award of Contract. Lowest bid shall be determined as stipulated in Article 1.15, Evaluation of Bids.

E. "CONTRACTOR" shall mean the person with whom the OWNER may enter into Contract for the execution of the work specified.

F. "Subcontractor" shall mean the person supplying materials, labor, equipment and appurtenances for the work, such person having contractual relations with the CONTRACTOR, but not with the OWNER.

G. "ENGINEER" shall mean VEENSTRA & KIMM, INC., Sergeant Bluff, Iowa, up to and including preparation of Plans and Specifications, Bidding Documents, Contract Documents and Bid Letting, Construction Phases.

H. The term "Bidding Documents" includes the Advertisement or Invitation to Bid, Instructions to Bidders, the Bid Form, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

I. The term(s) “Construct”, “Provide”, “Provide and/or Construct”, under this Contract, CONTRACTOR shall furnish and install item or system specified. CONTRACTOR shall perform all labor and furnish all materials and equipment necessary so that the item or system will be complete and operational in every respect.

J. The term “Furnish” under this Contract, CONTRACTOR shall deliver to the site, unload and properly store item(s) specified, as well as additional specialized materials, and/or accessories necessary for the use and operation of item(s) specified.

K. The term “Install” under this Contract, CONTRACTOR shall uncrate, set in position, connect (including sub-assemblies furnished) and adjust for use. CONTRACTOR shall provide miscellaneous specialty items such as fasteners, hangars, values, union, piping, sheet metal, etc., as obviously necessary for a complete and operating installation.

L. "Standard Drawings" shall mean construction Standard Detail Figures bound with the plans.

M. "Work" shall mean the work to be done and the equipment, materials, supplies and appurtenances to be furnished under the Contract, unless some other meaning is indicated by the context.

N. "Station", "Sta." shall mean one hundred (100) linear feet measure.

O. "Or equal" shall follow manufacturers' names used to establish standards and, if not stated, is implied.

P. "Or approved equal" shall follow manufacturers names approved for use in project. Manufacturers who are not listed may not be used without approval of ENGINEER prior to bidding.

Q. “Substantial Completion” shall mean the time at which the work (or a specified part thereof) has progressed to the point where, in the opinion of the ENGINEER, the work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “Substantially Complete” and “Substantially Completed” as applied to all or part of the work refer to Substantial Completion thereof.

R. “Final Completion” shall mean the time when all work is completed and the ENGINEER is of the opinion a Certificate of Completion can be issued and that the OWNER can make Final Acceptance of the work and approve final payment for the work.

S. Issuing Office – The ENGINEER’S office from which the Bidding Documents are to be issued.

1.03 BIDDING AND CONTRACT DOCUMENTS

A. Contract Documents, sometimes referred to as the "plans and specifications," shall mean and include the following parts as used herein:

1. Notice of Hearing and Letting
2. Instructions to Bidders
3. Proposal
4. Contract
5. Bonds
6. General Conditions
7. Special Conditions
8. Plans List
9. Detailed Specifications
10. Plans listed in the specifications
11. Numbered addenda issued to the foregoing.

Bidding and Contract Documents, including plans and specifications governing the proposed construction, have been prepared by the ENGINEER.

Copies of the bid documents including project drawings and technical specifications will be on file and may be inspected at the Office of the City Clerk at City Hall, 108 W. 4th Street, Logan, Iowa. Electronic copies of the project documents will be available at www.QuestCDN.com. Downloads of the project documents require the user to register for a free membership at www.QuestCDN.com Please contact QuestCDN.com for assistance with free membership registration. A complete paper set of bid documents, including Plans and Specifications, may be obtained from the ENGINEER, Veenstra & Kimm, Inc, 203 Sergeant Square Drive, Suite B, Sergeant Bluff, IA 51054, email nwiowa@v-k.net, phone (712) 943-5055.

Complete sets of Bidding and Contract Documents must be used in preparing Bids; neither OWNER nor ENGINEER assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding and Contract Documents.

OWNER and ENGINEER in making copies of Bidding and Contract Documents available on the above terms do so only for the purpose of obtaining Bids on the Work and do not confer a license or grant permission for any other use.

1.04 EXAMINATION OF WORK

A. It is the responsibility of each Bidder before submitting a Bid, to (1) examine the Contract Documents thoroughly, (2) visit the site to become familiar with local conditions that may affect cost, progress, performance or furnishing of the Work, (3) consider federal, state and local Laws and Regulations that may affect cost, progress, performance or furnishing of the Work, (4) study and carefully correlate Bidder's observations with the Contract Documents, and (5) notify ENGINEER of all conflicts, errors or discrepancies in the Contract Documents.

B. Underground Facilities: Information and data reflected in the Contract Documents with respect to Underground Facilities at or contiguous to the site is based upon information and data furnished to OWNER and ENGINEER by owners of such Underground Facilities or others, and OWNER and ENGINEER do not assume responsibility for the accuracy or completeness thereof.

C. Before submitting a Bid, each Bidder will, at Bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests and studies and obtain any additional information and data which pertain to the physical conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance or furnishing of the Work and which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price and other terms and conditions of the Contract Documents. Bidders are responsible for obtaining utility locates and for any utilities damaged by soil boring activities.

D. On request in advance, and to the extent OWNER has control over the site, and schedule permitting, OWNER will provide each Bidder access to the site to conduct such explorations and tests as each Bidder deems necessary for submission of a Bid. OWNER will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on OWNER'S authority regarding the site. Bidder shall fill all holes, clean up, and restore the site to its former condition upon completion of such explorations. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of site conditions. Bidder shall comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by OWNER or by property owners or other entities controlling the site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs. Bidder shall conduct the desired Site visit during normal working hours and shall not disturb any ongoing operations at the Site. Site visits and work at the Site may be governed by an OWNER safety program if an OWNER safety program exists, it will be noted in the Supplementary Conditions.

E. The lands upon which the Work is to be performed, rights-of-way and easements for access thereto and other lands designated for use by CONTRACTOR in performing the Work are identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities or storage of materials and equipment are to be provided by CONTRACTOR. Easements for permanent structures or permanent changes in existing structures are to be obtained and paid for by OWNER unless otherwise provided in the Contract Documents.

F. Soil borings have not been made along the route of the proposed work.

G. It is Bidder's responsibility to carefully study all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings;

H. It is Bidder's responsibility to consider the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques,

sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs;

I. Bidders agree, based on the information and observations referred to in the preceding paragraph, that at the time of submitting its Bid no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents;

J. Bidders shall become aware of the general nature of the work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Bidding Documents;

K. The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 1.04, that without exception the Bid is premised upon performing and furnishing the Work required by the Contract Documents and such means, methods, techniques, sequences or procedures of construction as may be indicated in or required by the Contract Documents, and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance and furnishing of the work.

L. Adequacy of Data: Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions, and underground facilities, and possible changes in the Bidding Documents due to differing or unanticipated subsurface or physical conditions appear in Articles 1.21 and 1.22 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to perspective Bidders with respect to a Hazardous Environmental Condition uncovered or revealed at the site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the work, appear in Articles 1.35 and 1.36 of the General Conditions.

M. Other Work at Site: Reference is made to Article 1.05 WORK BY OTHER CONTRACTORS of Section 01010 - Summary of Work for the identification of the general nature of other work of which OWNER is aware (if any) that is to be performed at the Site by OWNER or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If OWNER is party to a written Contract for such other work, then on request, OWNER will provide to each Bidder access to examine such Contracts (other than portions thereof related to price and other confidential matters), if any.

1.05 QUALIFICATIONS OF BIDDERS

A. To demonstrate Bidder's qualifications to perform the work, after submitting its bid and within 5 days of OWNER'S or ENGINEER'S request, Bidder shall submit (a) written evidence establishing its qualifications such as financial data, previous experience, and present commitments, and (b) the following additional information:
   1. Certificate of Authority as noted below
   2. Current Registration as noted below
   3. _____

B. A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.

C. No requirement in this Article 1.05 to submit information will prejudice the right of OWNER to seek additional pertinent information regarding Bidder's qualifications.

D. If the apparent lowest responsive Bidder is a non-Iowa corporation, the firm shall submit proof (Certificate of Authority) to OWNER, prior to execution of contract, that the firm has been authorized by Secretary of State to do business in Iowa.

E. Apparent lowest responsive Bidder shall submit evidence of current registration as a CONTRACTOR with the Iowa Department of Labor by providing their Contractor Registration Number as issued by the Labor Commissioner pursuant to Section 91C.5 of the Code of Iowa.

F. Pursuant to Section 91C.2 and Section 91C.7 of the Code of Iowa an out of state CONTRACTOR shall either file a surety bond with the Division of Labor Services in the amount of twenty-five thousand dollars for a one-year period pursuant to Section 314.1. The Surety Bond filed shall be executed by a surety company authorized to do business in this state, and the bond shall be continuous in nature until canceled by the surety with not less than thirty days' written notice to the CONTRACTOR and to the Division of Labor Services of the Department of Workforce Development indicating the surety's desire to cancel the bond. The CONTRACTOR should contact the Division of Labor Contractor Registration at 515-242-5871 for further information. Prior to Contract execution, the ENGINEER may forward a copy of the proposed Agreement to the Iowa Department of Workforce Development as notification of pending construction work. It is the CONTRACTOR'S responsibility to comply with said Section 91C.7 before commencing work.

G. All prices that Bidder sets forth in its Bid shall be based on the presumption that the CONTRACTOR will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of "or-equal" or substitution requests are made at Bidder's sole risk.

H. Bidders are advised to carefully review those portions of the Bid Form requiring Bidder's representations and certifications.

1.06 PRE-BID CONFERENCE

A. No Pre-Bid Conference is scheduled for this project.

1.07 CONTRACT TIME

A. The number of days within which, or the dates by which, Milestones are to be achieved and the Work is to be substantially completed, and completed and ready for final payment, are set forth in the Bid Form.

1.08 LIQUIDATED DAMAGES

A. Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

1.09 SUBSTITUTE AND "OR EQUAL" ITEMS

A. The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration during the bidding and Contract award process of possible substitute or "or-equal" items. In cases in which the Contract allows the CONTRACTOR to request that ENGINEER authorize the use of a substitute or "or-equal" item of material or equipment, application for such acceptance may not be made to and will not be considered by ENGINEER until after the Effective Date of the Contract.

1.10 SUBCONTRACTORS, SUPPLIERS AND OTHERS

A. A Bidder shall be prepared to retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of the Work if required by the Bidding Documents to do so. If a prospective Bidder objects to retaining any such Subcontractor, Supplier, or other individual or entity, and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.

B. Subsequent to the submittal of the Bid, OWNER may not require the Successful Bidder or CONTRACTOR to retain any Subcontractor, Supplier, or other individual or entity against which CONTRACTOR has reasonable objection.

C. The apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to OWNER a list of the Subcontractors or Suppliers. If requested by OWNER, such list shall be accompanied by an experience statement with

pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, or other individual or entity. If OWNER or ENGINEER, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, OWNER may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder shall submit a substitute, Bidder's Bid price will be increased (or decreased) by the difference in cost occasioned by such substitution, and OWNER may consider such price adjustment in evaluating Bids and making the Contract award.

D. If apparent Successful Bidder declines to make any such substitution, OWNER may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, or other individuals or entities. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which OWNER or ENGINEER makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to OWNER and ENGINEER subject to subsequent revocation of such acceptance as provided in Article 1.05 of Section 00700 - General Conditions.

1.11 METHOD OF BIDDING

A. Bidders shall submit lump sum or unit prices, as required, for the work covered by the plans and specifications. Prices shall cover complete work and include all costs incidental thereto, unless indicated otherwise.

B. Bids will be computed using quantities shown in the Proposal. Where unit price bids are called for, quantities are approximate and only for comparison of bids. ENGINEER retains right to change location, quantities and combination of units as may be required during progress of construction. Compensation due CONTRACTOR will be computed on basis of final quantities of completed work.

C. In the event of discrepancies between unit prices and price extensions listed in Bidder's proposal, unit prices shall govern, and unit price extensions shall be corrected, if necessary, for agreement with unit prices. The total price will be determined on the basis of corrected extensions of the unit price.

D. Unit price for payment items included in the specifications, but not listed in the Proposal, will be negotiated, if needed.

1.12 PREPARATION AND SUBMISSION OF BIDS

A. The Bid Form is included with the Bidding Documents. Bidders shall submit the Proposal stamped "OWNER'S Copy" and the Proposal stamped "ENGINEER'S Copy". The Proposal stamped "OWNER'S Copy" is considered the original Proposal and shall be used for bidding. The copy of the Proposal stamped "ENGINEER'S Copy" is for the use of the

ENGINEER. The copy of the Proposal stamped "Bidder's Copy" is for the use of the Bidder. Submit “OWNER’S Copy” in a sealed envelope. Envelope shall bear return address of the Bidder and shall be addressed as follows:

To: City Administrator
City of Logan
108 W. 4th Street
Logan, Iowa 51546

Proposal For:
Logan Well Field Generator

B. All bids shall be submitted to the City Clerk of said City on or before the time set for receiving bids. All bids shall be made on official bidding forms furnished by the City or ENGINEER, and any alterations in the official form of bid will entitle the City Council, at its option, to reject the bid involved from consideration. Each bid shall be sealed and plainly identified.

C. Bids shall be signed by a legally authorized representative of the Bidder.

D. Bidders shall submit with Proposal the following documents:
1. Data requested in Proposal
2. Bid Security
3. Bidder Status Form (if required see Article 1.14 – Iowa Reciprocal Preference)

E. If the Bid is sent through the mail or other delivery system the sealed envelope shall be enclosed in a separate envelope with the notation "BID ENCLOSED" on the face of it.

F. Bid Form must be completed in ink or by typewriter. Bid Schedule can be made available electronically as an excel spreadsheet file. If CONTRACTOR elects to fill in Bid Schedule manually CONTRACTOR is responsible for filling in both “Unit Price” and “Extended Prices” and all subtotals and totals. If CONTRACTOR uses the Bid Schedule in excel format CONTRACTOR is responsible for filling in all “Unit Prices” and then printing Bid Schedule in a format similar to that included in Section 00300 - Bid Form.

G. Bids by corporations must be executed in the corporate name by the president or a vice president (or other corporate office accompanied by evidence of authority to sign) and the corporate seal must be affixed and attested by a secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.

H. A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown below the signature.

I. A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown below the signature.

J. A Bid by an individual shall show the Bidder's name and official address.

K. A Bid by a joint venture shall be executed by each joint venture in the manner indicated on the Bid Form. The official address of the joint venture must be shown below the signature.

L. All names must be typed or printed below the signatures.

M. The Bid shall contain an acknowledgment of receipt of all Addenda, whose numbers shall be filled in on Bid Form.

N. The address and telephone number for communications regarding Bid must be shown.

O. The Bid shall contain evidence of Bidder's authority and qualifications to do business in the state where the Project is located or covenant to obtain such authority and qualification prior to award of the Contract and attach such covenant to the Bid. Bidder’s state contractor license number, if any, shall also be shown on the Bid Form.

P. Bidders shall submit lump sum bids as required for work covered by the Contract Documents. Prices shall cover complete work and include all costs incidental thereto, unless indicated otherwise.

Q. Bids received by facsimile (fax) or by e-mail, or by other electronic means shall not be accepted.

R. Bids will be received up until the date and time identified in the Notice to Bidders. As an example, where the Notice states the Bids will be received until 11:00 A.M. mean Bids will NOT be accepted after 10:59:59 A.M.

S. All blanks on the Bid Form shall be completed in ink and the Bid Form signed in ink. Erasures or alterations shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.

T. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words “No Bid” or “Not Applicable.”

1.13 BID SECURITY

A. Each bid shall be accompanied by bid security in the form and amount set out in the Notice to Bidders. Bid Security amount shall be based on the Bidder's Maximum Bid Price (determined by adding Base Bid and all Alternates).

B. Bid security shall be enclosed in a sealed envelope with the bid, or in a separate sealed envelope.

C. The Bid security of the apparent Successful Bidder will be retained until OWNER awards the Contract to such Bidder, and such Bidder has executed the Contract Documents, furnished the required Contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required Contract security within 15 days after the Notice of Award, OWNER may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be OWNER's exclusive remedy if Bidder defaults.

D. The Bid security of other Bidders that OWNER believes to have a reasonable chance of receiving the award may be retained by OWNER until the earlier of seven days after the Effective Date of the Contract or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

E. Bid security of other Bidders that OWNER believes do not have a reasonable chance of receiving the award will be released within 30 days after the Bid opening.

F. Bidders shall use bid bond form included with specifications, see Section 00400 – Bid Bond.

G. Attorney-in-Fact must be specifically named through a written "Power of Attorney", a copy of which must be attached to Bid Bond.

1.14 IOWA RECIPROCAL PREFERENCE

A. In accordance with Iowa Code, 73A.21, when a Contract for public improvement is to be awarded to the lowest responsible Bidder, a resident Bidder is allowed a preference as against a non-resident Bidder if the non-resident Bidder's state or country gives or requires any preference to Bidders from that state or country, any imposition of labor force preference, or any other preferential treatment to Bidders or laborers from that state or country. The Iowa resident Bidder preference allowed must be equal to the preference of the non-resident Bidder's state or country of residence. With regard to a resident labor force preference, a non-resident Bidder's state or country of residence. With regard to a resident labor force preference, a non-resident Bidder is required to

apply the same resident labor force preference to a public improvement in Iowa as would be required in the non-resident's state or country of residence.

B. In accordance with the requirements of the Iowa Department of Labor all Bidders must submit a fully completed Bidder Status Form (See Section 00350 - Bidder Status Form). The Bidder Status Form must be included with and is considered an essential attachment to the Proposal. Any Proposal that does not include a fully completed Bidder Status Form may result in the Proposal being determined non-responsive.

1.15 EVALUATION OF BIDS

A. The BID must include all unit prices and requested information shown on the Proposal Form; failure to comply may be cause for rejection. No segregated bids or assignments will be considered.

B. Award of Contract will be made on the low bid which shall be determined based on base bid only, exclusive of any alternates OWNER may select or request.

C. Bidders may submit alternate Bid(s) as listed on Bid Form and described in Contract Documents.

D. The OWNER may select or reject Alternate Bid(s) as best serves its interests.

E. The OWNER reserves the right to reject any and all bids and to waive informalities or technicalities as allowed by the law and to enter into such Contract as it shall deem for the best interest of the OWNER.

F. The OWNER reserves the right to reject the Bid of any Bidder if OWNER believes that it would not be in the best interest of the Project to make an award to that Bidder, whether because the Bid is not responsive, or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by OWNER.

G. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the unit price section of the Bid Form.

H. The "Bid Price" (sometimes referred to as the extended price) for each unit price Bid item will be the product of the "Estimated Quantity" (which OWNER or its representative has set forth in the Bid Form) for the item and the corresponding "Bid Unit Price" offered by the Bidder. The total of all unit price Bid items will be the sum of these "Bid Prices"; such total will be used by OWNER for Bid comparison purposes. The final quantities and Contract Price will be determined in accordance with Article 1.06 of Section 01025 - Measurement and Payment.

I. Discrepancies in the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

J. In the case of an obvious and serious clerical or entry error in the Proposal where the OWNER is able to clearly determine the Bidder's intent from the Proposal the OWNER may waive irregularities that are in the best interest of the OWNER as long as the integrity of the bidding process is not affected by waiving the clerical or entry irregularity.

K. In evaluating Bids, OWNER will consider the qualifications of the Bidders, whether or not the Bids comply with the prescribed requirements, [and such alternates] unit prices and other data as may be requested in the Proposal Schedule or prior to the Notice of Award. OWNER may conduct such investigation as OWNER deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial ability of Bidders, proposed Subcontractors, Suppliers and other persons and organizations to perform and furnish the Work in accordance with the Contract Documents to OWNER'S satisfaction within the prescribed items. Bidder shall provide data regarding qualifications and financial ability upon request by OWNER and/or ENGINEER prior to Notice of Award. Failure by Bidder to provide such data may be cause for OWNER to reject the bid of said Bidder.

OWNER may consider the qualifications and experience of Subcontractors, Suppliers, and other persons and organizations proposed for those portions of the Work as to which the identity of Subcontractors, Suppliers, and other persons and organizations must be submitted as provided in the General Conditions. OWNER also may consider the operating costs, maintenance requirements, performance data, and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data is required to be submitted prior to the Notice of Award.

L. If OWNER awards the Contract for the Work, such award shall be to the responsible Bidder submitting the lowest responsive Bid.

M. The Contract, if awarded, will be on the basis of materials and equipment described in the Drawings or specified in the Specifications without consideration of possible substitute or "or equal" items. Whenever it is indicated in the Drawings or specified in the Specifications that a substitute or "or equal" item of material or equipment may be furnished or used by CONTRACTOR if acceptable to ENGINEER, application for such acceptance will not be considered by ENGINEER until after the Effective Date of the Contract.

1.16 WITHDRAWAL OF BIDS

A. A Bidder may withdraw his Bid at any time prior to scheduled closing time for receipt of Bids, but no Bid shall be withdrawn for a period of 30 calendar days thereafter.

B. All Bids will remain subject to acceptance for the period of time stated in the Bid Form, but OWNER may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

1.17 OPENING OF BIDS

A. Bids will be opened and read aloud publicly at the time and place stated in the Notice to Bidders.

1.18 NOTICE OF AWARD

A. The successful Bidder will be notified of Contract award by receipt of Notice of Award or by letter from ENGINEER within 14 days of Contract award by resolution of the City Council.

1.19 EXECUTION OF CONTRACT

A. The successful Bidder shall enter into a written Contract with the OWNER, within 10 days after Notice of Award and acceptance of his proposal on the forms included with these specifications, for the performance of the work awarded to the CONTRACTOR.

B. The Contract, when executed, shall be deemed to include the entire agreement between the parties hereto, and the CONTRACTOR shall not claim any modification thereof resulting from any representation or promise made at any time by any representative of the OWNER or any other person.

C. After the Contract and Bonds have been approved, OWNER shall deliver one fully executed counterpart of the Agreement to Successful Bidder.

1.20 CONTRACT TERMINATION

A. Provisions of law, as contained in Chapter 573A of the Code of Iowa shall apply to and be a part of this Contract. Chapter 573A provides for termination of Contracts for construction of public improvements when construction or work thereon is stopped because of a national emergency. The provisions of Chapter 573A shall be binding upon all parties thereto, including subcontractors and sureties upon any bond given or filed in connection therewith.

B. The OWNER reserves the right to Terminate Contract for Cause or for Convenience as defined in Articles 1.28 and 1.29 or Section 00700, General Conditions.

1.21 TAXES

A. Bidders shall include in proposal all amounts payable by CONTRACTOR or OWNER on account of taxes imposed by any taxing authority upon sale, purchase or use of materials and equipment covered by the Contract. All taxes of foregoing descriptions shall be paid by CONTRACTOR.

B. The City will issue a sales tax exemption certificate for all materials purchased for the project. The City will issue the appropriate tax exemption certificates and authorization letters to the CONTRACTOR and all subcontractors completing work on the project. Tax exemption certificates are applicable only for the specific project for which the tax exemption certificate is issued.

C. CONTRACTOR shall provide a listing to the City identifying all appropriate subcontractors qualified for use of the tax exemption certificate. CONTRACTOR and subcontractors may make copies of the certificate and provide to each supplier providing construction materials a copy of the tax exemption certificate.

D. Successful Bidder is subject to payment of Iowa Income Tax on income from this work in amounts prescribed by law. If successful Bidder is a non-Iowa partnership, individual or association, he shall furnish evidence prior to execution of Contract, that bond or securities have been posted with the Iowa Department of Revenue in the amount required by law.

1.22 PREFERENCE FOR LABOR AND MATERIALS

A. By virtue of statutory authority, preference will be given to products and provisions grown and coal produced within the State of Iowa, and to Iowa domestic labor, to the extent lawfully required under Iowa Statutes, provided that the award of Contract will be made to the lowest responsible Bidder submitting the lowest responsive bid.

1.23 PAYMENT

A. Payment will be made in accordance with the payment provisions set forth in the Section 00700 – General Conditions, and Section 01025 - Measurement and Payment.

B. Payments will be made on the basis of estimates prepared by CONTRACTOR and approved by ENGINEER, solely for the purpose of payment; approval by ENGINEER shall not be deemed approval of workmanship or material.

1.24 PERIOD OF GUARANTEE AND BOND

A. CONTRACTOR shall guarantee work for a period of two (2) years from date of final acceptance of work by the OWNER as provided for in the Code of Iowa. Surety bond furnished by CONTRACTOR shall run for like period.

1.25 PERMITS

A. Construction permits shall be the responsibility of the CONTRACTOR.

B. The OWNER shall obtain a construction permit or approval letter as required from the Iowa Department of Natural Resources (IDNR) prior to commencing work.

C. Bidders are responsible for obtaining utility locates and for any utilities damaged by pre-bid soil boring activities

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

Not Applicable.

END OF SECTION

OWNER'S COPY
ENGINEER'S COPY
BIDDER'S COPY
(Circle One)

SECTION 00300

BID FORM
LOGAN WELL FIELD GENERATOR
LOGAN, IOWA

PROJECT IDENTIFICATION:

This Bid pertains to the LOGAN WELL FIELD GENERATOR.

THIS BID IS SUBMITTED TO: City Council
City of Logan
108 W. 4th Street
Logan, Iowa 51546

THIS BID IS SUBMITTED BY: _____
Name of Bidder

_____

_____
Address of Bidder

Phone: _____
Email: _____

Individual ( ) Partnership ( ) Corporation ( )

Contractor Iowa License Number: _____

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

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

3. In submitting this Bid, Bidder represents that:

   a. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of all, which is hereby acknowledged.

Addendum No.	**Addendum Date**

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

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

   d. Bidder has carefully studied all:

      (1) reports of explorations and tests of subsurface conditions, if any, at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities).

      (2) reports and drawings of a Hazardous Environmental Condition, if any, are provided in accordance with Section 00700 General Conditions.

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

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

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

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

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

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

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

5. The undersigned bidder states that this bid is made in conformity with the specifications and agrees that in the event of any discrepancies or differences between any conditions of this bid and the specifications prepared by VEENSTRA & KIMM, INC., that the provisions of the latter shall prevail.

6. Contract completion period or date shall be June 1st, 2024.

7. Liquidated Damages in the amount of Five Hundred and 00/100 Dollars ($500.00) per consecutive calendar day will be assessed for each day that work for the project is not completed after contract completion date as specified.

8. Due allowances for extensions of the contract period due to conditions beyond the control of the contractor shall be considered by the OWNER. Inclement weather shall not be considered as cause for extensions of the contract period for average or below average precipitation totals during the contract period. Separate liquidated damage assessments may be made for each of the completion dates.

10. Bidder agrees the following documents are enclosed and made a condition of this Bid:

a. Bid Schedule

b. Required Bid Security in the form of Bid Bond or Certified / Cashier's Check
c. Bidder Status Form – Section 00350
d.

11. Bidder will construct in accordance with the Contract Documents including all labor, materials, and equipment necessary the work, within the time and for the sum or sums stated hereinafter on attached Bid Schedule, which Bid Schedule is hereby made part of this bid.

Use Signature Block A, B, C or D as Applicable for Your Firm

If Bidder is:

A. Individual

Name (typed or printed): _____

By: _____ (SEAL)
(Individual's signature)

Doing business as: _____

Business address: _____

_____

Phone No.: _____ FAX No.: _____

Date Bid Submitted: _____, 20__

B. Partnership

Partnership Name: _____

By: _____ (SEAL)
(Signature of General Partner - attach evidence of authority to sign)

Name (typed or printed): _____

Business address: _____

_____

Phone No.: _____ FAX No.: _____

Date Bid Submitted: _____, 20__

C. Corporation

Corporation Name: _____(SEAL)

State of Incorporation: _____

Type (General Business, Professional, Service, Limited Liability): _____

By: _____
(Signature - attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____ (CORPORATE SEAL)

Attest: _____
(Signature of Corporate Secretary)

Business address: _____

_____

Phone No.: _____ FAX No.: _____

Date of Qualification to do business is _____.

Date Bid Submitted: _____, 20__

D. Joint Venture

Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of Joint Venture Partner - attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Business address: _____

_____

Phone No.: _____ FAX No.: _____

Joint Venturer Name: _____ (SEAL)

By: _____
(Signature of Joint Venture Partner - attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Business address: _____

_____

Phone No.: _____ FAX No.: _____

Phone and FAX Number, and Address for receipt of official communications:

_____

_____

(Each Joint Venturer must sign. The manner of signing for each individual, partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)

Date Bid Submitted: _____, 20__

BID SCHEDULE

LOGAN WELL FIELD GENERATOR

1. Construct Logan Well Field Generator for the following unit and lump sum prices:

Unit Price Work					
Item No.	**Description**	**Unit**	**Estimated Quantity**	**Unit Price**	**Extended Price**
1	LOGAN WELL FIELD GENERATOR	LS	1		
				TOTAL BID	**$**

Bidder Status Form

To be completed by all bidders — Part A

Please answer "Yes" or "No" for each of the following:

☐ Yes ☐ No My company is authorized to transact business in Iowa.
(To help you determine if your company is authorized, please review the worksheet on the next page).

☐ Yes ☐ No My company has an office to transact business in Iowa.

☐ Yes ☐ No My company's office in Iowa is suitable for more than receiving mail, telephone calls, and e-mail.

☐ Yes ☐ No My company has been conducting business in Iowa for at least 3 years prior to the first request for bids on this project.

☐ Yes ☐ No My company is not a subsidiary of another business entity or my company is a subsidiary of another business entity that would qualify as a resident bidder in Iowa.

If you answered "Yes" for each question above, your company qualifies as a resident bidder. Please complete Parts B and D of this form.

If you answered "No" to one or more questions above, your company is a nonresident bidder. Please complete Parts C and D of this form.

To be completed by resident bidders — Part B

My company has maintained offices in Iowa during the past 3 years at the following addresses:

Dates: _____ /_____ /_____ to _____ /_____ /_____ Address: _____

City, State, Zip: _____

Dates: _____ /_____ /_____ to _____ /_____ /_____ Address: _____

City, State, Zip: _____

Dates: _____ /_____ /_____ to _____ /_____ /_____ Address: _____

You may attach additional sheet(s) if needed. City, State, Zip: _____

To be completed by non-resident bidders — Part C

1. Name of home state or foreign country reported to the Iowa Secretary of State:

_____

2. Does your company's home state or foreign country offer preferences to bidders who are residents? ☐ Yes ☐ No

3. If you answered "Yes" to question 2, identify each preference offered by your company's home state or foreign country and the appropriate legal citation.

_____

_____

You may attach additional sheet(s) if needed.

To be completed by all bidders — Part D

I certify that the statements made on this document are true and complete to the best of my knowledge and I know that my failure to provide accurate and truthful information may be a reason to reject my bid.

Firm Name: _____

Signature: _____ Date: _____

You must submit the completed form to the governmental body requesting bids per 875 Iowa Administrative Code Chapter 156.
This form has been approved by the Iowa Labor Commissioner.

Worksheet: Authorization to Transact Business

This worksheet may be used to help complete Part A of the Resident Bidder Status form. If at least one of the following describes your business, you are authorized to transact business in Iowa.

☐ Yes ☐ No My business is currently registered as a contractor with the Iowa Division of Labor.

☐ Yes ☐ No My business is a sole proprietorship and I am an Iowa resident for Iowa income tax purposes.

☐ Yes ☐ No My business is a general partnership or joint venture. More than 50 percent of the general partners or joint venture parties are residents of Iowa for Iowa income tax purposes.

☐ Yes ☐ No My business is an active corporation with the Iowa Secretary of State and has paid all fees required by the Secretary of State, has filed its most recent biennial report, and has not filed articles of dissolution.

☐ Yes ☐ No My business is a corporation whose articles of incorporation are filed in a state other than Iowa, the corporation has received a certificate of authority from the Iowa secretary of state, has filed its most recent biennial report with the secretary of state, and has neither received a certificate of withdrawal from the secretary of state nor had its authority revoked.

☐ Yes ☐ No My business is a limited liability partnership which has filed a statement of qualification in this state and the statement has not been canceled.

☐ Yes ☐ No My business is a limited liability partnership which has filed a statement of qualification in a state other than Iowa, has filed a statement of foreign qualification in Iowa and a statement of cancellation has not been filed.

☐ Yes ☐ No My business is a limited partnership or limited liability limited partnership which has filed a certificate of limited partnership in this state, and has not filed a statement of termination.

☐ Yes ☐ No My business is a limited partnership or a limited liability limited partnership whose certificate of limited partnership is filed in a state other than Iowa, the limited partnership or limited liability limited partnership has received notification from the Iowa secretary of state that the application for certificate of authority has been approved and no notice of cancellation has been filed by the limited partnership or the limited liability limited partnership.

☐ Yes ☐ No My business is a limited liability company whose certificate of organization is filed in Iowa and has not filed a statement of termination.

☐ Yes ☐ No My business is a limited liability company whose certificate of organization is filed in a state other than Iowa, has received a certificate of authority to transact business in Iowa and the certificate has not been revoked or canceled.

SECTION 00400

BID BOND

KNOW ALL MEN BY THESE PRESENTS: That we,

_____,
of, _____, as Principal, and
_____ of _____,
as Surety, are held and firmly bound unto the City of Logan, Iowa, hereinafter defined as Obligee, in the penal sum of five percent (5%) of the total amount of the bid ($_____ _____), for which payment said Principal and Surety bind themselves, their heirs, executors, administrators, successors, and assigns jointly and severally, firmly by these presents.

The condition of the above obligation is such that whereas the Principal has submitted to the City of Logan, Iowa, a certain bid, in a sealed envelope, and hereby made a part hereof to enter into a contract in writing, for: Logan Well Field Generator.

NOW THEREFORE, if the said bid by said Principal be accepted, and the Principal shall enter into a contract with the Obligee in accordance with the terms of such bid, and give such bond as may be specified in the contract documents with good and sufficient surety for the faithful performance of such contract, for the prompt payment of labor and material furnished in the prosecution thereof, and for the maintenance of said improvements as may be required therein, then this obligation shall become null and void or in the event of the failure of the Principal to enter such contract and give such bond, the Principal shall pay to the Obligee the full amount of the bid bond, together with court costs, attorney's fees, and any other expense of recovery.

Signed and sealed this_____ day of _____, 20___.

Countersigned by:

_____
Principal

By_____
Contractor's Signature

_____

_____
Surety

By_____
Attorney-in-Fact
(Must attach Power of Attorney)

SECTION 00510

AGREEMENT BETWEEN OWNER AND CONTRACTOR

THIS AGREEMENT, made and entered into this _____ day of _____, 2023, by and between the City of Logan, Iowa, hereinafter referred to as the "OWNER", and _____, hereinafter referred to as the "CONTRACTOR".

WITNESSETH: THAT WHEREAS, the OWNER has heretofore caused to be prepared certain specifications and bid form blanks, dated the 22nd day of June, 2023, for Logan Well Field Generator Project under the terms and conditions therein fully stated and set forth, and,

WHEREAS, said specifications and bid form blanks accurately and fully describe the terms and conditions upon which the CONTRACTOR is willing to perform the work specified:

NOW, THEREFORE, IT IS AGREED:

That the OWNER hereby accepts the bid of the CONTRACTOR for the work, as follows:

ARTICLE 1 - THE PROJECT

1.01 The Project for which the Work under the Contract Documents may be the whole or only a part is named as follows:

Logan Well Field Generator

ARTICLE 2 - WORK

2.01 CONTRACTOR shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

Project consists of providing a new fully functional standby generator to operate the City's well field. Project includes all labor, materials, and equipment necessary to supply new generator to the site, PCC generator pad, supply and install 1,000-gallon propane tank, PCC propane tank pad, grading, connecting generator to existing system, mobilization, miscellaneous work, and cleanup.

ARTICLE 3 - ENGINEER

3.01 The Project has been designed by Veenstra & Kimm, Inc. (ENGINEER), who is to act as OWNER's representative, assume all duties and responsibilities, and have the rights and authority assigned to ENGINEER in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 - CONTRACT TIME

4.01 Time of the Essence

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 Days to Achieve Substantial Completion and Final Payment

A. The Work will be completed by June 1, 2024.

B. All work shall be complete and ready for Final Payment within 30 calendar days after Substantial Completion.

4.03 Liquidated Damages

A. CONTRACTOR and OWNER recognize that time is of the essence of this Agreement and that OWNER will suffer financial loss if the Work is not completed within the times specified in Article 4.02 above, plus any extensions thereof allowed in accordance with Article 1.22 of the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by OWNER if the Work is not completed on time. Accordingly, instead of requiring any such proof, OWNER and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty), CONTRACTOR shall pay OWNER Liquidated Damages an amount as set forth in the Notice to Bidders for each calendar day that expires after the time specified in Article 4.02 for Substantial Completion until the Work is substantially complete. After Substantial Completion, if CONTRACTOR shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by OWNER, CONTRACTOR shall pay OWNER an amount as set forth in the Notice to Bidders for each calendar day that expires after the time specified in Article 4.02 for completion and readiness for final payment until the Work is completed and ready for final payment.

B. Further, the CONTRACTOR shall pay OWNER an amount as set forth in the Notice to Bidders for each time periods day where portions of the Contract have specific completion dates, specified calendar or where specific completion dates are otherwise agreed to in writing or are identified on CONTRACTOR's Project Schedule as submitted, for work which remains uncompleted after said specified or agreed to date.

ARTICLE 5 - CONTRACT PRICE

5.01 OWNER shall pay CONTRACTOR for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to Paragraphs [5.01.A], [5.01.B], [and 5.01.C]. [All specific cash allowances are included in the prices and have been computed accordingly.]

A. For all Work other than Unit Price Work, a Lump Sum of:

_____ $ _____

(use words)

B. Unit Price Adjustments:

1. As provided in Article 1.03 of Section 01025 – Measurement and Payment, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by ENGINEER as provided in Article 1.03 of Section 01025 – Measurement and Payment. Payment shall be computed as provided in Article 1.05 of Section 01025 – Measurement and Payment.

ARTICLE 6 - PAYMENT PROCEDURES

6.01 Submittal and Processing of Payments

A. CONTRACTOR shall submit Applications for Payment in accordance with Article 1.04 of Section 01019 – Contract Considerations. Applications for Payment will be processed by ENGINEER as provided in Article 1.04 of Section 01019 – Contract Considerations and Article 1.31 of Section 00700 – General Conditions.

6.02 Progress Payments; Retainage

A. OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR's Applications for Payment submitted by the last day of each month during performance of the Work as provided in Paragraphs 6.02.A.1 and 6.02.A.2 below. All such payments will be determined by the Schedule of Values established as provided in Section 01025 – Measurement and Payment:

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as ENGINEER may determine or OWNER may withhold, including but not limited to liquidated damages, in accordance with Article 1.31 of Section 00700 – General Conditions:

a. 95 percent of Work completed (with the balance being retainage); and

b. 95 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).

2. Upon Substantial Completion, OWNER shall pay an amount sufficient to increase total payments to CONTRACTOR to 95 percent of the Work completed, less such amounts as ENGINEER shall determine in accordance with Article 1.31 of Section 00700 - General Conditions.

B. OWNER shall make payments to CONTRACTOR within 30 days following approval of Pay Estimate by City Council at a regularly scheduled Council meeting.

6.03 Final Payment

A. Upon receipt of the final Application for Payment accompanied by ENGINEER's recommendation of payment in accordance with Article 1.32 of Section 00700 - General Conditions, OWNER shall pay CONTRACTOR as provided in Article 1.32 of Section 00700 - General Conditions the remainder of the Contract Price as recommended by ENGINEER as provided in said Article 1.32, less any sum OWNER is entitled to withhold per ENGINEER's recommendation, including but not limited to liquidated damages.

B. Final payment will not be made sooner than thirty (30) days following final acceptance of the work by the OWNER.

ARTICLE 7 - INTEREST

7.01 All moneys not paid when due as provided in Article 1.32 of Section 00700 - General Conditions shall bear interest at the maximum legal rate.

ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS

8.01 In order to induce OWNER to enter into this Agreement Contractor makes the following representations:

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

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

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

D. CONTRACTOR does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.

E. CONTRACTOR is aware of the general nature of work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Contract Documents.

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

G. CONTRACTOR has given ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that CONTRACTOR has discovered in the Contract Documents, and the written resolution thereof by ENGINEER is acceptable to CONTRACTOR.

H. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 9 - GUARANTEE

9.01 CONTRACTOR guarantee's all work constructed under this agreement, regardless if said work is performed by CONTRACTOR, his subcontractors, or other third tier subcontractors retained by subcontractor's, against defective workmanship and / or materials for a period of two (2) years from the date of Final Acceptance of work by OWNER.

Workmanship and / or materials shall be considered defective when a condition causing premature failure (whole or in part) which was present in the relevant part or component of work when it was constructed or installed or comes into existence as a result of the way in which the relevant part or component of work was constructed or installed.

9.02 The CONTRACTOR shall faithfully perform the contract on its part and shall fully indemnify and save harmless the OWNER from all cost and damage which OWNER may suffer by reason of defective workmanship and / or materials, and shall fully reimburse and repay the OWNER all outlay and expense which the OWNER may incur in making good any such default.

ARTICLE 10 - CONTRACT DOCUMENTS

10.01 Contents

A. The Contract Documents consist of the following:

1. This Agreement (pages 1 to____, inclusive).

2. Performance Bond (pages 1 to_____, inclusive).

3. Payment Bond (pages 1 to_____, inclusive).

4. Maintenance Bond (pages 1 to_____, inclusive).

5. Other bonds:

   a. _____ (pages 1 to_____, inclusive).

   b. _____ (pages 1 to_____, inclusive).

   c. _____ (pages 1 to_____, inclusive).

6. General Conditions (pages 1 to_____, inclusive).

7. Special Conditions (pages 1 to_____, inclusive).

8. Specifications as listed in the table of contents of the Project Manual.

9. Drawings consisting of _____ sheets with each sheet bearing the following general title:_____.

10. Addenda (numbers _____ to_____, inclusive).

11. Notice of Award

12. Exhibits to this Agreement (enumerated as follows):

    a. Exhibit A: CONTRACTOR's Bid Schedule (pages 1 to_____, inclusive).

    b. _____.

    c. _____.

    d. _____.

13. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:

    a. Notice to Proceed (pages 1 to 1, inclusive).

    b. Work Change Directives.

    c. Change Order(s).

B. The documents listed in Paragraph 10.01.A are made part of this Agreement by reference; exhibits to this Agreement as listed in Paragraph 10.01.A.11 are attached except as expressly noted otherwise above.

C. There are no Contract Documents other than those listed above in this Article 10.

D. The Contract Documents may only be amended, modified, or supplemented as provided in Paragraph 1.23 of Section 00700 - General Conditions.

ARTICLE 11 - MISCELLANEOUS

11.01 Terms

A. Terms used in this Agreement will have the meanings stated in the Section 00100 – Instructions to Bidders.

11.02 Assignment of Contract

A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.

11.03 Successors and Assigns

A. OWNER and CONTRACTOR each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

11.04 Severability

A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon OWNER and CONTRACTOR, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

11.05 Controlling Law

A. This Agreement and any of its terms and provisions shall be interpreted or construed under the laws of the State of Iowa.

11.06 Contractor Public Registration Information

A. All Contractor: The CONTRACTOR shall enter its Public Registration Number as issued by the Iowa Labor Commissioner pursuant to Section 91C.5.

CONTRACTOR Registration No._____

B. Out of State CONTRACTORS:

1. Prior to executing this Agreement, the CONTRACTOR, if it be a Corporation organized under the Laws of a State other than Iowa, shall file with the ENGINEER a copy of a Certificate of Authority as issued by the Iowa Secretary of State documenting that this CONTRACTOR has complied with all the provisions of Chapter 490 of the Code of Iowa, or as amended, Governing Foreign Corporations. (For further information contact the Iowa Secretary of State Office at 515-281-5204.)
2. Pursuant to Section 91C.2 and Section 91C.7 of the Code of Iowa an out of state CONTRACTOR shall either file a surety bond with the Division of Labor Services in the amount of twenty-five thousand dollars for a one-year period or shall provide a statement to the Division of Labor services that the CONTRACTOR is prequalified to bid on projects for the Iowa Department of Transportation (IDOT) pursuant to Section 314.1. The Surety Bond filed shall be executed by a surety company authorized to do business in this state, and the bond shall be continuous in nature until canceled by the surety with not less than thirty days' written notice to the CONTRACTOR and to the Division of Labor Services of the Department of Workforce Development indicating the surety's desire to cancel the bond. The CONTRACTOR should contact the Division of Labor Contractor Registration at 515-242-5871 for further information. Prior to contract execution, the ENGINEER may forward a copy of the proposed Agreement to the Iowa Department of Workforce Development as notification of pending construction work. It is the CONTRACTOR'S

responsibility to comply with said Section 91C.7 before commencing work.

Bond No.: _____

Name of Surety: _____

Copy of documentation that CONTRACTOR is prequalified with IDOT pursuant to Section 314.1 of Code of Iowa attached:

_____ Yes _____ No

11.07 Other Provisions

A. [None]

IN WITNESS WHEREOF, OWNER and CONTRACTOR have signed this Agreement in three copies. One counterpart each has been delivered to OWNER, CONTRACTOR, and ENGINEER. All portions of the Contract Documents have been signed, initialed, or identified by OWNER and CONTRACTOR or identified by ENGINEER on their behalf.

This Agreement will be effective _____, 2023 (which is the Effective Date of the Agreement).

OWNER: CITY OF LOGAN, IOWA

Signature:

By:

Title:

Attest:

Title:

Designated Representative:

Name:

Title:

Address for giving notices:
108 W. 4th Street
Logan, Iowa 51546

Phone:

Email:

[(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of Owner-Contractor Agreement.)]

CONTRACTOR:

Signature:

By:

Title:

Attest:

Title:

Designated Representative:

Name:

Title:

Address for giving notices:

Phone:

Email:

License No.: _____
(Where applicable)

Agent for service or process: _____

(If Contractor is a corporation or a partnership, attach evidence of authority to sign.)]

SECTION 00600

Bond No.:_____

PERFORMANCE, PAYMENT AND MAINTENANCE BOND

KNOW ALL MEN: That we, _____
of _____, hereinafter called the Principal, and
_____,
hereinafter called the surety, are held and firmly bound unto the City of Logan, Iowa, hereinafter called the Owner in the sum of _____
Dollars ($_____), for the payment whereof the Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly, by these presents.

WHEREAS, the principal has, by means of a written Agreement dated _____, 2023, entered into a Contract with the Owner for Logan Well Field Generator Project, which Agreement includes a guarantee of all work against defective workmanship and materials for a period of two (2) years from the date of Final Acceptance of the work by the Owner, a copy of which Agreement is by reference made a part hereof;

NOW, THEREFORE, the condition of this Obligation is such that, if the Principal shall faithfully perform the Contract on his part and shall fully indemnify and save harmless the Owner from all costs and damage which he may suffer by reason of failure so to do and shall fully reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any such default,

And Further, that if the Principal shall pay all persons who have contracts directly with the Principal for labor or materials, failing which such persons shall have a direct right of action against the Principal and Surety under this Obligation, subject to the Owner's priority,

Then this Obligation shall be null and void, otherwise it shall remain in full force and effect.

Provided, however, that no suit, action or proceeding by reason of any default whatever shall be brought on this Bond after five (5) years from the date of final acceptance of the work.

And Provided, that any alterations which may be made in the terms of the Contract, or in the work to be done under it, or the giving by the Owner of any extension of time for the performance of the Contract, or any other forbearance on the part of either the Owner or the Principal to the other shall not in any way release the Principal and the Surety, or either of them, their heirs, executors, administrators, successors or assigns from their liability hereunder, notice to the Surety of any such alteration, extension or forbearance being hereby waived.

And Further Provided, the Principal and Surety on this Bond hereby agree to pay all persons, firms, or corporations having contracts directly with the Principal or with subcontractors all just claims due them for labor performed or material furnished, in the performance of the Contract on account of which this Bond is given, when the same are not satisfied out of the portion of the contract price which the Owner shall retain until completion of the improvements, but the Principal and Surety shall not be liable to said persons, firms, or corporations unless the claims of said claimants against said portions of the contract price shall have been established as provided by law.

The Surety on this Bond shall be deemed and held, any contract to the contrary notwithstanding, to consent without notice:

a. To the extension of time to the Principal in which to perform the Contract.

b. To changes in the plans, specifications, or Contract, when such changes do not involve an increase of more than twenty percent (20%) of the total contract price and shall then be released only as to such excess increase.

c. That no provision of this Bond or of any other contract shall be valid which limits to less than five (5) years from the date of final acceptance of the work the right to sue on this Bond for defects in workmanship or materials not discovered or known to the Owner at the time such work was accepted.

The Bond is executed in triplicate.

Signed and Sealed this _____ day of _____, 2023.

PRINCIPAL:	SURETY:
_____	_____
Contractor	Surety Company
_____	_____
Signature	Signature, Attorney-in-Fact
_____	_____
Title	Name of Attorney-in-Fact (must attach Power of Attorney)
	_____
	Company Name
	_____
	Company Address
	_____
	City, State, Zip Code
	_____
	Telephone Number

SECTION 00700

GENERAL CONDITIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Contract Documents (1.02)
B. Surety Bond (1.03)
C. Contractor's Responsibilities (1.04)
D. Subcontracts (1.05)
E. Contractor's Employees and Supervision (1.06)
F. Permits and Regulations (1.07)
G. Patents (1.08)
H. Defective Work / Contractor Failure to Comply with Contract Documents (1.09)
I. Guarantee (1.10)
J. Shop Drawings (1.11)
K. The ENGINEER (1.12)
L. Plans and Specifications (1.13)
M. Interpretation of Plans and Specifications (1.14)
N. Decisions by ENGINEER (1.15)
O. Workmanship and Materials (1.16)
P. On-Site Review or Observation (1.17)
Q. Resident Engineer and / or Engineering Technicians (1.18)
R. Tests (1.19)
S. Time (1.20)
T. Delays (1.21)
U. Liquidated Damages (1.22)
V. Changes (1.23)
W. Extra Work (1.24)
X. Ownership of Materials (1.25)
Y. Other Contracts (1.26)
Z. OWNER's Right to do Work (1.27)
AA. OWNER'S Right to Terminate Contract for Cause (1.28)
BB. OWNER'S Right to Terminate Contract for Convenience (1.29)
CC. CONTRACTOR'S Right to Stop Work or Terminate Contract (1.30)
DD. Payments Withheld (1.31)
EE. Acceptance and Final Payment (1.32)
FF. Suspension of Work (1.33)
GG. Cleaning Up (1.34)
HH. Hazardous Materials (1.35)
II. Hazardous Chemical Risks Right-to-Known Law / Act (1.36)
JJ. Contaminated Soils (1.37)

1.02 CONTRACT DOCUMENTS

A. All documents listed or identified as part of contract are each and all essential and component parts of agreement between OWNER and CONTRACTOR.

B. Contract Documents shall be signed in **triplicate** by OWNER and CONTRACTOR.

C. Contract Documents are complementary, and what is called for by any one shall be as binding as if called for by all. The intention of documents is to include all labor and materials, equipment and transportation necessary for proper execution of work. It is not intended that materials or work not covered by or properly inferable from any heading, branch, class or trade of the specifications shall be supplied unless distinctly noted. Materials or work described in words, which have a well-known technical or trade meaning, shall be held to refer to such recognized standards.

1.03 SURETY BOND

A. CONTRACTOR shall furnish a good and sufficient surety bond(s) in full amount of contract prior to signing contract. Surety bond(s) shall guarantee faithful performance of all provisions of contract and payment of all bills and obligations arising from said contract. Should surety become irresponsible during time contract is in force, OWNER may require additional and sufficient sureties. CONTRACTOR shall furnish said additional sureties to satisfaction of OWNER within ten (10) days after written notice to do so. In default thereof, contract may be suspended as hereinafter provided.

B. All surety bonds must specifically name the Attorney-in-Fact through a written “Power of Attorney”, a copy of which must be attached to each bond.

1.04 CONTRACTOR'S RESPONSIBILITY

A. CONTRACTOR shall assume full responsibility for safekeeping of all materials and equipment and for all unfinished work until final acceptance by OWNER. Materials and equipment which are damaged or destroyed during construction from any cause shall be replaced at CONTRACTOR'S expense.

B. CONTRACTOR shall be responsible for performing all work in accordance with the Contract Documents including all Plans and Specifications included herein. CONTRACTOR shall further be responsible for ensuring all sub-contractors retained by CONTRACTOR perform their work in accordance with Contract Documents including all Plans and Specifications included herein.

C. CONTRACTOR shall be responsible for providing a finished end product free of defective materials and workmanship for the period of the Guarantee and Maintenance Bond.

D. CONTRACTOR shall indemnify and save harmless OWNER against any liens filed and / or Iowa Code Chapter 573 Claims for non-payment of CONTRACTOR'S bills in connection with contract work. CONTRACTOR shall furnish OWNER satisfactory evidence that all persons who have done work or furnished materials, equipment, or service of any type, under the contract have been fully paid prior to acceptance of work by OWNER.

E. CONTRACTOR shall erect and maintain such barriers and lights as will prevent accidents as a consequence of its work. It shall indemnify and save harmless the OWNER and its agents from all suits brought against CONTRACTOR or OWNER for any injuries received or sustained by any person or persons by or through CONTRACTOR, its servants, or agents, in construction of work, or by or in consequence of any acts or omissions or negligence in performing contract work.

F. CONTRACTOR agrees to hold harmless and indemnify the OWNER and ENGINEER and their employees or agents against any liability sustained by reason of the work or the handling or storing of materials therefore when such liability arises out of negligent acts, errors or omissions of the CONTRACTOR, its employees or agents; failing to do so, any judgment against or settlements resulting therefrom shall become a lien against any funds due CONTRACTOR. There shall be no liability upon public officials, ENGINEER or his authorized assistants, either personally or as an official of the OWNER, it being understood that in such matters he acts as an agent and representative of the OWNER in carrying out any of the provisions of the contract or in exercising any power or authority granted him thereby.

G. If suit is brought by the OWNER for the breech of any provisions of this contract, the CONTRACTOR agrees to pay all costs in connection with suit, including reasonable attorney fees, whether or not the suit proceeds to judgment.

H. CONTRACTOR shall continuously maintain adequate protection of all of its work from damage and shall protect OWNER'S property from injury or loss arising in connection with this contract; CONTRACTOR shall make good any such damage, injury or loss; CONTRACTOR shall adequately protect adjacent property as provided by law and the contract documents; CONTRACTOR shall provide and maintain all passageways, guard fences, lights, sidewalks, street pavements, alleys, pipe, conduits, trees, shrubs, structures and other facilities for protection required by public authority of local conditions.

I. In an emergency affecting safety of life, work or adjoining property, CONTRACTOR, without special instruction or authorization from ENGINEER, is hereby permitted to act at its discretion to prevent such threatened loss or injury, and CONTRACTOR shall so act, without appeal, if so instructed or authorized; any compensation claimed by CONTRACTOR on account of emergency work, shall be determined by agreement or arbitration.

J. If in the opinion of the ENGINEER, CONTRACTOR has not taken sufficient precautions for safety of the public or the protection of the work to be constructed under this contract, or of adjacent structures or property which may be injured by the processes of construction on account of such neglect, and whenever, in the opinion of the ENGINEER, an emergency may arise and the public or private, personal or property interest are in danger, then the ENGINEER, with or without notice to the CONTRACTOR, may provide suitable protection to the said interest by causing such work to be done and material to be furnished and placed as the ENGINEER may consider necessary and adequate.

The cost and expense of such work and material so furnished shall be borne by the CONTRACTOR, and, if the same shall not be paid on presentation of the bills therefore, such costs shall be deducted from any amounts due or to become due the CONTRACTOR; performance of such emergency work under the direction of the ENGINEER shall in no way relieve the CONTRACTOR of responsibility for damages which may occur during or after such precaution has been duly taken by ENGINEER.

K. The CONTRACTOR shall perform all work in accordance with OSHA Regulations. The ENGINEER is not responsible for the CONTRACTOR'S operations or safety measures. Safety shall be the responsibility of the CONTRACTOR; all excavations shall comply with the latest requirements of OSHA 29 CFR Part 1926, Subpart P, "Excavations"; CONTRACTOR shall be responsible for safety items including but not limited to confined space entry, traffic control, trench and OSHA requirements; CONTRACTOR agrees to hold harmless and indemnify the OWNER and ENGINEER and the employees or agents of the OWNER and ENGINEER against any liability sustained from the CONTRACTOR'S negligent acts, errors or omissions.

Sloping or benching for excavations greater than 20 feet deep shall be designed by a registered professional engineer. For excavations greater than 20 feet deep CONTRACTOR shall submitted an Excavation Plan prepared by a licensed professional engineer to the ENGINEER for review by the ENGINEER prior to commencing excavation.

Worker safety requires compliance with all current and future federal and state OSHA requirements. In accordance with Section 6D.03 of the 2009 MUTCD and OSHA regulations all workers within the work right of way where exposed to traffic, work vehicles, or construction equipment are to wear high-visibility safety apparel.

L. CONTRACTOR shall cooperate and communicate effectively with others involved or affected by project.

1. Cooperate with OWNER, ENGINEER and representatives of utilities in locating underground utility lines and structures. Incorrect, inaccurate or inadequate information concerning location of utilities or structures shall not relieve CONTRACTOR of responsibility for damage thereto caused by his operation.
2. Cooperate with state and federal regulatory agencies in matters under their jurisdiction over construction operations.
3. Cooperate with local governmental agencies; secure necessary building permits and arrange for inspections at proper times. Building permit fees will be waived by City.
4. Advise all utilities prior to excavating; arrange for field locates of utilities by utility representatives.

M. CONTRACTOR shall comply with all federal, state, county and local laws and ordinances.

N. CONTRACTOR is responsible for the protection of health and safety of its personnel and all others in vicinity of work, including ENGINEER'S personnel and residents.

O. CONTRACTOR shall replace or repair objects sustaining any damage, injury or loss to satisfaction of OWNER and ENGINEER.

P. CONTRACTOR shall keep project site clean and orderly current with construction operations.

Q. CONTRACTOR shall notify ENGINEER 48 hours prior to expected time for operations requiring construction observation services.

1.05 SUBCONTRACTS

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to OWNER. CONTRACTOR shall submit initial list of proposed subcontractors and supplies with the executed agreement.

B. CONTRACTOR shall not assign, sub-let, subcontract, or transfer more than **40%** of the work herein specified without written approval from ENGINEER or OWNER. CONTRACTOR shall not assign, sub-let, subcontract, or transfer the whole or any part of work herein specified without written consent of OWNER. Upon request the CONTRACTOR shall submit a list of subcontractors or assignees indicating what portions of the work by bid item said subcontractors or assignees will be performing. The CONTRACTOR shall also provide documentation regarding each subcontractor or assignees qualifications and experience for the portions of work said subcontractor or assignee will be performing.

C. Assignment, sub-letting or transfer shall not relieve CONTRACTOR from its responsibilities set forth herein.

D. Detailed specifications are separated into titled parts for convenience or reference and to facilitate letting of contracts and subcontracts. Such arrangement shall not obligate ENGINEER to establish limits on contracts between CONTRACTORS and subcontractors. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

E. CONTRACTOR shall retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of designated parts of the Work if required by the Contract to do so.

F. Subsequent to the submittal of Contractor’s Bid or final negotiation of the terms of the Contract, OWNER may not require CONTRACTOR to retain any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against which CONTRACTOR has reasonable objection.

G. Prior to entry into any binding subcontract or purchase order, CONTRACTOR shall submit to OWNER the identity of the proposed Subcontractor or Supplier (unless OWNER has already deemed such proposed Subcontractor or Supplier acceptable, during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to OWNER unless OWNER raises a substantive, reasonable objection within ten days of contract award.

H. OWNER may require the replacement of any Subcontractor, Supplier, or other individual or entity retained by CONTRACTOR to perform any part of the Work. OWNER also may require CONTRACTOR to retain specific replacements; provided, however, that OWNER may not require a replacement to which CONTRACTOR has a reasonable objection. If CONTRACTOR has submitted the identity of certain Subcontractors, Suppliers, or other individuals or entities for acceptance by OWNER, and OWNER has accepted it (either in writing or by failing to make written objection thereto), then OWNER may subsequently revoke the acceptance of any such Subcontractor, Supplier, or other individual or entity so identified solely on the basis of substantive, reasonable objection after due investigation. CONTRACTOR shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity.

I. If OWNER requires the replacement of any Subcontractor, Supplier, or other individual or entity retained by CONTRACTOR to perform any part of the Work, then CONTRACTOR shall be entitled to an adjustment in Contract Price or Contract Times, or both, with respect to the replacement; and CONTRACTOR shall initiate a Change Proposal for such adjustment within 30 days of OWNER'S requirement of replacement.

J. No acceptance by OWNER of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of the right of OWNER to the completion of the Work in accordance with the Contract Documents.

K. On a monthly basis CONTRACTOR shall submit to ENGINEER a complete updated list of all Subcontractors and Suppliers having a direct contract with CONTRACTOR, and of all other Subcontractors and Suppliers known to CONTRACTOR at the time of submittal.

L. CONTRACTOR shall be fully responsible to OWNER and ENGINEER for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as CONTRACTOR is responsible for CONTRACTOR'S own acts and omissions.

M. CONTRACTOR shall be solely responsible for scheduling and coordinating the work of Subcontractors, Suppliers, and all other individuals or entities performing or furnishing any of the Work.

N. CONTRACTOR shall restrict all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work from communicating with ENGINEER or OWNER, except through CONTRACTOR or in case of an emergency, or as otherwise expressly allowed herein.

O. All Work performed for CONTRACTOR by a Subcontractor or Supplier shall be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of OWNER and ENGINEER.

P. OWNER may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to CONTRACTOR on account of Work performed for CONTRACTOR by the particular Subcontractor or Supplier.

Q. Nothing in the Contract Documents:

1. Shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between OWNER or ENGINEER and any such Subcontractor, Supplier, or other individual or entity; nor
2. Shall create any obligation on the part of OWNER or ENGINEER to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

1.06 CONTRACTOR'S EMPLOYEES AND SUPERVISION

A. CONTRACTOR shall personally direct, coordinate and supervise all work performed by CONTRACTOR'S employees and all subcontractors. CONTRACTOR shall provide a capable Job Superintendent satisfactory to ENGINEER. **Job Superintendent shall be on project site at all times when work by CONTRACTOR and / or subcontractor is being performed unless agreed to otherwise in writing by ENGINEER. Job Superintendent shall be authorized to receive instructions from ENGINEER. Job Superintendent shall direct, coordinate, supervise and be responsible for all facets of work on going at any time**. A crew foreman will not be a satisfactory substitute for superintendent.

B. In addition to the superintendent who will be on the project site at all times, the CONTRACTOR may also assign a Project Manager who will be responsible for administrative aspects of the project. If a Project Manager is assigned to the project, then the CONTRACTOR agrees to receive instructions from ENGINEER via Project Manager or Job Superintendent.

C. Incompetent or incorrigible employees, foreman, or supervisor shall be dismissed by the CONTRACTOR or its representative when requested by ENGINEER. Such dismissed persons shall not be permitted to return to work on this project without written consent of ENGINEER.

D. CONTRACTOR shall give preference to local labor in execution of this contract, insofar as is practicable.

1.07 PERMITS AND REGULATIONS

A. In execution of work specified herein, CONTRACTOR shall conform to regulations and ordinances of any governmental body which may apply in execution of specified work. CONTRACTOR shall obtain such permits and licenses as may be required for construction of work.

B. OWNER has obtained necessary Iowa Department of Natural Resources Construction Permits for water and sanitary sewer construction as may be applicable.

1.08 PATENTS

A. All fees or royalties for patented inventions, equipment or arrangements used in construction or erection of work, or any part thereof, shall be included in contract price. CONTRACTOR shall protect and hold harmless OWNER against any and all claims or litigation by reason of infringement of any patent rights on any materials, equipment of construction furnished by CONTRACTOR.

1.09 DEFECTIVE WORK / CONTRACTOR FAILURE TO COMPLY WITH CONTRACT DOCUMENTS

A. Any defective work shall be removed and replaced at the CONTRACTOR'S expense.

B. Should the CONTRACTOR fail or refuse to remove defective work when so ordered by the ENGINEER, the ENGINEER has to authority to order the CONTRACTOR to suspend further operations and may withhold payment on estimates until such defective work has been removed and replaced in accordance with the contract documents. Continued failure or refusal on the part of the CONTRACTOR to correct defective work promptly will be sufficient cause for the OWNER to declare the contract in default in accordance with Article 1.20 and to terminate said contract for cause in accordance with Article 1.28.

C. Should the CONTRACTOR fail or refuse to comply with the contract documents when so ordered by the ENGINEER, the ENGINEER has to authority to order the CONTRACTOR to suspend further operations and may withhold payment on estimates until CONTRACTOR fully complies with the contract documents. Continued failure or refusal on the part of the CONTRACTOR to comply with the contract documents promptly will be sufficient cause for the OWNER to declare the contract in default in accordance with Article 1.20 and to terminate said contract for cause in accordance with Article 1.28.

1.10 GUARANTEE

A. CONTRACTOR shall guarantee all work against faulty workmanship and materials for the Correction Period specified in Article 9 of Section 00510 - Agreement Between Owner and Contractor. Correction Period shall start the date of final acceptance of work by OWNER unless otherwise set out in "SPECIAL CONDITIONS" or "INSTRUCTIONS TO BIDDERS." CONTRACTOR shall repair or replace any defective workmanship and materials in a manner acceptable to OWNER, without expense to OWNER, within ten (10) days after written notification by OWNER of such defect. If said repairs or replacements are not made within ten (10) days, OWNER may make said repairs or replacements and charge the cost to CONTRACTOR.

B. CONTRACTOR shall provide OWNER with a good and sufficient surety maintenance bond in the full amount of contract prior to signing contract. Maintenance bond shall run for the period specified from time of acceptance to protect OWNER from faulty workmanship and materials as outlined in preceding paragraph.

1.11 SHOP DRAWINGS

A. CONTRACTOR shall provide ENGINEER with drawings, data and information regarding materials or equipment specified, or as may be called for by ENGINEER, for its review, within a reasonable time after award of contract. After review, ENGINEER shall return to CONTRACTOR a minimum of one copy within a reasonable time after receipt.

B. Fabrication and shipment of materials or equipment prior to ENGINEER'S review of drawings, data and information mentioned above shall be at CONTRACTOR'S risk.

1.12 THE ENGINEER

A. ENGINEER shall make general observation of work as agent of OWNER. ENGINEER'S general observation shall not be construed that it shall direct or control operations of CONTRACTOR.

B. **ENGINEER shall not be responsible for construction contract or construction means, methods, techniques, sequences or procedures or for any programs or precautions relating to the CONTRACTOR'S safety or the CONTRACTOR'S failure to perform work in accordance with the contract documents**.

C. There shall be no liability upon public officials, ENGINEER or his authorized assistants, either personally or as an official of the OWNER, it being understood that in such matters the ENGINEER acts as an agent and representative of the OWNER in carrying out any of the provisions of the contract or in exercising any power or authority granted him thereby.

1.13 PLANS AND SPECIFICATIONS

A. ENGINEER shall provide CONTRACTOR with three sets of plans and specifications after execution of contract. If additional plans and specifications are required, CONTRACTOR shall compensate ENGINEER for costs of printing.

B. ENGINEER shall provide CONTRACTOR with additional and supplemental plans as may be required to show details of construction after approval of manufacturers' drawings and data on materials and equipment.

C. ENGINEER will provide CONTRACTOR with such revised plans and specifications as may be required to show any authorized changes or extra work.

D. CONTRACTOR shall ensure all Sub-Contractors and Suppliers working on the project have complete sets of up to date plans and specifications.

1.14 INTERPRETATION OF PLANS AND SPECIFICATIONS

A. Plans and specifications shall be interpreted by ENGINEER. ENGINEER'S interpretation shall be final and binding the CONTRACTOR.

B. CONTRACTOR will not be allowed to take advantage of errors or omissions in plans and specifications. ENGINEER will provide full instructions when errors or omissions are discovered. ENGINEER will provide instructions within a reasonable time after discovery of errors or omissions. CONTRACTOR shall not be entitled to additional compensation due to delays or down time while ENGINEER provides full instructions.

1.15 DECISIONS BY ENGINEER

A. ENGINEER shall make decisions, in writing, on claims between CONTRACTOR and OWNER within a reasonable time after presentation. CONTRACTOR shall not be entitled to additional compensation due to delays or down time while ENGINEER renders said decision. Such decisions shall be regarded as final except for appropriate legal recourse.

B. Mediation

1. Either OWNER or CONTRACTOR may request mediation of any Claim submitted to ENGINEER for a decision before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of the ENGINEER'S decision.
2. OWNER and CONTRACTOR shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request.

The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

3. If the Claim is not resolved by mediation, ENGINEER'S action shall become final and binding 30 days after termination of the mediation unless, within that time period, OWNER or CONTRACTOR:
   a. Elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions, or
   b. Agrees with the other party to submit the Claim to another dispute resolution process, or
   c. Gives written notice to the other party of their intent to submit the Claim to a court of competent jurisdiction.

1.16 WORKMANSHIP AND MATERIALS

A. All work done, and all materials and equipment furnished by CONTRACTOR shall conform to plans and specifications. Competent labor and tradesmen shall be used on all work. Experienced manufacturers' representatives shall be used to supervise installation of equipment.

B. In absence of detailed specifications in other sections, all materials shall conform to standards of American Society for Testing Materials.

C. Wherever items of materials or equipment are specified by a manufacturer's name and type, or equal, it is the intent that materials or equipment of other manufacturers, equal in quality and performance, may be substituted. Such substitution may be made only with written authorization of ENGINEER.

D. Wherever items of materials or equipment are specified by a manufacturer's name and type, or equal, and additional features of items are specifically required by specifications, additional features specified shall be provided whether or not they are normally included in standard manufacturer's items listed.

E. Wherever items of materials or equipment are specified by a manufacturer's name and type, or equal, and specified items are or become obsolete and no longer available, CONTRACTOR shall provide acceptable equal items which are currently available at no change in contract price.

F. When proposing "or equal" items or substitutions, CONTRACTOR shall furnish general arrangement drawings, full descriptive data, manufacturer's specifications and such performance data as required to satisfy ENGINEER that materials or equipment proposed are equal to that specified. Burden of proof of equality shall be responsibility of CONTRACTOR.

G. Whenever items of materials or equipment are specified by a manufacturer's name and type and 'or equal" is not listed, CONTRACTOR shall provide specified equipment without substitution, unless prior approval of ENGINEER is obtained for any substitution.

H. CONTRACTOR shall abide by ENGINEER'S decision when proposed substitutes of material or equipment are deemed to be unacceptable and in such an event CONTRACTOR shall furnish items of equipment or materials specified.

I. ENGINEER reserves right to consider such factors as overall project arrangement, overall project cost, and similar factors in determining whether proposed substitutions will be acceptable.

1.17 ON-SITE REVIEW AND OBSERVATION

A. All materials used, and all work done by CONTRACTOR shall be subject at all times to review, observation, tests and approval by ENGINEER. CONTRACTOR shall furnish samples of materials for observation and tests as requested by ENGINEER. CONTRACTOR shall furnish any information required concerning nature or source of any proposed materials or equipment.

B. Construction, fabrication and manufacture of equipment or materials specified herein may be observed by ENGINEER at plant or factory.

C. Materials, equipment or work which do not satisfactorily meet specifications may be condemned by ENGINEER by written notice to CONTRACTOR. Condemned materials, equipment or work shall be promptly removed and replaced.

D. Defective materials, equipment or work may be rejected by ENGINEER at any time prior to final acceptance by OWNER even though said defective items may have been previously overlooked.

E. On-Site Review and Observation by the ENGINEER, his Resident Reviewer and / or Engineer Technician shall NOT relieve the CONTRACTOR of his responsibility to perform all work in accordance with the Contract Documents.

1.18 RESIDENT REVIEWER AND / OR ENGINEER TECHNICIANS

A. Resident Reviewer and / or Engineer Technicians may be appointed by ENGINEER if so authorized by OWNER to help ensure the work is being performed in accordance with plans and specifications.

B. Resident Reviewer and / or Engineer Technicians shall have authority to notify CONTRACTOR in writing of work which is not being properly performed. CONTRACTOR shall be liable for any work determined by ENGINEER as not being properly performed.

C. Resident Reviewer and / or Engineer Technicians shall have neither authority to permit deviation from plans and specifications nor authority to authorize additional work or changes in work which will result in additional compensation due to the CONTRACTOR, and CONTRACTOR shall be liable for any deviations made without written order from ENGINEER.

D. Resident Reviewer and / or Engineer Technicians shall not undertake any of the responsibilities of CONTRACTOR, subcontractors, suppliers, or CONTRACTOR'S superintendent.

E. Resident Reviewer and / or Engineer Technicians shall not advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of the CONTRACTOR'S work.

F. Resident Reviewer and / or Engineer Technicians shall not advise on, issue direction regarding, or assume control over safety practices, precautions, and programs in connection with the activities or operations of the CONTRACTOR.

G. Resident Reviewer and / or Engineer Technicians shall not participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically directed by the ENGINEER'S Project Engineer.

H. Resident Reviewer and / or Engineer Technicians shall not Accept Shop Drawing or Sample Submittals from anyone other than CONTRACTOR.

I. Resident Reviewer and / or Engineer Technicians shall not have the authority to authorize OWNER to occupy the project in whole or in part.

1.19 TESTS

A. Tests shall be performed upon materials and equipment specified, to determine if the materials and equipment meet requirements of specifications, conditions of operation and guarantees of CONTRACTOR.

B. Equipment shall be subject to factory tests specified herein. Certified evidence of tests shall be furnished when requested by ENGINEER.

C. Tests shall be made in accordance with standards of American Society of Mechanical Engineers, Institute of Electrical and Electronic Engineers, American Society for Testing Materials, and other recognized standards.

D. CONTRACTOR shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for OWNER’S and ENGINEER’S

acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to CONTRACTOR'S purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be provided to OWNER and ENGINEER upon request or as otherwise specified.

E. If any Work performed by CONTRACTOR or subcontractors that is to be inspected, tested, or approved is covered by CONTRACTOR or subcontractors without written concurrence of ENGINEER, it must, if requested by ENGINER, be uncovered for observation.

Uncovering Work shall be at CONTRACTOR'S expense unless CONTRACTOR has given ENGINEER timely notice of CONTRACTOR'S intention to cover the same and ENGINEER has not acted with reasonable promptness in response to such notice.

1. If any Work is covered contrary to the written request of ENGINEER, it must, if requested by ENGINEER, be uncovered for ENGINEER'S observation and replaced at CONTRACTOR'S expense.
2. If ENGINEER considers it necessary or advisable that covered Work be observed by ENGINEER or inspected or tested by others, CONTRACTOR, at ENGINEER'S request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as ENGINEER may require, that portion of the Work in question, furnishing all necessary labor, materials, and equipment.
3. If it is found that the uncovered Work is defective, CONTRACTOR shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others).
4. If, the uncovered Work is not found to be defective, CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction.

1.20 TIME

A. CONTRACTOR shall commence work within time specified and shall complete work within time specified in contract.

1.21 DELAYS

A. Delays caused by injunction or legal actions, damages by elements, or other properly documented causes beyond control of CONTRACTOR (of which OWNER shall be sole judge) shall entitle CONTRACTOR to a reasonable extension of time within which to complete work. CONTRACTOR shall not be entitled to additional compensation due to delays or down time unless expressly agreed to in writing between CONTRACTOR and OWNER.

B. Application for extension of time shall be made to OWNER by CONTRACTOR and shall state reasons for request for extension of time.

C. No extension of time shall be valid unless made in writing by OWNER following receipt of proper documentation of the cause of the delay from CONTRACTOR.

D. Normal weather conditions shall not form the basis of request for extension of time. Abnormal weather conditions shall form basis of request for extension of time only to the extent said delay is a result from abnormal weather conditions in excess of normal weather conditions and affects the critical path of the project.

1.22 LIQUIDATED DAMAGES

A. CONTRACTOR and OWNER recognize that time is of the essence and that OWNER will suffer financial loss if the Work is not completed within the times specified in the Notice of Letting and/or Agreement Between Owner and Contractor, plus any extensions thereof allowed in accordance with Article 1.21 of the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by OWNER if the Work is not completed on time. Accordingly, instead of requiring any such proof, OWNER and CONTRACTOR agree that as liquidated damages for not completing the work on time the CONTRACTOR shall be assessed, not as a penalty, but as a predetermined and agreed liquidated damages, the specified amount for each calendar day that expires after the time specified for Completion until the Work is substantially complete. After Substantial Completion, if CONTRACTOR shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by OWNER, CONTRACTOR shall be assessed, not as a penalty, but as a predetermined and agreed liquidated damages, the specified amount for each calendar day that expires after the time specified for completion and readiness for final payment until the Work is completed and ready for final payment.

1.23 CHANGES

A. ENGINEER shall have the right to make changes in location and quantities of work as may be deemed advisable with consent of OWNER and without notice to sureties on CONTRACTOR'S bond.

B. No change shall be made under this paragraph which will increase or decrease total contract amount more than **twenty percent (20%)** of original contract price and no changes shall be made in plan of improvement that would necessitate additional or different construction processes and equipment.

C. Amount due CONTRACTOR shall be adjusted for changes in following manner:
   1. Where unit prices have been bid, these unit prices shall be used to compute adjustment in compensation.
   2. Where no such unit prices have been bid, ENGINEER and CONTRACTOR shall negotiate a) new unit prices which will include all administrative costs for overhead and profit or b) a reasonable lump sum adjustment in CONTRACTOR'S compensation. Limitations on compensation as specified in Article "1.24 - EXTRA WORK" shall apply to changes where compensation is negotiated on a lump sum basis.
   3. No changes shall be authorized unless they are shown on revised plans or in written instructions of ENGINEER.
   4. Authorized changes which require additional time to complete shall entitle CONTRACTOR to proportionate extension of time to completion which shall be determined by ENGINEER.

1.24 EXTRA WORK

A. Required extra work not specified under this contract shall be done at an agreed price satisfactory to CONTRACTOR and OWNER, or on basis of actual cost of work plus not more than **ten percent (10%)** for CONTRACTOR'S overhead and profit. Overhead shall be construed to include all costs associated with furnishing Bonds as specified for this project. Actual cost shall include expense for equipment, materials, and labor and shall include no overhead items or profit. Where extra work is done by a subcontractor, with approval of OWNER, there may be included in CONTRACTOR'S actual cost, **five percent (5%)** for subcontractor's profit.

B. The term "extra work" as used herein shall not be construed to apply to changes described in "1.23 CHANGES".

C. No compensation shall be allowed CONTRACTOR for extra work unless such work has been authorized in writing by ENGINEER and approved by OWNER.

D. CONTRACTOR shall submit a statement of costs to ENGINEER for approval when extra work is performed on an actual cost-plus basis. After such a statement is approved, ENGINEER shall certify its correctness to OWNER.

1.25 OWNERSHIP OF MATERIALS

A. All materials and work covered by partial payments shall become sole property of OWNER, but this provision shall not be construed as relieving CONTRACTOR from sole responsibility for all materials and work for which payments have been made, for restoration of damaged work, or as a waiver of rights of OWNER to require fulfillment of all terms of contract.

1.26 OTHER CONTRACTS

A. OWNER reserves right to let other contracts in connection with this work. CONTRACTOR shall afford other CONTRACTORS reasonable opportunity for introduction and storage of their materials and execution of their work and shall properly connect and coordinate its work with theirs.

B. When proper execution of CONTRACTOR'S work depends upon work of another CONTRACTOR, it shall inspect other work and report any defects to ENGINEER. CONTRACTOR'S failure to inspect and report shall constitute an acceptance of other CONTRACTOR'S work except for defects which may develop in work after completion.

C. To ensure proper execution of its subsequent work, CONTRACTOR shall measure work already in place and shall at once report to the ENGINEER any discrepancy between the executed work and drawings.

1.27 OWNER'S RIGHT TO DO WORK

A. If CONTRACTOR neglects to prosecute work properly or fails to perform any provision of this contract, OWNER, after three (3) days' written notice to CONTRACTOR, may, without prejudice to any other remedy it may have, make good such deficiencies and may deduct the cost thereof from the payment then or thereafter due the CONTRACTOR, provided, however, that ENGINEER shall approve both such action and amount charged to CONTRACTOR.

1.28 OWNER'S RIGHT TO TERMINATE CONTRACT FOR CAUSE

A. In the event any provisions in the contract are violated by the CONTRACTOR or any of its subcontractors, the OWNER may serve written notice upon the CONTRACTOR and its surety of their intention to terminate such contract. Such notice shall contain a statement of the reasons for such action and unless within 10 days after the serving of such notice upon the CONTRACTOR such violation shall cease and satisfactory arrangements for correcting be made, the contract shall, upon expiration of said 10 days cease and terminate.

1. In the event of such termination, the OWNER shall immediately serve notice thereof upon the surety and CONTRACTOR and the surety shall have the right to take over and perform the contract, provided, however, that if the surety does not commence the performance thereof within 30 days, the OWNER may take over the work and prosecute the same to completion by contract for the account and at the expenses of the CONTRACTOR and the CONTRACTOR and its surety shall be liable to the OWNER for any excess cost occasioned the OWNER thereby; in such event, the OWNER may take possession of and utilize such materials, appliances and plant as may be on the site of the project and necessary in completing the work.

B. OWNER, upon certification of ENGINEER that there is sufficient cause to justify termination of contract, may, without prejudice to any other right or remedy, and after giving CONTRACTOR seven (7) days' notice may terminate employment of CONTRACTOR for any of following reasons:

1. CONTRACTOR makes a general assignment for benefit of its creditors, or if adjudged a bankrupt.
2. Receiver is appointed on account of CONTRACTOR'S insolvency.
3. CONTRACTOR persistently or repeatedly fails or refuses to provide enough skilled workmen or proper materials.
4. CONTRACTOR fails to make prompt payment to subcontractors for material or labor.
5. CONTRACTOR disregards laws, ordinances, OWNER policies or instructions of ENGINEER.
6. CONTRACTOR violates a provision of the contract.

C. If OWNER terminates employment of CONTRACTOR for cause, OWNER shall take possession of premises and all materials, tools and appliances thereon. OWNER shall finish work by whatever method it may deem expedient. In such case CONTRACTOR shall not be entitled to receive any further payment until work is finished.

D. If unpaid balance of contract price exceeds expense of finishing the work including compensation for additional managerial and administrative services, excess shall be paid to CONTRACTOR. If expense exceeds unpaid balance, CONTRACTOR shall pay difference to OWNER. Expense incurred by OWNER as herein provided, and damage incurred through CONTRACTOR'S default, shall be certified by ENGINEER.

1.29 OWNER’S RIGHT TO TERMINATE CONTRACT FOR CONVENIENCE

A. The OWNER may terminate this contract at any time by giving at least ten days notice in writing to the CONTRACTOR. If the contract is terminated by the OWNER as provided herein, the CONTRACTOR will be paid for the time provided and expenses incurred up to the termination date.

1.30 CONTRACTOR'S RIGHT TO STOP WORK OR TERMINATE CONTRACT

A. If ENGINEER fails to issue any certificate for payment within fifteen (15) days after it is due, or if OWNER fails to pay to CONTRACTOR within thirty (30) days of its maturity and presentation, any sum certified by ENGINEER, then CONTRACTOR may, upon seven (7) days simultaneous written notice to OWNER and ENGINEER, stop work or terminate this contract. If CONTRACTOR elects to stop work by written notice, work shall be resumed promptly upon payment by OWNER. If CONTRACTOR elects to terminate this contract by written notice it shall recover from OWNER payment for all work executed to date of notice and any loss sustained upon any plant or materials plus a reasonable profit.

1.31 PAYMENTS WITHHELD

A. ENGINEER may withhold or nullify the whole or a part of payment certificate, on account of subsequently discovered evidence, to such extent as may be necessary to protect OWNER from loss on account of:
   1. Defective work not remedied.
   2. Claims filed or reasonable evidence indicating probable filing of claims.
   3. Failure of CONTRACTOR to make payments properly to subcontractors or for materials or labor.
   4. A reasonable doubt that contract can be completed for balance then unpaid.
   5. Damage to another contractor.
   6. Claims of OWNER for liquidated damages.
   7. Failure of CONTRACTOR to conform to scheduling constraints in contract documents.

B. Payments shall be made for amounts withheld when above grounds are removed.

1.32 ACCEPTANCE AND FINAL PAYMENT

A. When work has been satisfactorily completed, ENGINEER will certify CONTRACTOR'S final estimate stating that work has been completed in accordance with terms and conditions thereof with qualifications, if any, as stated. Balance found to be due CONTRACTOR according to the terms of payment shall be paid by OWNER as provided in contract, provided, however, that any state laws which designate manner of final payment shall be followed in lieu of manner of final payment outlined above. Prior to receipt of final payment, CONTRACTOR shall file with OWNER a receipt in full from each manufacturer, subcontractor, and dealer for all equipment and materials used on the work and a complete release of all liens, including tax liens, which may have arisen from this contract and required statements from CONTRACTOR and all subcontractors of sales and use tax paid. In lieu thereof, OWNER, at its option, may accept from CONTRACTOR a statement showing balance due on all accounts.

B. Making and acceptance of final payment shall constitute a waiver of all claims by OWNER, except those arising from unsettled liens, from faulty work or materials appearing after final payment or from requirements of the specifications, and of all claims by CONTRACTOR, except those previously made and still unsettled.

1.33 SUSPENSION OF WORK

A. OWNER may suspend the work, or any part thereof, at any time, by giving ten (10) days' written notice to CONTRACTOR. The work shall be resumed by CONTRACTOR within ten (10) days after date fixed in written notice from OWNER to CONTRACTOR to do so.

B. If work, or any part thereof, shall be suspended and if OWNER does not give written notice to CONTRACTOR to resume work within one (1) year of date of suspension, CONTRACTOR may abandon suspended portion of work. CONTRACTOR will be entitled to estimates and payments for all work done on the portions so abandoned, if any.

1.34 CLEANING UP

A. CONTRACTOR shall keep premises free from accumulations of waste material or rubbish caused by its employees or work. After completion of work it shall remove all its rubbish and all its tools, scaffolding and surplus materials from work site. It shall leave its work "broom clean" or its equivalent, unless more exactly specified. In case of dispute the OWNER may remove rubbish and charge costs to CONTRACTOR as ENGINEER shall determine to be just.

1.35 HAZARDOUS MATERIALS

A. The use of Asbestos Construction Building Materials (ACBM) is specifically prohibited. The CONTRACTOR, suppliers, and subcontractors shall warrant that all products used are asbestos free. In the event that a specified product contains asbestos, it shall be the responsibility of the CONTRACTOR to notify the OWNER so that an appropriate substitution can be made in a timely manner so as not to delay the Project.

B. The CONTRACTOR shall provide the OWNER a certificate that warrants that no materials, products, items or equipment contains any asbestos upon completion of the work of this Contract. If asbestos is found to exist in any of the materials, products, items or equipment provided as part of this Contract, the CONTRACTOR shall be financially responsible for all costs resulting from removal in accordance with an OWNER approved method and replacement of an asbestos free condition to finished drawings and specifications. The financial responsibility of the CONTRACTOR shall not terminate with the end of the surety maintenance bond period but shall continue through the life of the facility.

1.36 IOWA HAZARDOUS CHEMICAL RISKS RIGHT-TO-KNOW LAW

A. OWNER'S Responsibility:
   1. OWNER shall provide to the CONTRACTOR a list of known hazardous chemicals within the project site to which their employees may be exposed and suggestions for appropriate protective measures.

B. CONTRACTOR'S Responsibility:
   1. CONTRACTOR shall inform his/her employees of the Iowa Hazardous Chemical Risks Right-to-Know Law.
   2. CONTRACTOR shall provide to the OWNER a list of known hazardous chemicals that they anticipate will be used on site as well as all pertinent information relating to

employee protection. CONTRACTOR'S Material Safety Data Sheets (MSDS) shall be available to OWNER upon request.

1.37 CONTAMINATED SOILS

A. Whenever contaminated soils are encountered during the progress of the work the CONTRACTOR shall immediately notify the ENGINEER and OWNER. If the contaminated soils are deemed to be an environmental concern the ENGINEER shall be provided a reasonable time period to arrange for testing and to plan for the removal and disposal of said materials. The CONTRACTOR shall **NOT** be entitled to additional compensation due to delays or down time while the ENGINEER resolves the contaminated soil issue. The ENGINEER shall be given a minimum of 72 hours to make arrangements for testing and disposal of the contaminated soils.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

Not Applicable.

END OF SECTION

SECTION 00800

SPECIAL CONDITIONS

PART 1 – GENERAL

A. Intent (1.01)
B. Location (1.02)
C. Construction Limits (1.03)
D. Right-of-Way (1.04)
E. Order of Construction (1.05)
F. Interruptions to Services (1.06)
G. Service Facilities (1.07)
H. Storage of Materials and Equipment (1.08)
I. Additional Contractor's Responsibility (1.09)
J. Employment Practices (1.10)
K. Historical/Archaeological Finds (1.11)
L. Inspection by State and Federal Personnel (1.12)
M. Audit (1.13)

1.01 INTENT

A. To supplement the provisions of the General Conditions by outlining special conditions applicable to this project.

1.02 LOCATION AND DESCRIPTION

A. The work is located outside the City of Logan, Iowa as shown on Drawing No. A1 titled Vicinity Map on the Index and Title Sheet.

B. Transportation facilities:
1. Highway 30

C. Description:
Project consists of providing a new fully functional standby generator to operate the City's well field. Project includes all labor, materials, and equipment necessary to supply new generator to the site, PCC generator pad, supply and install 1,000-gallon propane tank, PCC propane tank pad, grading, connecting generator to existing system, mobilization, miscellaneous work, and cleanup.

1.03 CONSTRUCTION LIMITS

A. Confine movements of equipment and personnel, storage of materials, excavation, spoil banks, and all other construction operations to construction limits shown or noted on plans.

B. Construction limits are within City owned property.

1.04 RIGHT-OF-WAY

A. OWNER will provide easements for construction on private lands.

B. Confine movements of equipment and personnel, storage of materials, excavation, spoil banks, and all other construction operations within the right-of-way provided.

C. CONTRACTOR will be held liable by City and adjacent property owners for damages outside right-of-way and easements; failure of ENGINEER to warn CONTRACTOR about incidence of trespassing does not relieve liability.

1.05 ORDER OF CONSTRUCTION

A. Provide ENGINEER with proposed schedule of construction showing dates of starting and completing various portions of work.

B. Coordinate work with OWNER and ENGINEER to assure orderly and expeditious progress of work.

C. CONTRACTOR shall establish schedule of working hours for construction, subject to approval of OWNER and ENGINEER.

D. Schedule construction to minimize service interruptions and use of road barricades and detours; clean up each portion of work as it is completed.

E. See Section 01010 – Summary of Work for additional Work Planning and Scheduling Constraints.

F. Provide OWNER 48 hours notice of any interruption of operations; coordinate with Water Superintendent.

1.06 INTERRUPTIONS TO SERVICE

A. Existing utilities shall remain in substantially continuous operation during construction, including water, sewer, power, and gas lines.

B. Do work which will interrupt utility service only at times approved by ENGINEER; hold interruptions of service to minimum.

C. See Section 01019 – Contract Considerations for protection of utilities and continuity of existing utilities.

1.07 SERVICE FACILITIES

A. Provide services, including electricity, phone, water, sanitary, and compressed air, to meet own requirements.

B. See Section 01500 – Construction Facilities and Temporary Controls.

1.08 STORAGE OF MATERIALS AND EQUIPMENT

A. Limited storage space for materials and equipment will be available at project sites.

B. Storage areas subject to approval of OWNER and ENGINEER.

C. Store materials and equipment in manner, which will preserve their quality and fitness.

D. Store and protect materials and equipment in accordance with Section 01600 – Material and Equipment.

1.09 ADDITIONAL CONTRACTOR'S RESPONSIBILITY

A. CONTRACTOR shall notify ENGINEER immediately upon determining that utility lines, mains, cables or other obstructions will prevent the work from progressing in accordance with the plans and specifications.

B. The CONTRACTOR shall notify the ENGINEER and OWNER immediately upon encountering contaminated soils.

1.10 EMPLOYMENT PRACTICES

A. CONTRACTORS, or subcontractors shall not employ any person whose physical or mental condition is such that said employment will endanger the health and safety of himself or others employed on the project.

1.11 HISTORICAL/ARCHAEOLOGICAL FINDS

A. If, during course of construction, evidence of deposits of historical or archaeological interest is found, cease operations affecting find and notify OWNER who shall notify the Iowa Department of Natural Resources and Director and Historic Prevention Officer, State Historical Department, 600 East Grand Avenue, Des Moines, Iowa 50319. No further disturbance of deposits shall ensue until notification by OWNER that work may proceed. OWNER will issue notice to proceed only after the appropriate state official has surveyed the finding and made determination to the Iowa Department of Natural Resources and OWNER. Compensation to Contractor, if any, for lost time or changes in construction to avoid find, will be determined in accordance with changed conditions or change order provisions of the General Conditions.

1.12 INSPECTION BY STATE AND FEDERAL PERSONNEL

A. Provide full access and cooperation for inspection of work by representatives of participating state and federal agencies.

1.13 AUDIT

A. Regional Administrator, the Comptroller General of the United States, or any authorized representative shall have access to any books, documents, papers and records of CONTRACTOR which pertain to the project for purpose of making audit, examination, excerpts and transcriptions thereof.

PART 2 – PRODUCTS

A. Not Applicable.

PART 3 – EXECUTION

A. Not Applicable.

END OF SECTION

SECTION 01010
SUMMARY OF WORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Work by OWNER.

B. Work by CONTRACTOR.

C. Work by other contractors.

D. OWNER furnished products.

E. CONTRACTOR use of site.

F. Future work.

G. Work Planning and Scheduling Constraints.

H. OWNER Occupancy.

1.02 RELATED SECTIONS

A. Section 00510 – Agreement Between Owner and Contractor

B. Section 01019 – Contract Considerations

C. Section 01025 – Measurement and Payment

D. Section 01300 – Submittals

1.03 WORK BY OWNER

A. None

1.04 WORK BY CONTRACTOR

A. Furnish all materials, labor, and equipment to construct the Logan Well Field Generator Project as set out in Notice of Hearing and Letting.

B. Work by Contractor includes, but is not limited to the following:
   1. Grading.
   2. Concrete pads.
   3. Supplying new generator.
   4. Propane line installation
   5. Electrical connections
   6. Seeding

1.05 WORK BY OTHER CONTRACTORS

A. OWNER reserves right to let other contracts in connection with this work. CONTRACTOR shall afford other CONTRACTOR'S reasonable opportunity for introduction and storage of their materials and execution of their work and shall properly connect and coordinate its work with theirs.

B. When proper execution of CONTRACTOR'S work depends upon work of another CONTRACTOR, it shall inspect other work and report any defects to ENGINEER. CONTRACTOR'S failure to inspect and report shall constitute an acceptance of other CONTRACTOR's work except for defects which may develop in work after completion.

C. To ensure proper execution of its subsequent work, CONTRACTOR shall measure work already in place and shall at once report to the ENGINEER any discrepancy between the executed work and drawings.

1.06 OWNER FURNISHED PRODUCTS

A. None

B. OWNER'S Responsibilities:
   1. Arrange for and deliver OWNER reviewed shop drawings, product data, and samples, to CONTRACTOR.
   2. Arrange and pay for product delivery to site.
   3. On delivery, inspect products jointly with CONTRACTOR.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections and service.

C. CONTRACTOR'S Responsibilities:
   1. Review OWNER reviewed shop drawings, product data, and samples.
   2. Receive and unload products at site; inspect for completeness or damage, jointly with OWNER.
   3. Handle, store, install and finish products.
   4. Repair or replace items damaged after receipt.

1.07 CONTRACTOR USE OF SITE

A. Limit use of site to allow:
   1. Operation of existing wells by OWNER.

1.08 FUTURE WORK

A. None

1.09 WORK PLANNING AND SCHEDULING CONSTRAINTS

A. Procedures outlined below are not intended to fully cover all special procedures or emergencies which may arise during construction but are offered as an aid to CONTRACTOR in planning work; CONTRACTOR will cooperate with OWNER and ENGINEER to minimize inconvenience, construction delays and interruptions to street traffic.

B. Determine location of underground utilities and piping before starting excavation work; locations of underground appurtenances are approximate and not guaranteed by OWNER or ENGINEER.

C. Remove and replace all signs and other appurtenances which interfere with construction operations; replace damaged signs at no cost to OWNER; signs not shown on drawings.

D. Limit construction operations to property, rights-of-way and easements provided by OWNER; provide barricades, lights, signs and detours as necessary to reroute traffic around construction areas.

E. Arrange with operating utilities for relocation or temporary removal of utilities in conflict with construction and for services needed during construction at no cost to OWNER.

F. Notify businesses and residents 2 days in advance, when construction will disrupt or block access to property.

G. Plan and construct work to accommodate OWNER'S use of premises and occupancy during entire construction period. Cooperate with OWNER to minimize conflict, and to facilitate OWNER'S operations and/or operations of other contractors.

H. Basic Planning and Scheduling Constraints on a Project Basis are:

1. Work and storage of materials, equipment, and debris shall be limited to OWNER-owned properties. Operations and storage shall be kept within OWNER-owned properties, right-of-ways, and easements (temporary and permanent).
2. The CONTRACTOR's sequence of operations shall be such as to cause as little inconvenience to the general public as possible.

1.10 OWNER OCCUPANCY

A. Cooperate with OWNER to minimize conflict, and to facilitate OWNER'S operations.

B. Schedule the Work to accommodate this requirement.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01019

CONTRACT CONSIDERATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Administrative Provisions Regarding:
   1. Agreement
   2. Taxes
   3. Format of Plans and Specifications
   4. Intent and Interpretation of Specifications
   5. Starting and Completion Time
   6. Information for ENGINEER
   7. Job Site Administration
   8. Copies of Drawings and Project Manuals
   9. Standards and Codes
   10. Protection of Utilities
   11. Continuity of Existing Utility Systems
   12. Maintenance of Traffic
   13. Protection of Open Trenches
   14. Restoration of Roads and Turf Areas
   15. Conflict in Dimensions
   16. Building Permits
   17. Signs
   18. Protection of Existing Trees
   19. Disposal of Debris
   20. Fences
   21. Conformance to Scheduling Constraints
   22. Defective Equipment
   23. Work Visibility Regulations

B. Application for Payment.

C. Change and Extra Work Authorization Procedures.

D. Requests for Information.

1.02 RELATED SECTIONS

A. Section 01010 - Summary of Work.

B. Section 01025 - Measurement and Payment

C. Section 01300 - Submittals

D. Section 01500 - Construction Facilities and Temporary Controls.

E. Section 01600 - Material and Equipment

1.03 ADMINISTRATIVE PROVISIONS

A. Agreement:
   1. Construct Work under Lump Sum Price Agreement.

B. Taxes:
   1. The City will issue a sales tax exemption certificate for all materials purchased on the project. The City will issue the appropriate tax exemption certificates and authorization letters to the CONTRACTOR and all subcontractors completing work on the project. Tax exemption certificates are applicable only for the specific project for which the tax exemption certificate is issued.

   2. CONTRACTOR shall provide a listing to the City identifying all appropriate subcontractors qualified for use of the tax exemption certificate. CONTRACTOR and subcontractors may make copies of the certificate and provide to each supplier providing construction materials a copy of the tax exemption certificate.

   3. Successful bidder is subject to payment of Iowa Income Tax on income from this work in amounts prescribed by law. If successful bidder is a non-Iowa partnership, individual or association, they shall furnish evidence prior to execution of contract, that bond or securities have been posted with the Iowa Department of Revenue in the amount required by law.

C. Plans and Specifications:
   1. Specifications - Format:
      a. Detailed specifications are in outline format and may include incomplete sentences. Omission of words or phrases is intentional. Supply omitted words or phrases by inference.
   2. Specifications - Intent:
      a. To set forth requirements of performance, type of equipment or structure desired, and standards of materials and construction.
      b. To describe work set out in Contract Documents, unless otherwise specifically indicated.
      c. To require performance of complete work in spite of omission of specific reference to any minor component parts.
      d. To provide for new materials and equipment, unless otherwise indicated.
   3. Specifications - Interpretation:

a. Report errors or ambiguities in specifications to ENGINEER as soon as detected; ENGINEER will answer questions regarding and interpret intended meaning of specifications; his interpretation shall be accepted as final.
b. CONTRACTOR will not be allowed to take advantage of errors or omissions in plans and specifications. ENGINEER will provide full instructions when errors or omissions are discovered.

4. Order of Precedence of Documents which is listed as shown below:
   a. Notice of Hearing or Notice to Bidders
   b. Agreement Between Owner and Contractor
   c. Special Conditions (Section 00800)
   d. General Conditions (Section 00700)
   e. Specifications
   f. Details on Drawings
   g. Plan Drawings

D. Starting and Completion Time:
1. Notice to Proceed will be issued by ENGINEER upon execution and approval of Contracts and Bonds and receipt of Certificate of Insurance. It is anticipated Notice to Proceed will be issued by the date set forth in the Notice to Bidders.
2. Commence work within 10 calendar days after date set forth in written Notice to Proceed.
3. Work shall be substantially completed by the date or within the time set out in Section 00510 – Agreement Between Owner and Contractor.
4. Substantial Completion shall mean the time at which the work (or a specified part thereof) has progressed to the point where, in the opinion of the ENGINEER, the work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the work refer to Substantial Completion thereof.
5. Provide adequate personnel and equipment to perform work within time or before completion date set out in Notice to Bidders.
6. Order all material and equipment immediately after award of contract. Notify OWNER and ENGINEER of scheduled delivery dates for all materials and equipment. Promptly act to accomplish one of the following if OWNER and ENGINEER, in consultation with CONTRACTOR, determine delivery dates to be unsatisfactory:
   a. Substitute alternate materials and equipment with approval of OWNER and ENGINEER.
   b. Expedite delivery of materials and equipment.
7. Extensions of contract period will be given consideration upon written request of CONTRACTOR. Request must include clear, concise reasons for requesting

extension and provide data and relevant information to support reasons for extension.

a. OWNER expects work to be complete and ready for final acceptance within completion time prior to completion date specified.
b. No extension of contract period will be granted for problems caused by delivers of materials or equipment.
c. The phrase “complete and ready for final acceptance” is interpreted to mean all items of construction, surface restoration and clean-up have been accomplished to the satisfaction of the OWNER and ENGINEER prior to the completion date for the contract. So-called “punchlist” items are included in this definition and must be completed prior to the completion date for the contract.

E. Information for ENGINEER;

1. After award of contract provide information and drawings for ENGINEER'S review in accordance with Section 01300 - Submittals: Information to include but not be limited to manufacturer's specifications and catalog data for pipe, castings and such other data as requested by ENGINEER.
2. Provide construction schedule showing dates of starting and completing various portions of work in accordance with Section 01300 - Submittals.
3. Provide 2 copies of following information:
   a. Purchase orders and subcontracts without prices.

F. Job Site Administration:

1. CONTRACTOR shall provide competent, suitably qualified personnel to survey and lay out Work and perform construction as required by Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at site.
2. Except in connection with safety or protection of persons or Work or property at site or adjacent thereto, and except as otherwise indicated under planning and scheduling constraints in Contract Documents, all Work at site shall be performed during regular working hours, and CONTRACTOR shall not permit overtime work or performance of Work on Saturday, Sunday, or any legal holiday without OWNER'S written consent given after prior written notice to ENGINEER.
3. Incompetent or incorrigible employees shall be dismissed from Work by CONTRACTOR or its representative when requested by ENGINEER, and such persons shall not again be permitted to return to Work without written consent of ENGINEER.
4. Workmanship shall be of best quality.
5. Project Documents.
   a. Maintain on site, one set of the following record Project Documents:
      (1) Contract Drawings.
      (2) Specifications.
      (3) Addenda.
      (4) Change Orders and other Modifications to the Contract.

(5) Reviewed shop drawings, product data, and samples.
(6) Copy of Executed Contract with OWNER, including Exhibits if applicable.
(7) Copies of all Payment Applications or Certifications submitted to OWNER to date.

b. Store Project Documents separate from documents used for construction, accessible for use by OWNER or ENGINEER.

G. Copies of Drawings and Project Manuals:
1. After Notice of Award, CONTRACTOR may obtain, at no charge, a maximum of 3 complete sets of Drawings, as listed in project manual, and 3 sets of Project Manuals.
2. Additional copies of project manuals and full-size Drawings may be obtained under following conditions:
a. Project Manuals:
(1) Furnished at ENGINEER'S reproduction cost plus handling charge.
(2) If CONTRACTOR'S requirements for additional project manuals necessitates reprinting of project manuals, CONTRACTOR shall pay entire cost of such reprinting.
(3) Partial sets of project manuals will not be provided.
b. Drawings: Furnished at ENGINEER'S reproduction cost plus handling charge.
3. Revised Drawings and project manuals, if required, will be provided by ENGINEER to show authorized changes or extra Work under following conditions:
a. Project manuals: Furnished at no charge, in same quantity as original issuance.
b. Drawings: One revised, complete set of full-size Drawings will be issued, at no charge, for each full-size set originally issued, and for each full-size set purchased by CONTRACTOR after Notice of Award.
4. Subcontractors and suppliers will be furnished copies only at request of CONTRACTOR; ENGINEER will be compensated for printing costs.
5. CONTRACTOR shall ensure each foreman or superintendent in charge of each crew on job has at least one (1) set of plans and specifications on the job site.

H. Standards and Codes:
1. For products specified by association of trade standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable codes.
2. Perform work in accordance with best present-day installation and construction practices.
3. Conform to and test materials in accordance with applicable sections of latest revisions or tentative revisions of codes and standards unless specifically noted to the contrary.

4. Date of standard is that in effect as of Bid date, or date of Agreement when there are no Bids, except when specific date is specified.
5. When required by individual Specifications Section, obtain copy of standard.
6. Should specified reference standards conflict with Contract Documents, request clarification for ENGINEER before proceeding.
7. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.
8. Standards and Codes:
   a. Do work in accordance with best present day construction practices.
   b. Unless specifically noted to contrary, comply and test in accordance with applicable sections of latest revisions of codes and standards of following:

AASHTO	American Association of State Highway & Transportation Officials
ACI	American Concrete Institute
AFBMA	Anti-friction Bearing Manufacturers Association
AGA	American Gas Association
AGC	Manual of Accident Prevention in Construction by Associated General Contractors of America, Inc.
AGMA	American Gear Manufacturers Association
AISC	American Institute of Steel Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
APA	American Plywood Association
APHA	American Public Health Association
API	American Petroleum Institute
ASA	American Standards Association
ASCE	American Society of Civil Engineering
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWI	Architectural Woodwork Quality Standards
AWWA	American Water Works Association
AWS	American Welding Society
CRA	California Redwood Association
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FM	Factory Mutual Corporation
FS	Federal Specifications
HI	Hydraulic Institute
HMI	Hoist Manufacturer’s Institute
ICEI	Internal Combustion Engine Institute

IDNR	Iowa Department of Natural Resources
IDOT	Iowa Department of Transportation
IEEE	Institute of Electrical and Electronis Engineers
IFI	Industrial Fasteners Institute
IOSHA	Iowa Occupational Safety & Health Act of 1972 (Chapter 88, Code of Iowa 2017)
IPCEA	Insulated Power Cable Engineers Association
IRI	Industrial Risk Insurers
MESA	Mining Enforcement and Safety Administration
NAAMM	National Association of Architectural Metal Manufacturers
NACE	National Association of Corrosion Engineering
NEC	National Fire Protection Associations' National Electrical Code
NEMA	National Electrical Manufacturers Association
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NLMA	National Lumber Manufacturers Association
NSC	National Safety Council
NSF	National Sanitation Foundation
NWMA	National Woodwork Manufacturers Association
OSHA	Occupational Safety & Health Act of 1970 (Public Law 91-596)
SAE	Society of Automotive Engineers
SDI	Steel Door Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association, Inc.
SSPC	Steel Structures Painting Council
UL	Underwriters' Laboratories, Inc.
WCLB	West Coast Lumber Inspection Bureau
WEF	Water Environment Federation
WWPA	Western Wood Products Association
29 CFR 1926	Safety and Health Regulation for Construction

c. Standards & Codes of the State of Iowa and applicable local standards, codes, and local ordinances of the City of Logan.

d. Other standards and codes which may be applicable to acceptable standards of the industry for equipment, materials and installation under the contract.

I. Protection of Utilities:

1. The locations of underground facilities as shown on the plans are approximate only and are shown only for the CONTRACTOR'S general

information. Existing subsurface utility data has been located to Utility Quality Level B as defined by ASCE/CI 38-02. The ENGINEER does not assume responsibility for showing all utilities in the plans. The ENGINEER does not assume responsibility for the accuracy of the utilities located by others as shown on the plans. Other utilities may exist, and their location may not be presently known or identified on the plans. The CONTRACTOR shall notify all public and private utilities of his work schedule and use suitable precautions to prevent damage to pipes, conduits, and other underground structures.

2. CONTRACTOR shall determine the exact location of all public and private utilities located within the construction area to avoid damage in accordance with Iowa Code 480.4. The CONTRACTOR shall contact the statewide notification center (Iowa One-Call) and provide notice of the planned excavation. The notice must be given at least 48 hours prior to the commencement of the excavation, excluding weekends and legal holidays. Notice is provided by calling the notification center at its toll-free number Iowa (1-800-292-8989 or 811). The notice for a location shall include:
    a. the name of the county, township, range and section;
    b. the name and address of the excavator;
    c. the excavators telephone number;
    d. the type and extent of the proposed excavation;
    e. whether the discharge of explosives is anticipated;
    f. the date and time when excavation is scheduled to begin;
    g. approximate location of the excavation on the property; and
    h. For a location outside of a city:
        if known, the quarter section, E911 address and global positioning system coordinate, name of property owner, name of housing development with street address or block and lot numbers, or both.
    i. For a location within a city:
        If known, the name of the housing development and property owner.
3. CONTRACTOR shall coordinate construction work with existing utility companies. The CONTRACTOR shall use due caution in working over and around all utility lines. Damages to or breaks in any utility line(s) due to the CONTRACTOR'S carelessness are to be repaired or replaced at the CONTRACTOR'S expense without cost to the utility OWNER.
4. In some areas, construction operations may be in very tight working conditions. The CONTRACTOR is reminded to make special note of the plans to what physical features are not to be harmed. Also, the CONTRACTOR is advised to work closely with City personnel and property owners during construction activities to prevent unnecessary damage.
5. The CONTRACTOR shall give notice to the Owners of all known utilities at least 48 hours before starting any operations affecting those utilities.

6. Advise all utilities prior to excavating in area where construction might affect underground gas, electrical, telephone, cable or water service.
    a. Advise telephone company of proposed construction schedule as it relates to telephone service.
    b. Advise power company of proposed construction schedule as it relates to electrical power.
    c. Advise gas company of proposed construction schedule as it relates to gas service.
    d. Advise City Water Superintendent of proposed construction schedule as it relates to water service.
    e. Advise cable television company of proposed construction schedule as it relates to cable television.
7. In some instances, it may be impossible to devise construction procedures which will allow construction to proceed over, around or under the utilities. If this should occur, the utility companies shall be notified by the CONTRACTOR and required to do what is necessary to save their facilities from harm. The ENGINEER shall approve construction changes necessary to protect utilities and shall decide whether or not a utility must be relocated. The ENGINEER shall approve construction changes or decide whether or not the utility must be relocated within a reasonable time after discovery of said conflict. CONTRACTOR shall not be entitled to additional compensation due to delays or down time while ENGINEER approves construction changes and/or decides whether or not a utility must be relocated.
8. When utilities must be relocated, the CONTRACTOR shall cooperate with the utility and provide them access to the work and time to make adjustments without interference.
9. CONTRACTOR shall verify location and elevations of existing utilities (water main, sanitary sewer and storm sewer) at all connection points with proposed utilities. Adjustment of proposed utilities, as needed, are to be made by the CONTRACTOR during construction as authorized by the ENGINEER or OWNER. Cost for adjustments shall be incidental to the respective utility.

J. Continuity of Existing Utility Systems:
1. Prepare detailed construction procedure schedule after award of contract; show definite and positive action to be taken to minimize disruption to utility systems.
2. Meet with City Water Superintendent to determine operability of isolation valves to determine area for which water service would be shut off for each water system connection.
3. Where area to be shut down consists of less than 4 blocks of water main, temporary shutdown of water system will be allowed as necessary to make connection.

4. Where area to be shut down exceeds 4 blocks, arrange construction schedule and activity so that connection work can be completed in a minimum number of shutdowns; obtain approval of ENGINEER for work schedule activities requiring system shutdown.
5. Notify OWNER of each water or sewer service connection or reconnection; notify ENGINEER of any conflicts with underground construction; water service relocation is incidental to construction.
6. Each new water or sanitary sewer service connection or reconnection to be inspected either by OWNER or ENGINEER.
7. Notify property owner 2 days in advance of interruption to water or sewer service, unless location of water or sewer service is unknown.
8. Water and sewer service connections or reconnections shall be made in accordance with City plumbing requirements; no inspection fees will be required from CONTRACTOR.

K. Maintenance of Traffic (Traffic Control):

1. General:
   a. A traffic flow pattern of City streets shall be maintained to provide emergency vehicle access to all property. Fire hydrants on or adjacent to the work shall be kept accessible to fire fighting equipment at all times. No road or street shall be closed to the public except with the permission of the ENGINEER and proper governmental authority.
   b. The ENGINEER, Chief of Police and Fire Chief shall be notified at least two (2) full working days before any street is closed or partially closed.
   c. Traffic Control shall be in accordance with the most current edition of Part 6, Temporary Traffic Control of the Manual on Uniform Traffic Control Devices (MUTCD) as published by the U.S. Department of Transportation Federal Highway Administration.
   d. It will be the CONTRACTOR'S responsibility to secure all necessary traffic control signs, devices, etc., and to place, maintain, and remove same as construction commences and is completed. Failure to comply with this portion of the specifications will result in suspension of work until the situation is corrected. A reduction in the lump sum to be paid for Traffic Control will be made for excessive noncompliance with required Traffic Control. No work shall commence in any given area until all appropriate traffic control is in place.
   e. The number of blocks closed to traffic shall be minimized.

2. Driveway/Alley Access:
   a. Temporary access, permanent access, or other means of access to personal driveways and city alleys providing access to private properties, shall be maintained at all times excluding the seven day period (or other time period stipulated by ENGINEER) immediately following placement of portland cement concrete.

b. CONTRACTOR shall notify all property owners whose access to driveways, alleys, or other access will be affected at least 48 hours before access is interrupted.

L. Protection of Open Trenches:

1. Open trenches or other hazards will not be permitted overnight unless protected by appropriate signs, lights, barricades or other safety devices. Open trenches shall be limited to locations where construction operations are being conducted. Leaving trenches open for future connections will not be allowed for more than 24 hours at any location unless approved by the ENGINEER. Barricades, signs, fence, lights and other traffic control measures shall be provided and maintained by the CONTRACTOR.
2. Provide snow fence along boundaries of construction area as specified hereinafter and as directed by ENGINEER.
   a. Install snowfence when area is prepared for excavation; install on steel posts with maximum spacing of 8'; maintain until work is completed.
   b. Provide snowfence around all open trenches or open structures when left unattended.

M. Restoration:

1. The term restoration applies to the backfilling and required compaction of trenches and related excavation, the removal of excess materials, the shaping and resurfacing of streets, the placement of walkways, sidewalks, driveways, etc., and related work necessary to restore the construction area to a usable and like original condition.
2. Unnecessary delay by the CONTRACTOR in site restoration may result in the ENGINEER suspending further construction until such restoration is completed.

N. Conflict in Dimensions:

1. In case of conflict between dimensions shown in the plans or detail drawings and those in the specifications, the dimensions on the detail drawings shall govern. If the conflict is other than dimensions, the specifications shall govern.

O. Permits:

1. It shall be the CONTRACTOR'S responsibility to obtain all local building permits and licenses as required to perform the work.
2. It shall be the OWNER’S responsibility to obtain all applicable Iowa Department of Natural Resources Water Supply and Wastewater Construction Permits as may apply to this project.
3. It shall be the OWNER’S responsibility to obtain the NPDES General Permit No. 2 Authorization from the Iowa Department of Natural Resources as may be applicable should the area disturbed by construction exceed 1 acre in size.

P. Signs:

1. The CONTRACTOR shall protect all street and traffic signs in the work area. Signs which must be removed to complete the work shall be removed only just before the work requires and shall be replaced immediately when the work permits. Removal and replacement of signs shall be incidental to project cost.
2. The CONTRACTOR shall replace all signs or poles he damages. Removal and replacement of signs and poles shall be at CONTRACTORS expense.

Q. Protection of Existing Trees:
1. Every effort shall be made to protect and save the existing trees indicated on the plans. Sheet piling or other methods of excavation stabilization approved by the ENGINEER shall be used to maintain, at a minimum, a three-foot clearance between the tree trunk face and the excavation. No equipment operation or material storage will be allowed within the limits of the drip line of the tree.
2. Protection of existing trees shall be incidental to project cost.

R. Disposal of Debris:
1. Dispose of materials removed during construction at locations as approved by ENGINEER.
    a. Dispose of waste products containing putrescible materials at landfill.
    b. Dispose of surfacing, broken concrete or rubble, excess excavated materials and spoil.
    c. OWNER reserves the right to salvage any materials removed as part of the project; CONTRACTOR responsible to deliver salvaged materials at location determined by OWNER within Corporate City limits.

S. Fence:
1. Fences encountered shall be removed and replaced to original condition or better unless noted otherwise. The CONTRACTOR may use undamaged-salvaged material. Removal and replacement of fence shall be incidental to project cost.

T. Conformance to Scheduling Constraints:
1. If the CONTRACTOR does not conform to the scheduling constraints as set forth in Section 01010 – Summary of Work the OWNER/ENGINEER reserve the right to suspend all work, further payments, or both in accordance with Section 00700 - General Conditions.

U. Defective Equipment and Materials:
1. OWNER retains right to operate equipment or use materials installed until defects are corrected and guarantees satisfied.
2. OWNER reserves right to operate rejected equipment or use other work installed until replaced, without cost for depreciation, use or wear.
3. Remove equipment or other work from operation for examination, adjustment or change at times approved by ENGINEER.

V. Worker Visibility Regulations:
   1. Worker safety requires compliance with all current and future federal and state OSHA requirements.
   2. In accordance with Section 6D.03 of the 2009 MUTCD and OSHA regulations all workers within the work right of way where exposed to traffic, work vehicles, or construction equipment are to wear high-visibility safety apparel.

1.04 APPLICATIONS FOR PAYMENT

A. Payment request shall be submitted in accordance with the following requirements. Transmit each copy with a transmittal form listing any attachments, and recording appropriate information related to application in a manner acceptable to ENGINEER. Transmit to ENGINEER by means ensuring receipt within 24 hours.

B. Submit 1 copy of quantities completed to date in accordance with Section 01300. CONTRACTOR'S standard form or electronic media printout will be considered.

C. Content and Format: Utilize Schedule of Values for listing items and quantities. Except as otherwise indicated, complete every entry provided for on the form. Incomplete quantity submittals will be returned by ENGINEER without action. Entries must match data on the Bid Schedule. Listing should include amounts of change orders issued prior to last day of the “period of construction” covered by application.

D. Cut-off date for quantities shall be the last day of each month.

E. Submit quantities for payment prior to the last day of each month. The ENGINEER shall review and confirm quantities completed to date as submitted by CONTRACTOR. The ENGINEER will prepare Application of Payment and forward same to CONTRACTOR for his review and signature. Upon receiving signed original copies of Application of Payment from CONTRACTOR, ENGINEER shall submit three (3) copies of Application of Payment to OWNER prior to the first Monday of the following month. The OWNER will consider application for payment at monthly City Council meetings held the first or the third Monday of each month.

F. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that OWNER has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect OWNER'S interest therein, all of which must be satisfactory to OWNER.

1.05 CHANGE AND EXTRA WORK AUTHORIZATION PROCEDURES

A. The ENGINEER will advise of minor changes in the Work not involving an adjustment to Contract Sum/Price or Contract Time as authorized by Section 00700 - General Conditions. The ENGINEER will advise of minor changes within a reasonable time after discovery for the need for potential change. CONTRACTOR shall not be entitled to additional compensation due to delays or down time while ENGINEER advises of minor changes in work.

B. The ENGINEER may issue a Notice of Change which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change and the period of time during which the requested price will be considered valid. CONTRACTOR will prepare and submit an estimate within 7 days.

C. The CONTRACTOR may propose changes by submitting a request for change to the ENGINEER, describing the proposed change and its full effect on the Work. Include a statement describing the reason for the change, and the effect on the Contract Sum/Price and Contract Time with full documentation.

D. Stipulated Sum/Price Change Order: Based on Notice of Change and CONTRACTOR'S fixed price quotation or CONTRACTOR'S request for a Change Order as approved by ENGINEER.

E. Unit Price Change Order: For pre-determined unit prices and quantities, the Change Order will be executed on a fixed unit price basis. For unit costs or quantities of units of work which are not pre-determined, execute Work under a Work Directive Change. Changes in Contract Sum/Price or Contract Time will be computed as specified for Time and Material Change Order.

F. Work Directive Change: ENGINEER may issue a directive, signed by the OWNER, instructing the CONTRACTOR to proceed with a change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute the change.

G. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract. ENGINEER will determine the change allowable in Contract Sum/Price and Contract Time as provided in the Contract Documents.

H. Maintain detailed records of work done on Time and Material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.

I. Change Orders shall be prepared by the ENGINEER.

J. Execution of Change Orders: ENGINEER will issue Change Orders for signatures of parties as required.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Payment criteria applicable to the Work performed under a lump sum payment method.

B. Unit adjustment prices to adjust lump sum contract price.

1.02 RELATED SECTIONS

A. Section 01019 - Contract Considerations.

B. Section 01300 – Submittals.

1.03 AUTHORITY

A. Measurement methods delineated in the individual specification sections are intended to complement the criteria of this section. In the event of conflict, the requirements of the individual specification section shall govern.

B. Take all measurements and compute quantities. The ENGINEER will verify measurements and quantities.

C. Assist by providing necessary equipment, workers, and survey personnel as required.

1.04 SCHEDULE OF VALUES

A. Prepare the Schedule of Values, as required by the General conditions, in conjunction with the preparation of the Progress Schedule. Co-ordinate preparation of Schedule of Values and Progress Schedule. Correlate line items with other administrative schedules and the forms required for the work, including the Progress Schedule, payment request form, listing of subcontractors, schedule of allowances, schedule of alternates, listing of products and principal supliers and fabricators, and the schedule of submittals. Provide breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of payment requests and progress reports, generally by Specification Sections. Round off to the nearest whole dollar, but with the total equal to the contract sum.

1.05 MEASUREMENT OF QUANTITIES FOR UNIT ADJUSTMENT ITEMS

A. Measurement Devices:

1. Weigh Scales: Inspected, tested and certified by the applicable state Weights and Measures department within the past year.
2. Platform Scales: Of sufficient size and capacity to accommodate the conveying vehicle.
3. Metering Devices: Inspected, tested and certified by the applicable State department within the past year.

B. Measurement by Weight: Concrete reinforcing steel, rolled or formed steel or other metal shapes will be measured by handbook weights. Welded assemblies will be measured by handbook or scale weight.

C. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness, or measured by gallons.

D. Measurement by Area: Measured by square dimension using mean length and width or radius.

E. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

F. Stipulated Sum/Price Measurement: Items measured by weight, volume, area, or linear means or combination, as appropriate, as a completed item or unit of the Work.

G. Material Record: The CONTRACTOR shall furnish the ENGINEER with supplier weight tickets indicating date, project name, net weight and/or cubic yards, material per day, item number proposal (i.e. Bid Item Number) and disposal location of each of the items on this project that are measured or quantified on a per ton basis or as required per technical specifications.

Bid Items measured and paid by the cubic yard, gallon, or other volumetric measure shall be quantified by load (truckload) count using a pre-agreed to volume per load unless means of measuring volume, be it by survey or other, are specified. The CONTRACTOR shall furnish the ENGINEER with load tickets indicating date, project name, net weight, material per day, item number from proposal (i.e. Bid Item Number) and disposal location of each of the Bid Items on this project that are paid by the cubic yard or as required per technical specifications.

Project name will not suffice as disposal location; Disposal location needs to be specific indicating either structure number, stationing, street name and address, or other suitable means for identifying specific location as approved by ENGINEER.

The field copy of each weight and load ticket shall be given to the Project Inspector or ENGINEER no later than one working day following delivery of materials. Weight and

load tickets delivered after this period will be accepted only at the Project ENGINEER'S discretion.

Weight and load tickets submitted without the information noted herein will be accepted only at the Project Engineer's discretion.

1.06 PAYMENT

A. Payment Includes: Full compensation for all required labor, Products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

B. Submit applications for payment in accordance with Section 01019 – Contract Considerations, Article 1.04.

C. Final payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities accepted by the ENGINEER multiplied by the unit sum / price for Work which is incorporated in or made necessary by the Work.

1.07 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of the ENGINEER, it is not practical to remove and replace the Work, the ENGINEER will direct one of the following remedies:
   1. The defective Work may remain, but the lump sum/price will be adjusted to a new lump sum/price at the discretion of the ENGINEER.
   2. The defective Work will be partially repaired to the instructions of the ENGINEER, and the lump sum/price will be adjusted to a new lump sum/price at the discretion of the ENGINEER.

C. The individual specification sections may modify these options or may identify a specific formula or percentage sum/price reduction.

D. The authority of the ENGINEER to assess the defect and identify payment adjustment is final.

1.08 NON-PAYMENT FOR REJECTED PRODUCTS

A. Payment will not be made for any of the following:
   1. Products wasted or disposed of in a manner that is not acceptable.
   2. Products determined as unacceptable before or after placement.
   3. Products not completely unloaded from the transporting vehicle.
   4. Products placed beyond the lines and levels of the required Work.

5. Products remaining on hand after completion of the Work.
6. Loading, hauling and disposing of rejected Products.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittal Procedures.

B. Construction Progress Schedules.

C. Proposed Products List.

D. Shop Drawings.

E. Product Data.

F. Mix Designs

G. Samples.

H. Manufacturers' Instructions.

I. Material Compliance.

J. Construction Photographs.

1.02 RELATED SECTIONS

A. Section 01019 - Contract Considerations

B. Section 01025 - Measurement and Payment

C. Section 01700 - Contract Closeout

1.03 SUBMITTAL PROCEDURES

A. CONTRACTOR to Deliver [all] submittals to the following:

Mr. Chad Kehrt, P.E.
Veenstra & Kimm, Inc.
203 Sergeant Square Drive, Suite B
PO Box 220
Sergeant Bluff, IA 51054

B. CONTRACTOR to transmit submittals utilizing ENGINEER accepted transmittal form or cover letter. Multiple items may be submitted with each transmittal.

C. CONTRACTOR to sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.

D. All submittal transmittals shall be dated, and identify the following:
   1. Project Title
   2. OWNER'S Name
   3. ENGINEER'S Project Number: #32251
   4. CONTRACTOR's Name
   5. Transmittal Number
   6. First Submittal or Resubmittal
   7. Subcontractor or Supplier
   8. Items Submitted
   9. Drawing Sheet and Detail Number(s)
   10. Specification Section Number as Appropriate
   11. Number of Copies Enclosed

E. Apply CONTRACTOR'S stamp to each submittal item, signed or initialled and dated by CONTRACTOR, certifying that CONTRACTOR has Reviewed and Verified that all Products and materials submitted, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.

F. Each Shop Drawing Transmittal shall be numbered consecutively starting with the Number 1. Each Shop Drawing Transmittal shall indicate if the submittal is the "1st Submittal" or a "Resubmittal".

G. CONTRACTOR to schedule submittals to expedite the Project. CONTRACTOR to coordinate submission of related items. All items shall be submitted in a manner which allows each item to be reviewed and commented on individually.

H. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.

I. Provide space for CONTRACTOR and ENGINEER review stamps.

J. Revise and resubmit submittals as required, identify all changes made since previous submittal.

K. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

L. All submittals shall be submitted via the CONTRACTOR in accordance with the above. Submittals received directly from Sub-Contractors and/or Suppliers will be returned to sender without review.

M. CONTRACTOR may submit via email and only one (1) copy is required. Review of electronic submittals via email will be returned to the CONTRACTOR via email.

N. In lieu of hard copy submittals CONTRACTOR may submit documents electronically in pdf format via flash drive or email to ENGINEER.

O. After review ENGINEER will, distribute pdf copy of Shop Drawings electronically to OWNER, CONTRACTOR and Resident Reviewer.

P. Electronic submittal of Shop Drawings and documents in pdf format will be acceptable with ENGINEER's approval.

Q. Submittal shall be in a timely fashion to permit ENGINEER reasonable period of time for review.

1.04 INFORMATION FOR ENGINEER [AND OWNER]

A. After award of contract submit following information and drawings for ENGINEER'S review:
   1. Construction schedules.
   2. Proposed products list.
   3. List of subcontractors - List shall Identify by Bid Item Work being Performed by CONTRACTOR and each SUB-CONTRACTOR.
   4. Shop drawings.
   5. Product data.
   6. Mix designs.
   7. Manufacturer's instructions.
   8. Manufacturer's specifications and catalog data for miscellaneous equipment.
   9. Such other information as ENGINEER may request.
   10. Operation and Maintenance data as specified in Section 01700 – Contract Closeout.
   11. Record documents as described in Section 01700 – Contract Closeout.

B. Provide 2 copies of following information:
   1. Contract price breakdown of lump sum bid for use in preparation of periodic payment estimates.

1.05 CONSTRUCTION PROGRESS SCHEDULES

A. Construction Progress Schedule shall be prepared and submitted monthly.

B. Work shall be scheduled so as to conform with all scheduling constraints set forth in Section 01010 – Summary of Work, Article 1.09.

C. Revise and resubmit as required.

D. Schedule shall consist of a horizontal bar (Gantt) chart with a separate line for each section of Work, identifying first workday of each week, and shall indicate at a minimum the following:
   1. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the duration for each activity.
   2. Provide separate hoizontal bar for each trade, activity or operation.
   3. Horizontal time scale: Identify first workday of each week.
   4. Scale and spacings to allow space for notations and future revisions.
   5. Formate of listings: Chronological order of start of each item of work.
   6. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates.

1.06 PROPOSED PRODUCTS LIST

A. Within 15 days after date of OWNER-CONTRACTOR Agreement, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.07 SHOP DRAWINGS

A. Intent of ENGINEER'S Review: To assist CONTRACTOR in interpreting plans and specifications.

B. CONTRACTOR'S Responsibility: To check drawings prior to submission of coordination and conformance with contract; do not submit without checking.

C. ENGINEER'S review is only for general conformance with design concept of project and general compliance with information given in contract documents. Corrections or comments made on the shop drawings during this review do not relieve the CONTRACTOR from compliance with the requirements of the plans and specifications. Any action shown is subject to requirements of specifications. Review of a specific item shall not include review of an assembly of which the item is a component. CONTRACTOR is responsible for: Dimensions which must be confirmed and correlated at

job site; fabrication processes and techniques of construction; coordination of the work; and satisfactory performance of work.

D. Prior to submission of shop drawings and catalog data to ENGINEER: Affix CONTRACTOR'S stamp with signature of responsible person to show that material submitted has been Checked and Approved/Reviewed by CONTRACTOR; Shop Drawings submitted without appropriate stamp and signature will be returned without ENGINEER'S review.

1.08 PRODUCT DATA

A. Submit the number of copies which the CONTRACTOR requires, plus four copies which will be retained by the ENGINEER.

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

C. After review, distribute in accordance with Article on Procedures above and provide copies for Record Documents described in Section 01700 - Contract Closeout.

1.09 MIX DESIGNS

A. Submit Portland Cement Concrete (PCC) mix design a minimum of 8 days before proposed mix is to be used.

1.10 SAMPLES

A. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

B. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for ENGINEER'S selection.

C. Include identification on each sample, with full Project information.

D. Submit the number or samples specified in individual specification Sections; one of which will be retained by ENGINEER.

1.11 MANUFACTURER'S INSTRUCTIONS

A. When specified in individual specification Sections, submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for Product Data.

B. Identify conflicts between manufacturers' instructions and Contract Documents.

1.12 MATERIAL COMPLIANCE

A. The CONTRACTOR shall provide current material certifications for all materials and equipment incorporated into the work. All certifications shall be submitted to the ENGINEER at one time.

B. All aggregate certifications shall include mechanical sieve analysis (gradations). Cost of retesting materials due to previous testing failures shall be at the CONTRACTOR'S expense.

C. No payment for any work shall be made until all material certifications and shop drawings have been received by the ENGINEER in accordance with the above.

D. Material certifications and shop drawings shall be provided for, but not limited to, the following:

1. Generator
2. Propane Tank
3. Propane piping
4. Electrical and communication connections
5. Concrete Mix for pads
6. Seed Materials
7. Fertilizer
8. Mulch Materials

E. Fabrication and shipment of materials or equipment prior to ENGINEER'S review of drawings, data and information mentioned above shall be at CONTRACTOR'S risk.

F. No materials or equipment are to be installed prior to shop drawing or material certification review by ENGINEER. Materials or equipment installed prior to review of shop drawings or material certifications by ENGINEER are subject to removal at CONTRACTOR'S cost.

1.13 CONSTRUCTION PHOTOGRAPHS

A. Not applicable to this project.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not used

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Field Offices

B. Temporary Utilities: Electricity, lighting, heat, ventilation, water, and sanitary facilities.

C. Temporary Controls: Protection of the Work and exterior & interior enclosures.

D. Security and Regulated Areas.

E. Construction Facilities: Access roads, parking, progress cleaning, position, line and grade. Damage to existing property.

F. Position, Line, & Grade: Construction Staking.

1.02 RELATED SECTIONS

A. Section 01019 - Contract Considerations.

B. Section 01300 - Submittals.

C. Section 01600 - Materials and Equipment.

D. Section 01700 - Contract Closeout.

1.03 APPROVAL OF FACILITY LOCATIONS

A. Location of all construction facilities, including field offices, sheds, plants, equipment storage, materials storage and yard, subject to approval of ENGINEER and OWNER.

1.04 FIELD OFFICES AND BUILDINGS

A. Not applicable to this project.

1.05 TEMPORARY ELECTRICITY

A. Connect to existing power service. Power consumption shall not disrupt OWNER'S need for continuous service.

B. Provide temporary electric feeder from existing building electrical service at location as directed. Power consumption shall not disrupt OWNER'S need for continuous service.

C. OWNER will pay cost of energy used. Exercise measures to conserve energy.

D. Facilities exposed to weather shall be weatherproof type and electrical equipment enclosure locked to prevent access by unauthroized personnel.

E. Remove temporary electrical service facilities at completion of project. Patch affected surfaces and structures after temporary services removed.

1.06 TEMPORARY LIGHTING

A. CONTRACTOR to provide temporary lighting as may be required to complete the work. Temporary lighting shall be sufficient to enable CONTRACTOR to complete work and enable ENGINEER to check work as it is being performed. Illumination shall meet or exceed state code requirements.

1.07 TEMPORARY HEAT

A. Existing facilities shall not be used.

1.08 TEMPORARY VENTILATION

A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

1.09 TELEPHONE SERVICE

A. Provide telephone numbers at which CONTRACTOR can be reached by OWNER and ENGINEER at all times during the working day; provide liaison as needed between telephone and construction personnel for expeditious handling of messages.

B. Provide OWNER and ENGINEER with at least two telephone numbers where CONTRACTOR'S representative can be reached evenings, weekend and holidays in event of emergency.

C. ENGINEER will pay for own telephone service.

1.10 TEMPORARY WATER SERVICE

A. Provide, maintain and pay for suitable quality water service as required for construction operations.

1.11 TEMPORARY SANITARY FACILITIES

A. CONTRACTOR to provide and maintain suitable required sanitary facilities and enclosures for construction personnel for duration of work. Temporary sanitary toilet facilities shall conform to state and local health and sanitation requirements, in sufficient number for use by CONTRACTOR's employees. Remove upon completion of work.

1.12 TEMPORARY FIRE PROTECTION

A. Provide and maintain in working order, minimum of 1 fire extinguisher on each floor of each building, and such other fire protective equipment and devices as would be reasonably effective in extinguishing fires during early stages by personnel at project site.

B. Comply with NFPA, federal, state, local and other applicable requirements.

1.13 TEMPORARY SITE WORK

A. Provide and maintain temporary roadways necessary to carry out construction operations in clean, dust free, snow free, ice free, driveable condition.

B. Provide and maintain temporary site drainage and stormwater controls.

C. Exercise caution to minimize increase in suspended solids and turbidity in surface waters within and adjacent to construction area. Do not deposit spoils in surface waters. Control and Minimize sediment runoff and excavation erosion to surface waters.

D. Make all temporary service connections necessary for maintaining utility service during the course of the work; do work as specified hereinafter.

E. Plug water line at bottom to prevent debris from entering water system; remove debris when work is complete.

1.14 BARRIERS

A. CONTRACTOR to provide barriers to prevent unauthorized entry to construction areas, to allow for OWNER'S use of site, and to protect existing facilities and adjacent properties from damage from construction operations.

B. Provide protection for plant life designated to remain. Replace damaged plant life.

C. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

1.15 TEMPORARY FENCING

A. Provide temporary fencing sufficient to prevent trespass by CONTRACTOR's emplyees and suppliers onto private property and by public onto construction site.

B. Materials shall be sufficiently durable to be effective for duration of construction period.

C. Construction: Plastic snow fence.

D. Provide 4-foot-high fence around construction site.

1.16 STORM WATER EROSION CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.17 EXTERIOR ENCLOSURES

A. Provide temporary insulated weather-tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification Sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.18 INTERIOR ENCLOSURES

A. Provide temporary partitions and ceilings as required to separate work areas from OWNER occupied areas, to prevent penetration of dust and moisture into OWNER occupied areas, and to prevent damage to existing materials and equipment.

1.19 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual specification Sections.

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage.

C. Prohibit traffic from landscaped areas.

D. Prohibit traffic from recently paved walks, drives, roadways, and parking areas until adequate strength is achieved by pavement to sustain traffic.

1.20 SECURITY

A. Provide security and facilities to protect Work, and existing facilities, and OWNER'S operations from unauthorized entry, vandalism, or theft. Security not provided by OWNER.

B. CONTRACTOR shall be held responsible for loss or injury to persons or property where his work is involved and shall provide security and take precautionary measures to protect CONTRACTOR’s and OWNER’s interests.

1.21 ACCESS ROADS

A. Existing on-site roads shall not be used for construction traffic.

1.22 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Broom and vacuum clean interior areas and continue cleaning to eliminate dust.

C. Remove waste materials, debris, and rubbish from site periodically and dispose off-site.

1.24 PROJECT IDENTIFICATION

A. Not applicable to this project.

1.25 REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary above grade or buried utilities, equipment, facilities, materials, prior to Substantial Completion inspection.

B. Remove underground installations to a minimum depth of 2. Grade site as indicated.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

1.26 POSITION, LINE, AND GRADE

A. Construct to lines and grades shown on plans or as specified hereinafter.

B. ENGINEER has established required benchmarks and control points as shown on plans.

C. CONTRACTOR shall provide competent men and tools, stakes, and other materials as required to establish temporary or permanent reference marks in connection with the work. CONTRACTOR shall perform such detailed measurements and transfer alignment and elevations from construction staking as required to properly lay out and construct work.

D. CONTRACTOR shall provide, without extra compensation, all men and necessary tools to make all test holes and exploration, at any time, for purpose of determining location of existing structures beneath ground surface which might conflict with work of CONTRACTOR.

E. CONTRACTOR shall carefully preserve all monuments, reference points, stakes, and benchmarks set by ENGINEER. CONTRACTOR shall promptly notify ENGINEER of any stakes, reference points, or benchmarks which have been disturbed.

F. In case of disruption or destruction by CONTRACTOR'S negligence or carelessness, he will be charged with resulting expense of replacement, and responsibility for any mistakes or loss of time caused thereby.

G. Construction staking shall be performed by ENGINEER unless otherwise noted herein.

1.27 DAMAGE TO EXISTING PROPERTY

A. Be responsible for replacing or repairing damage to existing buildings, sidewalks, roads, parking lot surfacing, and other existing assets.

B. CONTRACTOR shall have option of having OWNER contract for such work and have cost deducted from contract amount.

C. In unfinished areas, clean and repair damage caused by temporary installations or use of temporary facilities, restore drainage, and evenly grade, seed or plant as necessary to provide appearance equal to or better than original.

D. In finished areas, restore existing or permanent facilities used for temporary services to specifed, or to original condition.

1.28 OWNER’S USE

A. Upon acceptance of work, or portion of work defined and certified as substantially completed by ENGINEER, and OWNER commences full-time successful operation of facility or portion thereof, OWNER will pay cost for utilites used for OWNER's operation. CONTRACTOR shall continue to pay for utilities used until final acceptance or work, except as provided herein. However, heat for heating building as required for construction purposes shall still be paid by CONTRACTOR unless, due to occupancy by OWNER, more heat shall be required either due to increased temperature or lengthened duration, in which case OWNER will bear difference in costs.

PART 2 PRODUCTS

2.01 Not Applicable

PART 3 EXECUTION

3.01 Not Applicable

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Products.

B. Transportation and handling.

C. Storage and protection.

D. Product options.

E. Substitutions.

1.02 RELATED SECTIONS

A. Section 00100 - Instructions to Bidders.

B. Section 00700 - General Conditions

1.03 PRODUCTS

A. Products: Products are defined as 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.

B. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

C. Provide interchangeable components of the same manufacturer, for similar components.

1.04 TRANSPORTATION AND HANDLING

A. Transport and handle products in accordance with manufacturer's 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.

1.05 STORAGE AND PROTECTION

A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate-controlled enclosures.

B. OWNER assumes no responsibility for materials and equipment stored in buildings or on site or at another location approved in writing. CONTRACTOR assumes full responsibility for damage due to storage of materials and equipment.

C. Interior Storage:
   1. Store materials and equipment in accordance with manufacturer’s instruction, with seals and labels intact and legible.
   2. Store materials and equipment subject to damage by elements in weathertight enclosures.
   3. Maintain temperature and humidity within ranges required by manufacturer’s instructions.

D. Exterior Storage:
   1. Store fabricated materials and equipment above ground, on blocking or skids, to prevent soling or staining. Cover materials and equipment subject to deterioration and impervious sheet coverings, provide adequate ventilation to avoid condensation.
   2. Store loose granular materials in well-drained area on solid surfaces to prevent mixing with foreign matter.
   3. Materials such as pipe, reinforcing and structural steel, and equipment shall be stored on pallets or racks, off ground.

E. For exterior storage of fabricated products, place on sloped supports, above ground.

F. Provide off-site storage and protection when site does not permit on-site storage or protection.

G. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.

H. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

I. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

J. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.

1.06 PRODUCT OPTIONS

A. Compatibility of Options: Where more than one choice available as options for CONTRACTOR'S selection of equipment or material, select option compatible with other equipment and materials already selected.

B. Standards, Codes and Regulations: Where compliance with imposed standard, code or regulation required, select from among products which comply with requirements of those standards, codes, and regulations.

C. "Or Equal": For material or equipment specified by naming one or more equipment manufacturer and "or equal," Contractor shall submit request for substitution for any equipment or manufacturer not specifically named. Submit in accordance with Section 00700 - GENERAL CONDITIONS, Article 1.16 and Article 1.07 this section.

D. Two or More Manufacturers: For equipment or material specified by naming several manufacturers, select any one of manufacturers named. Do not provide or offer to provide unnamed manufacturer or equipment.

E. Single Manufacturer or Material: For equipment or material specified by naming only one manufacturer or material, there is no option.

1.07 SUBSTITUTIONS

A. Requests for substitutions shall be submitted via the CONTRACTOR in accordance with the following requirements. Requests for substitutions shall be made in a timely fashion to permit the ENGINEER a reasonable period of time for review.

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.
5. Will reimburse OWNER for review or redesign services associated with re-approval by authorities.

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 hard copies of request for Substitution for consideration. Limit each request to one proposed Substitution. Request for substitution may be submitted via email.
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.

G. Whenever items of materials or equipment are specified by a manufacturer's name and type and "or equal" is not listed, Contractor shall provide specified equipment without substitution, unless prior approval of Engineer is obtained for any substitution.

H. Contractor shall abide by ENGINEER'S decision when proposed substitute of material or equipment are deemed to be unacceptable and in such an event Contractor shall furnish items of equipment or materials specified.

I. ENGINEER reserves right to consider such factors as overall project arrangement, overall project cost, and similar factors in determining whether proposed substitutions will be acceptable.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not used

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Closeout procedures.

B. Final cleaning.

C. Final Inspection.

D. Record Documents.

E. Operation and maintenance data.

F. Warranties.

G. Spare parts and maintenance materials.

H. Certificate of Completion

1.02 RELATED SECTIONS

A. Section 01019 - Contract Considerations.

B. Section 01300 - Submittals.

C. Section 01500 - Construction Facilities and Temporary Controls.

D. Section 01600 - Material and Equipment.

1.03 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 Sales and Use Tax Statements and lien waivers/releases for all suppliers and subcontractors.

1.04 FINAL CLEANING

A. Execute final cleaning prior to final inspection.

B. Clean debris from work area.

C. Clean site; sweep paved areas, rake clean landscaped surfaces.

D. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.05 FINAL INSPECTION

A. CONTRACTOR shall notify ENGINEER in writing when all work is Substantially Complete and ready for Final Inspection.

B. Within 5 working days of notification ENGINEER, Resident Engineering Technician, OWNER'S representative, and CONTRACTOR shall make a final inspection of work.

C. ENGINEER shall prepare a written report, herein referred to as a "Punchlist", of work items requiring corrective work, replacement, or other remedy acceptable to ENGINEER and/or OWNER.

D. ENGINEER will not prepare or issue a "Certificate of Completion" untill all Punchlist items are satisfactorily resolved.

1.06 RECORD DOCUMENTS

A. Record Documents include the collection of information pertaining to the project which differs from that which is included in the Contract Documents. This information includes the location, dimension, quality/quantity of materials and quality of workmanship for both proposed facilities constructed, and existing facilities encountered.

B. The CONTRACTOR shall be required to maintain records regarding aspects of the project which differ from the Contract Documents. This includes both existing facilites encountered and proposed facilities constructed. The information shall include location, dimension and material data.

1. The location of underground facilities shall be noted if they differ from the plans by more than 2 feet horizontally and 0.5 feet vertically or are not shown.
2. Facilities constructed or encountered above ground shall be noted if they differ from the plans by more than 1 foot horizontally and 0.25 feet vertically.

C. The CONTRACTOR shall record the location of all service lines. Existing water and sewer services are to be inspected by the City Staff or ENGINEER prior to replacement. The CONTRACTOR shall maintain accurate records of the services lines replaced (length, corp stop, curb stop, existing material, etc.) and shall provide the OWNER and ENGINEER an accurate and complete record drawings at the completion of the project.

D. Store Record Documents separate from those used for construction.

E. Keep Record Documents current; do not permanently conceal any Work until required information has been recorded.

F. At Contract closeout, submit Record Documents with transmittal letter containing date, Project title, CONTRACTOR'S name and address, list of documents, and signature of CONTRACTOR.

1.07 OPERATION AND MAINTENANCE DATA

A. Submit three sets prior to final inspection, bound in 8-1/2 x 11 inch text pages, binders with durable plastic covers. Also include one digital copy saved to a flash drive.

B. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.

C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

D. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, type on 24 pound white paper.

E. Operation and Maintenance Manuals shall be organized in three parts as follows:

Part 1:

1. Directory - Listing names, addresses, and telephone numbers of ENGINEER, CONTRACTOR, Subcontractors, and major equipment suppliers.

Part 2:

2. Operation and Maintenance Instructions - Arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
   a. Significant design criteria.
   b. List of equipment.
   c. Parts list for each component.
   d. Operating instructions.
   e. Maintenance instructions for equipment and systems.
   f. Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.

Part 3:

3. Project Documents and Certificates - Including the following:
   a. Shop drawings and product data.
   b. Air balance and reports.
   c. Water quality and reports
   d. Certificates.
   e. Photocopies of warranties and bonds.

F. Submit one copy of completed volumes in final form 15 days prior to final inspection. This copy will be returned after final inspection, with ENGINEER comments. Revise content of documents as required prior to final submittal.

G. Submit final volumes revised, within ten days after final inspection.

1.08 WARRANTIES

A. Provide notarized copies.

B. Execute and assemble documents from Subcontractors, suppliers, and manufacturers.

C. Provide Table of Contents and assemble in binder with durable plastic cover.

D. Submit prior to final Application for Payment.

E. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.09 SPARE PARTS AND MAINTENANCE MATERIALS

A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification Sections.

B. Deliver to Project site; obtain receipt prior to final payment.

1.10 CERTIFICATE OF COMPLETION

A. Upon satisfactory completion of all work, including resolution of all Punchlist items noted during Final Inspection, and upon receipt of all project record documents, operation and maintenance data, warranties, spare parts and maintenance materials, ENGINEER shall prepare and submit to the OWNER a "Certificate of Completion" stating all work to the best of his knowledge has been completed in accordance with plans and specifications.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Not used

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section describes the following:
   1. Earthwork for construction of Public Works Facility Expansion Project including buildings, approaches and miscellaneous items.
      a. Excavate and compact earth as specified hereinafter to provide finish grade at building as shown on plans. Rough grading of site by others.
      b. Remove and stockpile top 6" of topsoil for replacement when site grading is complete.
      c. Provide necessary machine or hand finishing and shaping to elevations as shown on plans.
      d. Pile excavated material, suitable for backfill, in an orderly manner a sufficient distance back from edge of excavation to avoid slides or cave-ins; 2'-0" minimum clear distance.
      e. Remove and dispose of spoil and excess excavated material not suitable for trench, structural or embankment backfill at location directed by OWNER.
      f. Excavate in open cut, except as noted on plans or as directed by ENGINEER.
      g. Do not damage trees and plantings except as noted on plans or as directed by ENGINEER.
      h. Reference to percent maximum density shall mean a soil density not less than the stated percent of maximum density of optimum moisture content for soils as determined by ASTM D698, Moisture-Density Relations of Soils, using 5.5-lb. Rammer and 12-in Drop. (Standard Proctor method.)
      i. Do work in accordance with best present-day installation and construction practices.

1.02 RELATED SECTIONS

A. Section 03300 - Cast-in-Place Concrete.

1.03 DEFINITIONS

A. Earth: All materials, not classified as rock or rubble, including clay, silt, sand, gravel, hardpan, disintegrated shale, debris, loose stones, boulders less than 1/3 CY in volume, trees, stumps, roots and rubbish.

B. Rock: Boulders larger than 1/3 CY in volume or solid deposits so firmly cemented together that they cannot be removed without continuous use of pneumatic tools or blasting.

C. Rubble: Buried concrete foundations, beams, walls and other material which require continuous use of pneumatic tools or blasting.

D. Borrow: Materials, in excess of excavated materials, needed to backfill embankments and around structures.

E. Unsuitable Material: Unsuitable Material shall be defined as any organic or inorganic silts and clays with more than ½ of the material smaller than the No. 200 sieve. Materials classified by the Unified Soil Classification as Ml, CL, OL, MH, CH, OH and Pt (peat) shall be considered as Unsuitable Material. Unsuitable Materials shall also include organic solids, rubble, foreign objects, frozen earth, large clods, or rock 6” or greater in size.

F. Removal of rock, rubble and miscellaneous debris above ground is incidental to construction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Pipe Bedding: Sharp, clean, crushed stone; comply with following gradation:

	Pipe Diameter	
	Up to 18"	Over 18"
Sieve	% Passing	% Passing
1-1/2"		100
1"	100	95-100
3/4"	80-95	35-70
1/2"	50-60	25-50
3/8"	20-40	10-30
No. 4	0-5	0-5

1. ENGINEER may authorize change in gradation subject to materials available locally at time of construction.

B. Stabilizing Material: Sharp, clean, crushed stone; comply with following gradation:

Sieve	% Passing
2-1/2"	100
2"	90 - 100
1-1/2"	35 - 70
1"	0 - 20
1/2"	0 - 5

C. Select Material: Excavated and re-used material, graded and free of debris [generated from project site]. Select Material shall be IDOT Class 10, Class 13, or trench excavated materials free from organic material, rubble, foreign objects, frozen earth, large clods, unsuitable material, or rock 3 inches or greater in size.

D. Granular Backfill Material: Granular Backfill Material shall be composed of particles passing the No. 8 sieve or these particles in combination with coarser particles passing the 3-inch sieve with fine particles predominating so that voids between coarse particles are not likely to occur. Granular Backfill Material shall conform to the requirements of IDOT 4133.

E. Special Backfill Material: Special Backfill Material shall be a uniform mixture of coarse and fine particles of crushed concrete, crushed limestone, or a mixture of gravel, sand, and soil. Special Backfill Material shall conform to the requirements of IDOT 4132.

F. 3” Road Stone: Normal 3” stone meeting the following gradation:

PASSING SIEVE SIZE	% Passing
1-1/2"	35-70
1"	0-20
1/2"	0-5

G. Crushed Stone Aggregate: Crushed Stone Aggregate shall be Class A Crushed Stone conforming to IDOT 4120.04.

H. Topsoil: Friable loam; free of roots, rocks, debris or hard clods larger than 1/2 inches including any subsoil materials, large weeds, and foreign matter; acidity range (pH) of 6.0 to 7.5; shall contain a minimum of 4 percent and a maximum of 10 percent inorganic matter. Topsoil shall consist of high-quality soil consisting of the top six (6) inches of field or pasture loam containing a good supply of humus and a high degree of fertility. Topsoil shall not

include surface soils from ditch bottoms, drained ponds, and eroded areas, or soils which are supporting growth of noxious weeds or undesirable vegetation.

I. Porous Fill Material: Porous Fill Material shall be a granular material to be used as pervious materials along drain tile, longitudinal drains, and elsewhere to intercept the flow of ground water. Porous Fill Material shall conform to the requirements of IDOT 4131.

J. Crushed Stone Aggregate: Crushed Stone Aggregate shall be Class A Crushed Stone conforming to IDOT 4120.04.

K. Gravel Aggregate: Gravel Aggregate shall be Class C Gravel conforming to IDOT 4120.03.

L. Lime for Subgrade Treatment: Hydrated Lime: ASTM C207, Type N.

2.02 TRENCH BACKFILL

A. Haunch Support: (Top of pipe bedding to the spring line of the pipe.)
   1. Pressure Pipe: Use Bedding Material.
   2. RCP and CMP Gravity Pipe: Use Bedding Material.
   3. Gravity Sewer Pipe: Use Bedding Material.
   4. PVC and HDPE Subdrain Pipe: Use Porous Backfill.

B. Primary Backfill: (spring line of the pipe to the top of the pipe.)
   1. PVC Pressure Pipe:
      a. Trenches with centerline beneath or closer than 5’ to paved streets and drives, sidewalks, or curb and gutter: Use Pipe Bedding Material as specified herein.
      b. Trenches with centerline line more than 5’ from sidewalks, streets, drives, or curb and gutter: Use Pipe Bedding Material as specified herein.
   2. Ductile Iron (DI) Pressure Pipe:
      a. Trenches with centerline beneath or closer than 5’ to paved streets and drives, sidewalks, or curb and gutter: Use Granular Backfill Material as specified herein.
      b. Trenches with centerline line more than 5’ from sidewalks, streets, drives, or curb and gutter: Use Select Material. Soil Materials shall be free of rocks 2” and larger.
   3. RCP Gravity Pipe:
      a. Trenches with centerline beneath or closer than 5’ to paved streets and drives, sidewalks, or curb and gutter: Use Granular Backfill Material as specified herein.
      b. Trenches with centerline line more than 5’ from sidewalks, streets, drives, or curb and gutter: Use Select Material as specified herein. Soil Materials shall be free of rocks 2” and larger.
   4. PVC and HDPE Gravity Pipe:

a. Trenches with centerline beneath or closer than 5’ to paved streets and drives, sidewalks, or curb and gutter: Use Pipe Bedding Material as specified herein.
b. Trenches with centerline line more than 5’ from sidewalks, streets, drives, or curb and gutter: Use Pipe Bedding Material as specified herein.

C. Secondary Backfill: (Top of pipe to 1 foot above top of pipe.)
1. PVC Pressure Pipe:
a. Trenches with centerline beneath or closer than 5’ to paved streets and drives, sidewalks, or curb and gutter: Use Pipe Bedding Material as specified herein.
b. Trenches with centerline line more than 5’ from sidewalks, streets, drives, or curb and gutter: Use Pipe Bedding Material as specified herein.
2. Ductile Iron (DI) Pressure Pipe:
a. Trenches with centerline beneath or closer than 5’ to paved streets and drives, sidewalks, or curb and gutter: Use Granular Backfill Material as specified herein.
b. Trenches with centerline line more than 5’ from sidewalks, streets, drives, or curb and gutter: Use Select Material as specified herein. Soil Materials shall be free of rocks 2” and larger.
3. RCP Gravity Pipe:
a. Trenches with centerline beneath or closer than 5’ to paved streets and drives, sidewalks, or curb and gutter: Use Granular Backfill Material as specified herein.
b. Trenches with centerline line more than 5’ from sidewalks, streets, drives, or curb and gutter: Use Select Material as specified herein. Soil Materials shall be free of rocks 2” and larger.
4. PVC and HDPE Gravity Pipe:
a. Trenches with centerline beneath or closer than 5’ to paved streets and drives, sidewalks, or curb and gutter: Use Pipe Bedding Material as specified herein.
b. Trenches with centerline line more than 5’ from sidewalks, streets, drives, or curb and gutter: Use Pipe Bedding Material as specified herein.

D. Final Trench Backfill (for all types of pipe) (1 foot above top of pipe to ground surface):
1. Trenches with centerline beneath or closer than 5' to paved streets and drives, sidewalks, or curb and gutter: Backfill with Granular Backfill Material.
2. Trenches with centerline beneath or closer than 5’ to seal coat or gravel surfaced streets and drives: Backfill with suitable job excavated Select Material.
3. Trenches with centerline more than 5' from sidewalks, streets, drives, or curb and gutter: Backfill with Select Material.
4. Trenches for open-cut casing under highway and railroad: Backfill with Select Material.

5. PVC and HDPE Subdrain Pipe: Use porous backfill to 2’ above flow line of pipe or as shown on Figure 4030.231; then backfill with Granular Subbase Material, Select Material, or Topsoil per IDOT Figure 4030.231.

PART 3 EXECUTION

3.01 CLEARING AND SURFACE REMOVAL

A. Clear entire surface of all areas to be excavated or on which embankments are to be placed as necessary; fell all trees and grub all stumps and roots. Strip vegetation and organic materials within 5' of building footprint.

B. Remove topsoil as required; depth varies.

C. Haul trees, stumps, roots, brush and rubbish to local landfill.

D. Remove existing fences as necessary within site, unless otherwise specified or shown on plans.

E. Remove existing concrete and asphalt areas as shown on drawings; see drawings for designation of surfacing.

F. Cut pavement vertically and horizontally on straight lines; saw cut full depth of surfacing.

G. Dispose of waste material at disposal area obtained by CONTRACTOR.

3.02 EXCAVATION FOR STRUCTURES

A. Excavate as directed by the foundation notes; if excavation is carried below bottom of foundations as shown on plans, fill with concrete at no expense to OWNER; see Section 03300 - Cast-in-Place Concrete for fill concrete requirements.

B. Provide sheeting, shoring and bracing where required to hold walls of excavation, to protect structures or utilities or to provide safety for workmen.

C. When quicksand, soft, spongy or otherwise unstable material is encountered which will not, in ENGINEER's opinion, provide suitable foundation for structure, ENGINEER will authorize in writing and direct removal and replacement with granular material; authorized over excavation and backfill will be paid for as Extra Work.

3.03 TRENCH EXCAVATION

A. Keep width of trench as narrow as possible and still provide adequate room for backfilling and jointing.

B. Maximum width of trench at top of pipe: 2'-3" or outside diameter of pipe plus 12", whichever is greater.

C. Keep sides of trench as nearly vertical as practicable; maintain vertical walls of excavation below top of pipe.

D. Trench excavated below required grade: backfill to proper elevation with pipe bedding, as specified, at no cost to OWNER.

E. When unstable material is encountered which may not provide a suitable foundation for pipe:
   1. Notify ENGINEER immediately.
   2. ENGINEER will investigate questionable material to determine its suitability for pipe foundation.
   3. If material is considered unsuitable for foundations, ENGINEER will specify and authorize remedial measures in writing.
   4. If removal of unsuitable material is authorized:
      a. Replace with stabilizing material as specified hereinbefore.
      b. Place pipe bedding on top of stabilizing material as specified hereinbefore.
      c. Authorized over excavation and backfill will be paid for as Extra Work.

3.04 INSTALLING PIPE BEDDING

A. Bedding Installation for Ductile Iron, Cast Iron, and Copper Pipe:
   1. Bedding for iron gravity sewer in open cut: Use Hand Shaped Trench Bottom unless otherwise shown on plans.
   2. Provide bell holes at each pipe joint; allow access completely around circumference of pipe for proper jointing operations.
   3. Trench bottoms carried below required grade: Backfill to proper elevation with bedding material at no additional expense to OWNER.
   4. Shape trench bottom or pipe bedding with template before placing pipe for pipe sizes greater than 24" diameter. Minimum depth of shaping to be 10% of outside pipe diameter.

B. Bedding Installation for Polyvinyl Chloride (PVC) Gravity Sewer Pipe:
   1. Bedding for PVC gravity sewer in open cut: Use Class F-3 unless otherwise shown on plans.
   2. Provide bell holes at each pipe joint; allow access completely around circumference of pipe for proper jointing operations.
   3. Trench bottom carried below required grade: Backfill to proper elevation with bedding material at no additional expense to OWNER.
   4. Hand work bedding with a shovel to provide uniform bearing and support for full length of pipe.

5. Place bedding in layers not to exceed 6” and compact by handheld tamping device. Compact to 95% maximum density as determined by ASTM D698.

C. Bedding Installation and Trench Bottom for Ductile Iron (DIP) or Polyvinyl Chloride (PVC) Pressure Pipe:
   1. Bedding for PVC pressure pipe in open cut: Use Class F-3 unless otherwise shown on plans.
   2. Finely divided loose material left in trench bottom shall be hand worked with a shovel to provide uniform bearing and support for full length of pipe. If trench bottom material is not suitable for hand working to uniform bearing surface, provide 4" thick layer of pipe bedding consisting of sand or gravel as specified.
   3. Place bedding in layers not to exceed 6” and compact by handheld tamping device. Compact to 95% maximum density as determined by ASTM D698.
   4. Provide bell holes at each pipe joint; allow access completely around circumference of pipe for proper jointing operations.
   5. Where trench is in rock, place 6" minimum depth of pipe bedding consisting of sand or gravel as specified.

D. Bedding Installation for Reinforced Concrete (RCP) Pipe:
   1. Bedding for Reinforced Concrete Pipe in open cut: Use Class R-1 unless otherwise shown on plans. See Sewer Pipe Bedding Requirement Table at end of this Section.
   2. Provide bell holes at each pipe joint; allow access completely around circumference of pipe for proper jointing operations.
   3. Trench bottoms carried below required grade: Backfill to proper elevation with bedding material at no additional expense to OWNER.
   4. Shape pipe bedding with template before placing pipe for pipe sizes greater than 24" diameter. Minimum depth of shaping to be 10% of outside pipe diameter.
   5. Compact or force bedding under edge of pipe by rodding or slicing with shovel.
   6. Place bedding in layers not to exceed 6” and compact by handheld tamping device. Compact to 95% maximum density as determined by ASTM D698.

3.05 ROCK EXCAVATION

A. Use pneumatic tools or blasting.

B. If blasting is used, provide Special Hazard Insurance covering liability for all blasting operations; use experienced demolition personnel; obtain written approval of ENGINEER of safety measures to be employed.

C. Dispose of excavated rock not suitable for backfill at disposal areas designated by ENGINEER.

3.06 RUBBLE EXCAVATION

A. Rubble, as specified and defined herein, may be encountered.

B. Removal and disposal: as specified for rock; disposal is incidental to cost of rubble excavation.

C. Use explosives as specified for removal of rock.

3.07 SHEETING, SHORING AND BRACING

A. Construct sheeting, shoring and bracing where shown on plans or where required to hold walls of excavation, to provide safety for workmen, to protect existing utilities or structures or to permit construction in the dry.

B. Leave in place all temporary sheeting below top of footings or below 2' over top of pipe.

C. Leave sheeting and shoring in place above top of footings or above 2' over top of pipe when removal, in the opinion of ENGINEER, might damage piping or structures.

D. CONTRACTOR may be required to provide sheeting by regulatory agencies when not required by OWNER or ENGINEER; sheeting, shoring and bracing cost is incidental to construction.

3.08 DEWATERING

A. Do all work in the dry; obtain ENGINEER’s approval for methods of dewatering.

B. Grade as required to prevent surface water from flowing into excavations; promptly remove any water accumulated.

C. Lay no pipe in or pour no concrete on excessively wet soil.

D. Do not pump water into adjacent property without approval of ENGINEER.

E. If unstable condition due to groundwater is encountered during excavation: change method of dewatering; if soil cannot be stabilized by dewatering methods including sand point installation, notify ENGINEER.

F. Cost of dewatering is incidental to construction.

3.09 BACKFILL AND EMBANKMENT FOR STRUCTURES

A. Backfill after concrete or masonry has cured, and waterproofing and sheet drain, if specified, has been inspected by ENGINEER.

B. Backfill with material removed from excavation except as shown on drawings and as specified hereinafter; use no debris, frozen earth, large clods or stones.

C. Backfill simultaneously on all sides of structure; save structure from damage at all times; compact all types of backfill and embankment around structures to 95% maximum density as determined by ASTM D698.

D. Terminate at elevation shown on drawings; dispose of excess excavation off site.

E. If settlement of any backfill occurs within period of guarantee and bond, refill, compact and level off.

F. Provide 12 Moisture-Density Tests.

3.10 BACKFILLING AND COMPACTING TRENCHES

A. Backfill trench immediately after ENGINEER has recorded location of connections and appurtenances.

B. Pull wood sheeting, to be removed, ahead of backfilling to prevent formation of voids. Steel sheeting may be pulled after backfilling.

C. Adjust moisture content of excessively wet, but otherwise suitable, backfill material by spreading, turning, aerating and otherwise working material as necessary to achieve required moisture range.

D. Adjust moisture content of excessively dry, but otherwise suitable, backfill material by adding water, then turning, mixing, and otherwise blending the water uniformly throughout the material until the required moisture range is achieved.

E. Carefully Place Haunch Support, Primary Backfill, and Secondary Backfill in accordance with the applicable detail.
   1. Backfill shall be carefully placed with clamshell or backhoe bucket or other similar means. Pushing material over edge of trench will not be permitted.
   2. Place in lifts no greater than 8” thick. Compact to minimum 95% maximum density as determined by ASTM D698.
   3. Material shall be hand worked to completely fill all voids around pipe.
   4. Backfill simultaneously on both sides of pipe to prevent displacement.

F. Place Final Trench Backfill (for all types of pipe) as follows:
   1. Trenches with center line beneath or closer than 5’ to paved streets, sidewalks, and drives or curb and gutter: Backfill in layers not to exceed 8” thick. Mechanically or hydraulically compact to 95% maximum density as determined by ASTM D698. Obtain required compaction with a soil moisture content in the range of optimum

moisture to 4% above optimum moisture content. Prepare upper portion of trench for surface restoration or pavement replacement.

2. Trenches with center line beneath or closer than 5' to seal coat or gravel surfaced streets and drives: Backfill in layers not to exceed 8”; moisten if required; compact to 95% maximum density as determined by ASTM D698. Obtain required compaction with a soil moisture content in the range of optimum moisture to 4% above optimum moisture content. Prepare upper portion of trench for surface restoration or pavement replacement.
3. Trenches with center line more than 5' from sidewalks, streets, drives, or curb and gutter: Consolidate by mechanical compaction; fill upper portion of trench and consolidate by mechanical compaction to 95% Maximum density as determined by ASTM D698. Obtain required compaction with a soil moisture content in the range of optimum moisture to 4% above optimum moisture content. Finish with 6” topsoil in turf areas prepare for surface restoration; notify ENGINEER before mounding over trench or leveling off. Subsequent settlement: Refill, compact, and level.

G. Backfill under existing water, sewer, drain tile, or gas main; mechanically compact to 95% maximum density as determined by ASTM D698. Obtain required compaction with a soil moisture content in the range of optimum moisture to 4% above optimum moisture content. Length of backfill at elevation of existing utility shall extend 5' each side of existing utility.

H. Check dams shall be installed during backfilling operations to prevent surface runoff from following trench alignment and causing erosion prior to re-establishment of ground cover.

I. New pipe below existing water, sewer, or other mains: backfill under existing water, sewer, or other mains with sand; compact to 95% maximum density; length of sand backfill at elevation of existing utility: equal to depth of excavation below utility.

J. If removal of sheeting disturbs compacted backfill, recompact backfill to comply with specifications.

K. Place concrete encasement where directed by ENGINEER.
1. Make pipe joint in same manner specified for pipe not encased.
2. Pour concrete beneath and around pipe after jointing is complete.
3. Use two temporary pipe supports under barrel per pipe length: one near bell and one near spigot.
4. Provide ties and braces to prevent displacement or flotation during encasement.
5. Use concrete encasement shown on drawings.

L. If settlement of any backfill occurs within period of guarantee and bond, refill, compact and level off.

M. Provide 5 Moisture-Density Tests.

3.11 FIELD QUALITY CONTROL

A. In-Place Compaction testing will be performed in accordance with ASTM D6938 (Nuclear Density & Moisture Content Testing).

B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.

3.12 FINISH GRADING

A. Finish grade building footprint area to elevation shown on plans.

B. Compact all materials in horizontal layers; maximum thickness: 6".

C. Compact with tamping or sheepsfoot roller.

D. Use roller designed to provide at least 250 psi distributed on one row of knobs.

E. Maintain optimum moisture content in soil within practicable limits for each layer placed:
   1. Uniformly distribute water over each layer to raise moisture content.
   2. Scarify, harrow or work material to aerate, if necessary, to reduce moisture content.

F. Density of Fill:
   1. Driveways, sidewalks, parking lots and areas under structures: not less than 95% maximum density as determined by ASTM D698.
   2. All other areas: roll until daylight can be observed between ground surface and drum of sheepsfoot roller.

G. Finish to neat uniform lines; provide for drainage.

H. Surface: smooth and free of clods and stones, suitable for surface restoration.

I. Upper 6" of all graded and embanked areas: place 6" of topsoil saved from excavating and clearing.

3.13 FIELD DRAIN LINES

A. Field drain lines are not expected to be encountered; notify ENGINEER if drain line conflicts with construction; ENGINEER will determine corrective measures in field.

B. Where new sewer or water main crosses under field drain lines, replace with 20' lengths of AWWA C900 PVC pipe; cut 1/8" to 1/4" wide slots at 12" centers 1/4 depth of pipe; place slots on bottom; match size of existing drain line; replacement will be paid as EXTRA WORK.

C. Where new sewer or water main parallel field drain lines, replace damaged field drain lines, match size and material of existing drain line.

END OF SECTION

SECTION 02530

SURFACE RESTORATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Section Includes:

1. Restoration of lawn areas - embankments.

1.02 RELATED SECTIONS

A. Section 01019 - Contract Considerations.

B. Section 01025 - Measurement and Payment.

1.03 REFERENCES

A. Most current version of Iowa Department of Transportation (IDOT) Standard Specifications for Highway and Bridge Construction, General Supplemental Specification, and all supplemental specifications dated thereafter.

1.04 SUBMITTALS

A. Submit under provisions of Section 01300 - Submittals.

PART 2 PRODUCTS

2.01 LAWN AND TURF RESTORATION

A. Embankments and field areas including rural street right-of-ways, farm fields, creek banks, and other undeveloped areas:
1. Fertilizer: 10 Nitrogen - 10 Phosphorus - 10 Potassium.
2. Seed: Certified seed mixture - Type 2 Mixture.

Bromegrass	60%
Alfalfa	20%
Red Clover	12%
Alsike Clover	8%

i. Add rye to seed mixture at rate of 1 bushel per acre if seeded between August 15 and October 15; Add Oats at rate of 1/2 bushel per acre if seeded between April 1 and May 30.

ii. Inoculate alfalfa and clover seed not more than 8 hours before sowing.

3. Mulch: Clean dry oat straw or hydraulically applied wood cellulose fiber.

PART 3 EXECUTION

3.01 LAWN AND TURF RESTORATION

A. Surface Preparation:

1. Roughen subgrade, remove stones, clods, and debris larger than 1" from surface prior to placement of topsoil.
2. CONTRACTOR to haul and place salvaged stockpiled topsoil materials for all areas to receive turf restoration. CONTRACTOR to furnish imported topsoil materials only when necessary to fulfill requirements specified herein. Topsoil material shall be provided by the CONTRACTOR ONLY when authorized in writing by the ENGINEER.
3. Spread topsoil and firm to a minimum depth of 4". Blend with surrounding grade.
4. Mechanical rake finished grade (Topsoil) to remove all stones, clods, concrete debris, or any other foreign matter larger than 1/2” from ground surface. All areas to be seeded or sodded shall be inspected and approved by ENGINEER in writing before commencing with seeding or sodding operations. Any areas seeded or sodded prior to inspection and approval of finished grade (Topsoil) by ENGINEER in writing shall not be eligible for payment unless otherwise agreed to by ENGINEER in writing.
5. All stones, clods, debris and foreign matter removed from topsoil shall be properly disposed of by CONTRACTOR.

B. Seeding Embankments and Field Areas:

1. Spread stockpiled topsoil and firm to a minimum depth of 6”.
2. Precede seeding with uniform application of commercial grade fertilizer 5 Nitrogen - 10 Phosphorous - 5 Potassium; Cultivate area 3" deep and work with harrow within 24 hours before seeding; smooth surface to eliminate clods and lumps before seeding.
3. Apply fertilizer at rate of 400 lbs/acre. Thoroughly till soil to minimum depth of 3" by cultivating; work with harrow within 24 hours of seeding. Smooth surface to eliminate clods and lumps before seeding.
4. Sow seed mixture at rate of 4 lb/1,000 SF. Cover seed 1/4" by rolling with cultipacker or by dragging or hand raking.

5. Mulch immediately after seeding with straw at rate of 4,000 lbs/acre SF stabilizing mulch with tiller designed to anchor mulch to soil or with hydraulically applied wood cellulose fiber mulch at rate of 45 lb/1,000 SF.
6. Water seeded areas immediately after seeding, and thereafter as necessary to maintain adequate moisture for promotion of deep root growth.
7. Seed between April 1 and May 30 or August 10 and September 30.
8. CONTRACTOR is responsible for turning over to OWNER full stand of grass; replant or redevelop bare spots or areas not attaining full stand of grass during first growing season.

3.07 PROTECTION

A. Lawn and Turf Areas
   1. Protection: Provide temporary protective fences, barriers, and signs where deemed necessary by ENGINEER.

3.08 DEFECTS

A. At time of inspection, turf shall exhibit healthy, vigorous growth, shall be uniform in color and quality, and shall be reasonably free of weeds, diseases, or other visible imperfections.

B. At time of inspection, grassed area shall contain no bare spots greater than 2 sq ft in size.

C. Any turf areas not accepted by ENGINEER shall be replanted.

D. Upon final acceptance of turf area, remove temporary fences, barriers, and signs installed for protection of that area. CONTRACTOR will be relieved of further responsibility for care and maintenance of accepted area.

3.09 CLEANUP

A. Clean up each portion of construction as it is completed.

B. Cleanup operations in public right-of-way shall be kept within 400' of construction operations.

C. Clean up and remove rubbish, debris, and surplus material.

D. Leave site in neat condition.

3.10 MAINTENANCE OF SURFACES

A. Pavement damage due to settlement of backfill: Repair as directed by OWNER or ENGINEER for period of Bond.

B. Lawn or turf damaged due to erosion: Repair for period of bond.

C. Watering: Water turfed areas immediately after planting and thereafter as necessary to maintain adequate moisture for promotion of deep root growth. Water shall be applied in such a way that ruts will not be made in soil surface.

D. Reseeding: When directed by ENGINEER, CONTRACTOR shall reseed any areas on which original seed has failed to grow. Reseeding shall be performed as specified herein for seeding, and in manner that will cause minimum disturbance to existing stand of grass.

3.11 ACCEPTANCE OF LAWN OR TURF RESTORATION

A. Upon written request by CONTRACTOR, or expiration of establishment period, whichever comes first, ENGINEER will inspect turf areas.

B. At time of inspection, turf shall exhibit healthy, vigorous growth, shall be uniform in color and quality, and shall be reasonably free of weeds, diseases, or other visible imperfections.

C. At time of inspection, grassed area shall contain no bare spots greater than 2 sq ft in size.

D. Any turf areas not accepted by ENGINEER shall be replanted.

E. Upon final acceptance of turf area, remove temporary fences, barriers, and signs installed for protection of that area. CONTRACTOR will at that time be relieved of further responsibility for care and maintenance of accepted area.

END OF SECTION

SECTION 03100

CONCRETE FORMWORK

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3.03 OBSERVATION AND MAINTENANCE
3.04 REMOVAL OF FORMS
3.05 REUSE OF FORMS

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes formwork for concrete specified under Section 03300 – Cast-in-Place Concrete.

B. Where 'ACI 347' is referred to herein, reference is to 'ACI Standard Recommended Practice for Concrete Formwork' adopted by the American Concrete Institute.

C. Related work specified elsewhere:
   1. Section 03200 - Concrete Reinforcement.
   2. Section 03300 - Cast-in-Place Concrete.

D. Anchors and inserts are specified elsewhere.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General:

1. Contact surfaces of forms for concrete exposed: wood, plywood, hardboard, metal, form liner or other material which will produce surface finishes specified under Section 03300 - Cast-in-Place Concrete without adverse effect on concrete.
2. Plywood: comply with PS 1-74; use maximum sheet sizes to keep joints to minimum.
3. Hardboard: comply with FS LLL-H-35, Type 1, Class 2, hard pressed fiberboard treated for formwork use.
4. Metal forms: smooth surfaces free from irregularities, dents and sags.
5. Where used, form release agent must not stain or cause imperfections on concrete surface.

B. Chamfer strips: Polyvinylchloride, steel, good quality lumber carefully milled, free from protruding slivers and well-sealed, or other nonabsorbent material.

C. Form Ties
1. Form ties encased in concrete other than those specified in the following paragraphs shall be designed so that, after removal of the projecting part, no metal shall remain within 1-1/2" of the face of the concrete. The part of the tie to be removed shall be provided with a removable cone at least 1" diameter and 1-1/2" deep. Form ties in concrete exposed to view shall be the cone-washer type.
2. Flat bar ties for panel forms shall have plastic or rubber inserts having a minimum depth of 1-1/2" and sufficient dimensions to permit proper patching of the tie hole.
3. Ties for liquid containment structures shall have an integral waterstop that is tightly welded to the tie.
4. Common wire shall not be used for form ties.
5. Alternate form ties consisting of tapered through-bolts at least 1" in diameter at smallest end or through-bolts that utilize a removable tapered sleeve of the same minimum size may be used at the Contractor's option. Obtain Engineer's acceptance of system and spacing of ties prior to ordering or purchase of forming. Clean, fill and seal form tie hole with non-shrink cement grout. The Contractor shall be responsible for watertightness of the form ties and any repairs needed.

2.02 DESIGN AND FABRICATION

A. Design, engineer and construct formwork to satisfy specified requirements and conditions shown on plans.

B. For concrete exposed to chemical attack, comply with recommendations contained in Chapter 4 of Environmental Engineering Concrete Structures - ACI 350.

C. Strength of forms, supports, and braces adequate to resist vertical and lateral loads; follow recommendations contained in Chapter 2 of ACI 347.

D. Provide positive means for adjusting shores and struts (wedges and jacks) so settlement can be taken up during concrete placement operations.

E. Allowable deflection of facing materials reflected in exposed concrete surfaces: not greater than 1/240 of span between structural members.

F. On exposed surfaces, pattern of joints between facing panels and marks left by form ties must be rhythmic and symmetrical.

G. Provide temporary openings near bottom of deep forms and other locations where necessary to facilitate observation and cleaning immediately prior to deposit of concrete.

H. Form design must include provisions for easy removal.

I. Provide 3/4" x 3/4" chamfers on external corners of columns, beams, slabs and walls which have two adjacent faces exposed.

J. Do not use earth cuts as forms for vertical surfaces without specific approval from Engineer.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Solidly back joints between facing panels and perimeter edges of facing panels to maintain proper alignment.

B. Forms must be sufficiently tight to prevent leakage of mortar; gasket, tape, caulk or seal otherwise.

C. Cooperate with subcontractors in placement of anchors, bolts, inserts and other items embedded in concrete.

D. Leave section of forms adjacent to construction joint in place until concrete is deposited on other side of joint; retighten forms on completed section before next section is placed and carefully seal joint to prevent grout or paste leakage.

E. Securely brace shores and struts against lateral displacement.

F. Preparation of form surfaces:
   1. Remove loose concrete dust and other fine material from contact surface.

2. Prior to placement of concrete, saturate board forms with joints opened by shrinkage of wood with water until wood swells and closes joints.
3. Seal plywood and other wood surfaces not subject to shrinkage against absorption of moisture from concrete (field or factory applied).
4. Apply coating for preventing of bond with concrete prior to placement of reinforcing steel; do not allow excess coating material to stand in puddles in forms or come in contact with concrete surfaces against which fresh concrete will be placed.
5. Where painting of finished concrete is required, coatings applied to contact surface of forms must be compatible with type of paint to be used.
6. Where as-cast finishes are required, do not use form coatings which will impart stain to concrete.

G. Prior to placement of reinforcing steel, request Engineer to inspect form surfaces; obtain permission from Engineer to start placement of reinforcing steel.

3.02 WORKMANSHIP

A. Form surfaces adjacent to concrete must conform to shape, line, and dimension shown with corners uniform, true and sharp, unless otherwise shown on plans.

B. Transition between curved and straight surfaces must be smooth, even and tangent; when such forms are in place request Engineer to inspect them before concrete is placed.

C. When forms are removed, concrete surfaces shall conform to size, shape and line shown on plans within tolerances listed under Chapter 3 of ACI 347.

3.03 OBSERVATION AND MAINTENANCE

A. Observe formwork continuously while concrete is being placed to ensure that there are no changes of elevation, plumbness or camber from as-designed conditions.

B. Stop placement if settlement is noted and adjust shores and struts to eliminate settlement.

C. If weakness in falsework is observed which will produce distortion or variation on concrete surfaces in excess of allowable tolerances, stop work and strengthen falsework; remove permanently damaged construction before proceeding with work.

3.04 REMOVAL OF FORMS

A. Remove in manner that will not mar, spall or otherwise damage the concrete or other work.

B. Formwork not supporting weight of concrete: Formwork at locations such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing concrete at not less than 50ºF. for 24 hours after its placement, provided all of the following criteria are met:
   1. Concrete has obtained strength required to not be damaged by form removal operations.
   2. Concrete curing and protection operations will be maintained in accordance with the requirements for those materials.
   3. Shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and supports.

C. Do not remove supporting forms and shoring for slabs, beams, channels, troughs, corbels, brackets, haunches, cantilevered or Y-shape elements, or other flexural members until concrete complies with all of the following criteria:
   1. No sooner than 14 days following concrete placement.
   2. Obtained a minimum compressive strength of 80% of the 28-day strength.
   3. Of sufficient strength required to support its own weight and superimposed loads.

D. Remove the removable portion of form ties in a manner and at the period required to prevent damage to concrete.

E. Accomplish removal without prying against face of concrete or jarring structure; use wooden wedges only.

F. Remove supports in manner permitting concrete to assume load gradually and uniformly.

G. Perform reshoring for purpose of early form removal in manner that will not require large areas of new construction to support own weight.

H. When forms are removed before end of curing period, exposed concrete must be cured as specified under Section 03300 - Cast-in-Place Concrete.

I. Do not drop forms on floor.

J. Do not subject unsupported portions of structure to heavy construction or material loading.

3.05 REUSE OF FORMS

A. Reuse forms for exposed concrete only when in near new condition.

B. Do not reuse metal pans with bent flanges or dents until they have been straightened to near new condition.

C. Thoroughly clean and recoat forms before reuse; recondition if necessary.

D. Do not reuse forms if condition does not meet requirements set forth herein.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

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1.03 MINIMUM REINFORCEMENT REQUIREMENTS

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PART 1 – GENERAL

1.01 DESCRIPTION

A. This section describes reinforcing steel for concrete specified under Section 03300 - Cast-in-Place Concrete.

B. Related work specified elsewhere:
   1. Section 03100 – Concrete Formwork.
   2. Section 03300 – Cast-in-Place Concrete.

1.02 SUBMITTALS

A. Submit complete shop drawings showing all dimensions necessary for fabrication and placement of reinforcing steel and accessories, without reference to contract drawings; include elevations of wall reinforcing and location of construction joints.

B. Do not start fabrication until receipt of reviewed drawings from Engineer.

C. See Section 01300 - Submittals for additional requirements.

1.03 MINIMUM REINFORCEMENT REQUIREMENTS

A. Bars:
   1. Reinforce footings as shown on drawings; where reinforcing is not shown include:
      a. #4 at 8" each way bars for spread wall footings.
      b. #5 at 8" each way bars top and bottom in trench footings up to 8" thick.
      c. #6 at 10" each way bars top and bottom in trench footings 10" thick and over.
   2. Reinforce top of wall footing under door and other openings with two #4 bars, minimum; 4'-0" longer than opening.

3. Reinforce curbs as shown on drawings; where reinforcing is not shown, place one #4 bar top and bottom.
4. Reinforce walls as shown on drawings; where reinforcing is not shown, include:

Wall Thickness	Horizontal Bars	Vertical Bars	Location
6"	#4 @ 12"	#4 @ 12"	Center on Wall
8"	#4 @ 12"	#4 @ 12"	Center on Wall
10"	#4 @ 12"	#4 @ 12"	Each Face
12"	#5 @ 12"	#5 @ 12"	Each Face
16"	#5 @ 12"	#5 @ 12"	Each Face

5. At wall or floor openings, if reinforcing is not shown, include two #5 bars, each face, on all sides, 4'-0" longer than opening dimension.
6. Reinforce masonry load bearing and exterior concrete block walls as shown on drawings; where reinforcing is not shown, include #5 @ 24" vertical.

B. Mesh:
1. Reinforce slabs as shown on drawings; where reinforcing is not shown, include:
   a. 6" x 6" W2.1.x W2.1 mesh for following:
      1) 4" slabs on grade.
      2) Toppings.
   b. 6" x 6" W2.9 x W2.9 mesh for following:
      1) 6" or thicker slabs.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Bars:
1. ASTM A615, Grade 40 billet-steel with 40,000 psi minimum yield strength for #3 and smaller bars.
2. ASTM A615, Grade 60 billet-steel with 60,000 psi minimum yield strength for #4 and larger bars.

B. Prefabricated steel bar mats which meet specified bar requirements and spacings may be used in lieu of job placed individual bars.

C. Welded Wire Reinforcement, Mesh or Welded Wire Fabric: welded wire reinforcement; ASTM A1064.

D. Shear connectors: welded wire truss; ASTM A1064.

E. Spacers and chairs:
   1. Type: as shown on plans.
   2. Comply with ACI 315.
   3. Chairs: corrosion resistant.

F. Tie wire: black annealed wire; 16 gauge, minimum.

G. Mechanical splices: threaded splice; Dayton Superior D-101, or equal.

2.02 FABRICATION

A. Carefully form bars to shapes and dimensions shown on plans; where not shown, comply with requirements of ACI 315.

B. Tolerances: comply with ACI 117, ACI 301 and ACI 315 unless otherwise shown on plans.

C. Bend all bars cold.

D. Make bends for stirrups and ties around pin having diameter not less than two times thickness of bar.

E. Bend bars around pin having diameter not less than six times minimum thickness of bar; eight times minimum thickness for bars larger than 1".

F. Hooks: conform to requirements of ACI 318.

G. Where column bars are offset or dowels used for column splices, provide 1/2" clearance between bars or dowels and vertical bars of next lift.

H. Tag bars with metal, linen or rope fiber tags filled in by machine or waterproof ink; do not use paper tags.

PART 3 – EXECUTION

3.01 PLACEMENT

A. Design must comply with ACI 318 and details must conform to ACI 315, unless otherwise shown on plans.

B. Reinforcement: free from dirt, loose, flaky rust and scale, oil, grease, ice, or other coating which could reduce or destroy bond.

C. Bars:
   1. Accurately place and securely wire-tie bars in position before concrete is deposited; point wire-tie ends away from form.
   2. Support bars rigidly on spacers and chairs:
      a. Number, location and size: comply with Chapter 5 of ACI 315 and CRSI RB4.1 unless otherwise shown; other methods of support will be permitted subject to Engineer's approval.
      b. List number of supports for each span on schedule or mark on placing plan.
      c. Chairs required for top layer of reinforcing in footings.
      d. Use U or Z 1/4" reinforcing bar spacers between layers in walls at 5' oc each way.
   3. Lap splices and butt-welded splices in accordance with Chapter 7 ACI 350-06, Chapter 12 ACI 318-11 or (Chapter 25 of ACI 318-14). If a conflict exists between ACI codes, ACI 350-06 takes precedence.
   4. At walls without footing pads, rest bottom of reinforcing on concrete brick.
   5. Reinforcement spacing shown on plans is in inches.

D. Minimum protection between face of steel and outer face of concrete must comply with following, unless otherwise shown on plans:
   1. 3" for footings and other principal structural members where concrete is cast against ground.
   2. 2" for wall or other formed surfaces exposed to sewage, effluent, chemical attack, weather or in contact with ground; 1-1/2" if bars are #5 or smaller.
   3. 1-1/2" or 1-1/2 times maximum size of coarse aggregate for beams, girders and columns; dimension is to ties where used.
   4. 1" for floor joists where clear distance between joists is not over 30".
   5. 3/4" for slabs and walls not exposed to weather or directly to ground.
   6. Protection of reinforcement must at least equal to diameter of bars being covered, except 3/4" protection is sufficient for bars in slabs, regardless of bar size.

E. Tolerances:
   1. Height of bottom bars above bottom of form: 1/4" plus or minus from established dimension.
   2. Lengthwise:
      a. Top or bottom bars: 2"$\pm$ from plan dimension (extend same amount into each support).
      b. Truss bars: 2"$\pm$ from plan dimension (applies to ends of bars and bend points).
   3. Bar spacing in walls and solid slabs: do not exceed two times thickness of slab or all unless otherwise shown on plans.
   4. Lateral spacing in joists or beams where spacing is established: plus or minus 1/4".
   5. Clearance between face of steel and face of concrete: plus or minus 1/4".
   6. Height of top bars (top of bar to top of beam or slab): plus or minus 1/4" (if necessary to lower bars over 1/4", check with Engineer for increase in size or number of bars).
   7. Stirrup or tie spacing: 2"$\pm$ for any one unit (end unit not more than 1" either way from position shown).

F. Welded Wire Reinforcement (WWR):
   1. End lap by one of following methods:
      a. Overlap one full WWR (tip to tip of wires) and tie with wire and 1'-6" oc.
      b. Overlap with end cross wire of one piece in contact with next-to-end wire of other piece; tie to keep fabric in place or prevent edge from curling up.
   2. Side lap by one of following methods:
      a. Place selvage wire in middle of first WWR and wire tie at 5'-0" oc (stagger ties).
      b. Place selvage wire in contact with next-to-edge longitudinal wire; tie to keep fabric in place or prevent edge from curling up.
   3. Place WWR 2-1/2" below top of slab on grade, unless otherwise shown on plans or specified.
   4. Accurately place and rigidly support WWR on metallic supports, built-in concrete blocks or other suitable means; prevent displacement by foot traffic runways and compaction tools.
   5. Positioning WWR in slab by lifting with hook from bottom of form through concrete not permitted.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

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PART 1 – GENERAL

1.01 DESCRIPTION

A. This section describes all cast-in-place concrete work shown on plans, including but not limited to:
   1. Foundations (footings and grade beams).
   2. Below grade walls.
   3. Tanks and similar structures.
   4. Columns.
   5. Interior walls at basement level.
   6. Interior slabs on grade.
   7. Bases for mechanical and electrical equipment.
   8. Concrete encasement.
   9. Grout for equipment leveling and where shown.
   10. Fill or fillet concrete for tanks and where shown.

B. Related work specified elsewhere:
   1. Section 01010 - General Provisions.
   2. Section 02200 - Sitework.
   3. Section 03100 - Concrete Formwork.
   4. Section 03200 - Concrete Reinforcement.
   5. Section 07900 – Joint Sealers.

1.02 QUALITY CRITERIA

A. Contractor must follow recommendations set forth in Chapter 4 of Environmental Engineering Concrete Structures - ACI 350~~R~~ for concrete in contact with sewage or effluent or exposed to chemical attack.

1.03 STORAGE OF CEMENT AND AGGREGATES

A. Store cement in weathertight structure with floor raised not less than 1' from ground.

B. Do not use cement which has hardened or partially set; remove from site.

C. Store fine and coarse aggregate separately in manner to prevent segregation of sizes and avoid inclusion of dirt and other foreign materials.

D. Stockpile natural sand at least 24 hours before using.

1.04 DEPOSITING DURING COLD WEATHER

A. Do not place concrete without protection if temperature of surrounding air is below 40ºF. and falling or if it may be subjected to freezing temperature during curing period.

B. From November 1st to May 1st, do not place concrete without protective materials readily available, on job site, in quantities sufficient to protect all concrete that has not cured for specified period. U.S. Weather Bureau predictions will be used as basis for requiring that protective measures be taken.

C. Do not use frozen materials or materials containing ice in concrete.

D. Do not place concrete over or in contact with frozen earth; forms, reinforcement and fillers must be free from frost.

E. Protection of concrete required:
   1. If temperature is expected to drop into 32ºF. to 35ºF. range during period:
      a. After curing membrane specified herein under PROTECTING AND CURING is installed, cover following with minimum 1" blanket insulation:
         1) Exposed surfaces of slabs on earth.
         2) Framed components (including beams and walls) formed with 1" thick wood.
         3) All metal formed items.
      b. Protect insulation with polyethylene sheets, Sisalkraft, tarpaulins, or equal.

2. If temperature is below 35ºF. when concrete is placed:
    a. Placement temperature of concrete must be 60ºF. plus or minus 10ºF.; methods and equipment for heating mixing water and aggregates must be agreeable to Engineer.
    b. Temperature of surrounding air must be maintained at minimum 50ºF. during placement and for not less than 5 days thereafter; minimum 40ºF. for next 2 days (3 days and 1 day respectively if high early strength cement is used).
    c. When heating is discontinued, lower temperatures gradually; maximum 1ºF. per hour for first 24 hours; 2ºF. per hour thereafter until outside temperature is reached.
3. Any method of protection included in recommendations in Title 75-18 by ACI Committee 306 may be substituted for protection specified herein if temperature and moisture conditions recommended for type and service category of concrete being placed are maintained for recommended period of time; obtain permission of Engineer for substitute method before using.

F. Use of salts or chemicals for protection from freezing not permitted.

G. Remove and replace concrete damaged by freezing.

1.05 DEPOSITING DURING HOT WEATHER

A. Contractor must follow recommendations set forth in Hot Weather Concreting (Title 74-33 by ACI Committee 305) to minimize detrimental effects of hot weather on concrete placed on project; whenever air temperature is expected to exceed 75ºF. during placement operations, Contractor must consult with Engineer concerning practices to be followed.

B. Temperature of concrete at time of deposit must be below 90ºF.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Portland cement: ASTM C150, Type I or Type III. C_3A (Tricalcium aluminate) content must be less than 8% for concrete in direct contact with sewage or effluent or exposed to chemical attack.

B. Portland pozzolan cement: ASTM C595, Type IP or IP-A; pozzolan content must not exceed 25% by weight.

C. Fine aggregate:
    1. Meet requirements of ASTM C33, except where more rigid requirements are included herein.

2. Gradation within requirements of ASTM C33, Par. 3; sieve analysis of aggregate must accompany mix design when submitted to Engineer for review.
3. Natural sand:
    a. Clean, hard, strong, durable, uncoated grains.
    b. Coal and Lignite: 1.0% maximum.
    c. Prove acceptability of aggregate by laboratory test conducted and certified by laboratory acceptable to Engineer on samples taken in accordance with ASTM C75.

D. Coarse aggregate:
1. Meet requirements of ASTM C33, except where more rigid requirements are included herein.
2. Clean, hard, strong, durable uncoated pieces.
3. Gradation within requirements of ASTM C33, Table II:
    a. #467 or #57, 1-1/2" or 1" to No. 4, for footings and plain concrete.
    b. #57, 1" to No. 4, for slabs on grade and reinforced walls.
    c. #57 or #67, 1" or 3/4" to No. 4, for slabs, beams, girders, columns, fillet and fill concrete.
    d. #7, 1/2" to No. 4, for fill over steel stair treads and landings.
4. Limitation of deleterious substances:
    a. Clay lumps and friable particles: maximum 1.0%.
    b. Soft particles: maximum 2.0%.
    c. Coal and Lignite: maximum 0.25%.
5. Crushed limestone: meet IDOT specifications 4115.03 for abrasion and 4115.04 for Class 2 or 3 durability; not more than 1.0% of clay lumps and friable particles, 2.0% of soft particles and 0.25% of coal and lignite allowed; prove acceptability by submission of certified laboratory test report.

E. Admixtures:
1. Air-entraining agents: ASTM C260.
2. Water reducing agents: ASTM C494, Type A.
3. Retarding agents: ASTM C494, Type B.
4. Accelerating agents: ASTM C494, Type C.
5. Water reducing and retarding agents: ASTM C494, Type D.
6. Water reducing and accelerating agents: ASTM C494, Type E.
7. High range water reducing agents: ASTM C494, Type F.
8. High range water reducing and retarding agents: ASTM C494, Type G.
9. Fly ash and GGBFS: IDOT Section 4108. Fly ash to be Class C.
10. Shrinkage reducing admixture: ASTM C157; W.R. Grace, or equal.
11. Synthetic fibers: high volume monofilament polypropylene/polyethylene blend; 1-1/2" to 2" length; 78 ksi fiber tensile strength; minimum 1,300 ksi modules of elasticity; ASTM C1116; dosage rate 3.5 lbs./CY of concrete.

F. Water: clean and free from injurious amounts of oil, alkalis, acids, or organic matter.

H. Dowels:
   1. ASTM A15; 1'-6" long, smooth round steel rods: diameter as shown on drawings.
   2. Where preformed filler is required, completely coat one end with heavy grease and cover with expansion cap.

I. Preformed expansion or isolation joint filler:
   1. Self-expanding cork, ASTM D1752, Type III.
   2. 1/2" thick, unless otherwise shown on drawings.

J. Joint sealer:
   1. Thickol sealer: FS TT-S-00227E (two part) or FS TT-S-00230C (one part), Type I (self-leveling), Class B (resistant to 25% total movement), based on liquid polysulfide polymers.
   2. Pour-type urethane sealant: Sonneborn Sonolastic Paving Joint Sealant (two parts), or Sonomeric CT (one part), or equal.

K. Backing rod: round polyethylene rod; Dow Chemical Co., Ethafoam rod, or equal.

L. Waterstops:
   1. Polyvinylchloride with following characteristics when tested in accordance with ASTM test method listed:

Specific Gravity	1.32 plus or minus 0.05	ASTM D792
Hardness	76 plus or minus 3	ASTM D2240
Tensile Strength	2250 psi (minimum)	ASTM D638
Elongation	350% (minimum)	ASTM D638
Cold Brittleness	-35ºF. or lower	ASTM D476

   2. Design: 6", ribbed with corrugations and center bulb, except where shown otherwise; Greenstreak Type 705, or equal.
   3. Expansive waterstop may be used for vertical construction joints and where shown on drawings; Greenstreak Hydrotite, or equal.

M. Liquid applied curing and sealing compounds:
   1. For interior surfaces, except where floor hardness is specified: West Concrete Floor Sealer (West Chemical Products, Inc.), Kure-N-Seal (Sonneborn-Contech), L & M Cure (L & M Construction Chemicals, Inc.), or equal; do not use Kure-N-Seal on floors that will be subjected to petroleum drips and spills, such as motor vehicle traffic or parking.

N. Liquid applied floor hardener; fluosilicate based material; Sonneborn Lapidolith, A.C. Horn Hornolith, L & M Fluohard, or equal.

O. Abrasive aggregate:
   1. Silicon carbide or aluminum oxide.
   2. Any manufacturer's gradation which falls in range of 12 to 36 grit is acceptable.

P. Grout: ASTM C1107 Class B or C; mix according to recommendations of manufacturer; strength: not less than that of adjacent concrete; L&M Crystex, Master Builders Masterflow 928, or equal.

Q. Use Dur-O-Wall heavy duty trusses, or equal, for vertical trusses; use single truss full height and width according to wall thickness.

R. Bond Breaker
   1. Bond breaker tape shall be an adhesive-backed glazed butyl or polyethylene tape which will satisfactorily adhere to the premolded joint filler or concrete surface as required. The tape shall be the same width as the joint unless otherwise noted.
   2. Except where tape is specifically called for on the drawings, bond breaker for concrete shall be either bond breaker tape or a non-staining type bond prevention coating such as Williams Tilt-up Compound by Williams Distributors Inc.; Silcoseal 2000F, by SCA Construction Supply Division, Superior Concrete Accessories or equal.

S. Bonding Agent
   1. Epoxy bonding agent shall be a two-component, solvent-free, moisture insensitive, epoxy resin material conforming to ASTM C881 (1999), Type V. The bonding agent shall be Sikadur 32 Hi-Mod by Sika Corporation of Lyndhurst, NJ; Concresive Liquid (LPL) by Master Builders of Cleveland, OH or equal.
   2. Latex bonding agent shall be a non-reemulsifiable acrylic-polymer latex conforming to ASTM C1059, Type II.

2.02 QUALITY AND DESIGN OF MIXES

A. Design compressive strength:
   1. Pipe encasement, fill and fillet (Class B) concrete: 2,500 psi.
   2. All other (Class A) concrete: 4,000 psi.
   3. Maximum water to cement ratio 0.40 for concrete containing shrinkage reducing admixture. Maximum water to cement ratio 0.45 for all other (Class A) 4,000 psi concrete.

B. Design of mix:
   1. Overdesign mixes in accordance with plant coefficient of variation. Overdesign must assure less than 1 chance in 10 that test will fall below design compressive strength and that 99 chances out of 100 no test will fall below 90% of design compressive strength.

2. Complete design in advance of first placement; any existing mix design may be used if made or checked within previous six months by approved testing laboratory using aggregates from same source and same gradation as those used on this project.
3. Comply with ACI 211.1 Recommended Practice for Selecting Proportions for Normal Weight Concrete and recommendations set forth in Chapter 3 of Environmental Engineering Concrete Structures - ACI 350R for concrete in contact with sewage or effluent or exposed to chemical attack.
4. Slump:
    a. Footings and substructure walls: 3" plus or minus 1".
    b. Beams, columns, slabs and reinforced walls: 3" plus or minus 1".
    c. Heavy mass construction: 2" plus or minus 1".
5. Submit mix design to Engineer for agreement before any concrete is placed; include design which contains fly ash or Pozzolan based admix and design which contains retarding type water reducing admix, with appropriate slump adjustments, if need is indicated.
6. Assign number to each mix design for future reference.

C. Admixtures:
1. Air entraining agent:
    a. Add at mixer for all concrete.
    b. Concrete must contain 5.0% plus or minus 1.0% air by volume if maximum aggregate size is 1-1/2"; 6.0% plus or minus 1.0% if maximum aggregate size is 3/4" or 1", 7.0% plus or minus 1% if concrete contains shrinkage reducing admixture.
2. Do not use calcium chloride or other salts as antifreeze or to accelerate set.
3. Cement dispersing agent or concrete densifiers (water reducing and high range water reducing agents):
    a. Recommended to improve workability and control rate of hardening for controlling uniformity under varying temperature and weather conditions.
    b. Add water reducing and retarding type to mix if air temperature is above 80ºF. and freshly placed concrete will be exposed to sun and/or hot drying wind.
    c. Fly ash or Pozzolan based admixture recommended for exposed interior finish concrete, including slabs on grade and floor fill.
    d. Fly ash or pozzolan based admixture required when using high range water reducing agents.
    e. Do no use melamine-based high range water reducing agents if concrete is exposed to freeze-thaw cycles.
    f. Do not use high range water reducing agents in beams, joists or elevated slabs.
    g. Use in accordance with manufacturer's recommendations.
4. Shrinkage reducing admixtures may be used at Contractor's option.

2.03 BATCHING AND MIXING

A. Operations, equipment and location of facilities subject to approval of Engineer.

B. Measuring of materials:
   1. By weight such that proportions can be accurately controlled and easily checked.
   2. Weigh ingredients separately.
   3. Weigh cement for each batch if fractional sacks or bulk cement is used.
   4. Water measurement to 1 pint plus or minus for total per batch.

C. Mix one cubic yard batch for at least 1-1/2 minutes after all materials are in mixer; increase time by 15 seconds for each additional cubic yard or fraction thereof.

D. Ready-mixed concrete: comply with ASTM C94.

2.04 QUALITY CONTROL

A. Slump tests:
   1. Make test in accordance with ASTM C143 on sample taken in accordance with ASTM C172.
   2. Tests required:
      a. First load each day.
      b. Whenever other tests are being made.
      c. After any change in mix.
      d. When directed by Engineer.

B. Temperature tests:
   1. Required whenever outside temperature is within 10ºF. of limiting temperatures specified herein under DEPOSITING DURING HOT (or COLD) WEATHER.
   2. Make tests at same time slump tests are taken.
   3. Use armored thermometer accurate to plus or minus 2ºF.
   4. Place thermometer in freshly discharged concrete and leave it in place until reading becomes stable.

C. Air content tests:
   1. By pressure method (ASTM C231) or volumetric method (ASTM C173) on samples taken in accordance with ASTM (C172).
   2. Test first load of air entrained concrete and spot check by additional test on each day that air entrained concrete in placed.

D. Compression tests:
   1. Prepare cylinders in accordance with ASTM C31.
   2. Set of 3 cylinders required for every run of 50 CY or fraction thereof.
   3. Cure cylinders under laboratory conditions and test by procedure in ASTM C39.

4. Prepare additional cylinders and cure under job conditions if air temperature is likely to fall below 40ºF.
5. Break cylinders at 7 and 28 days.
6. If over 1 in 10 tests of laboratory specimens fall below design compressive strength specified, check design of mix and make necessary corrections before additional concrete is placed.
7. When test specimens break below strength specified, Contractor may be required to test concrete affected by procedure in ASTM C42 (core tests) or load test portion of structure affected.
8. Remove concrete not in accordance with specifications and replace without cost to Owner.

E. Record results of all test immediately in Log of Tests which must be maintained at job site; log must contain following information:
   1. Date and time test are made.
   2. Test results, if immediately available.
   3. Exact location where tested concrete was placed in structure.
   4. Weather conditions, including air temperature at time tests were made.
   5. Plant and number of mixer truck that delivered concrete.
   6. Name of person who made test.
   7. Mix design number.

PART 3 – EXECUTION

3.01 PREPARATIONS FOR PLACEMENT

A. Verify with Engineer that reinforcing steel placement has been checked, and with subcontractors that wall pipes, anchor bolts, wall thimbles, pipe sleeves, drains, conduit and outlets have been placed in forms.

B. Remove foreign materials (chips, blocks, sawdust, ice and water) from forms.

C. Where placing against hardened concrete, clean contact surface thoroughly and remove all laitance, wet vertical surfaces and slush with neat cement grout just prior to placement of new concrete.

3.02 WATERSTOPS

A. PVC Waterstops
   1. Install PVC waterstops for all joints where waterstops are indicated on the drawings, unless specifically noted otherwise. Waterstops shall be continuous around all corners and intersections so that a continuous seal is provided. Splices shall be made by welding.

2. PVC splices shall be made by welding in accordance with the manufacturer's recommendations, subject to acceptance of the Engineer. Only manufacturer's special approved tools shall be used for welding. The finished splices shall provide a cross-section that is dense and free of porosity.
3. Each piece of the waterstop shall be of maximum practicable length to provide a minimum number of splices.
4. To properly secure PVC waterstops in wall joints before concrete is placed, drill holes in waterstops approximately 1" from each edge or between the outermost ribs at each edge and center the waterstop in the joint. Tie both edges of the waterstop and fasten to reinforcing steel with black annealed steel tie wire as specified for tying reinforcing steel and secure in place so that the waterstop will be perpendicular to the joint and remain in the required position during concrete placement. The spacing of the waterstop ties shall match the spacing of the adjacent reinforcing but need not be spaced closer than 12" on center.
5. Horizontal waterstops in slabs shall be clamped in position by the bulkhead (unless previously set in concrete).
6. Horizontal PVC waterstops in slabs shall have the edge of the waterstop lifted while placing concrete below the waterstop. Then the waterstop shall be manually forced against and into the placed concrete and covered with fresh concrete, to ensure adequate encasement of the waterstop in concrete.
7. Waterstops shall be installed so that half of the width will be embedded on each side of the joint. Care shall be exercised to ensure that the waterstop is completely embedded in void-free concrete.
8. Waterstops shall be terminated 3" below the exposed top of walls. Expansion joint waterstop center bulbs shall be plugged with foam rubber, 1" deep, at point of termination.

B. Expansive Waterstops
1. Install waterstops at joints where specifically noted on the drawings. Waterstops shall be continuous around all corners and intersections so that a continuous seal is provided.
2. Each piece of the waterstop shall be of maximum practicable length to provide a minimum number of connections or splices. Connections and splices shall conform to the manufacturer’s recommendations and as specified herein.
3. Waterstops shall be terminated 3" below the exposed top of walls.
4. Prepare the joint surfaces, install primers or adhesives, and install expansive waterstops in accordance with the manufacturer’ instructions.

3.03 PLACING CONCRETE

A. Notify Engineer 1 day before each placement.

B. Do not add water to concrete between mixing and placing operations without specific agreement of Engineer and continuous inspection acceptable to Engineer; under no circumstances may added water cause concrete to slump greater than that established in design mix; verify with slump tests; maintain uniform consistency.

C. Conveying:
   1. Method must ensure uniform concrete at forms with minimum slump loss.
   2. Chutes must be steep enough to permit concrete of design consistency to flow to point of deposit or other means of conveying must be used.

D. Fill forms completely in one operation.

E. During placement operations, work concrete around reinforcement, embedded fixtures, and into corners of forms; thoroughly compact and exercise particular care to prevent surface voids and honeycomb on exposed surfaces.

F. Placement in deep narrow forms other than column forms:
   1. Discharge into hopper feeding into drop chute if free fall will be more than 3'.
   2. Drop vertical; do not push or pull bottom of chute from vertical position to distribute concrete; move chute.
   3. For concrete exposed, the following applies:
      a. Place in maximum 20" deep layers and consolidate each layer with preceding layer before starting placement of next layer.
      b. Do not allow concrete to flow laterally for more than 3'; move chute or place sufficient number of chutes in forms to assure top of concrete is kept level.
      c. If placement rate is faster than 2' per hour, reduce slump proportionally as each 1/4 of form depth is filled so slump of top 1/4 will not exceed 3".
      d. If plasticized concrete is used, the maximum lift thickness may be increased to 7' and the maximum free fall of concrete shall not exceed 15'; subparagraphs "b." and "c." above do not apply.

G. Place beams, girders, brackets, column caps and haunches integrally with floor system.

H. Allow minimum 2 hours after deposit of columns or walls before depositing beams, girders or slabs supported thereon.

I. Vibration of concrete:
   1. Use internal type vibrator; insert and withdraw slowly.
   2. Insert vibrator vertically to full depth of layer being placed, at regular intervals (18" to 30").
   3. Do not use vibrator to cause concrete to flow from one location to another.
   4. Avoid segregation in concrete due to over vibration.
   5. Do not allow vibrator to come in contact with formwork surfaces for exposed concrete.

J. Stop placement only where directed, at point of no shear, and erect tight, plumb dams through forms.

3.04 JOINTS

A. Key construction joints; where reinforcing is interrupted, dowel joints; size and number of dowels as shown on drawings.

B. Place construction joints through framed slabs on center of span unless otherwise shown on drawings or approved by Engineer.

C. Wall construction joints must form symmetrical pattern on exposed surfaces, unless otherwise shown on drawings

D. Horizontal and Vertical construction joints are required where shown on the plans. Provide additional joints to meet maximum spacing requirements shown in Section 03300, 3.04, K and L of the specifications. Additional vertical joints are allowed at quarter points in walls. Reinforcement shall be continuous through the joints and keyways shall be provided unless shown otherwise on the drawings or noted otherwise in the specifications. Lap reinforcing steel as specified; install keyway and waterstop; submit location of proposed vertical construction joints prior to construction for Engineer's review.

E. Hold top of expansion or isolation joint filler maximum 1/2" below surface for joint sealer at exposed joints.

F. Control joints in slabs on grade:
   1. Saw cut joints to depth of 1/4 of slab thickness, unless otherwise specified; make cut not less than 8 hours or more than 24 hours after slab is placed unless shown or otherwise on the plans or indicated otherwise in the specifications.
   2. In lieu of saw cutting joint, Contractor may place metal crack control joint.
   3. Stop every other bar at joint.

G. Dowels:
   1. For expansion joints.
   2. Install in center of slab or at third points as shown on drawings, parallel to surface and perpendicular to joint.
   3. Completely coat one end with heavy grease at joints where preformed filler is required; expansion cap required over greased end of dowel.

H. Where applied floor coverings are scheduled, fill saw cut joints in interior slabs with dry mix of 1:9 cement and sand.

I. Fill all other interior saw cut joints, expansion and isolation joints with Thickol joint sealer in accordance with manufacturer's directions; prime edges of joint if recommended by manufacturer.

J. Waterstops:
   1. Required where shown on drawings and at joints subject to hydrostatic pressure.
   2. Heat splice joints in accordance with manufacturer's specifications.
   3. Install as detailed on drawings; wire to reinforcing.

K. Maximum Spacing for Structures Not Intended to Contain Liquid:
   1. Wall Vertical Construction Joints:
      60 FT maximum centers.
      At wall intersections, 30 FT maximum from corner.

   2. Base Slab, Floor and Roof Construction Joints:
      Placement to be approximately square and not to exceed 3500 SF.
      Maximum side dimension of pour to be less than twice the length of the short side and 80 FT.

L. Maximum Spacing for Structures Intended to Contain Liquid:
   1. Wall Vertical Construction Joints:
      30 FT maximum centers.
      At wall intersections, 15 FT maximum from corner.

   2. Base Slab, Floor and Roof Construction Joints:
      Placement to be approximately square and not to exceed 2000 SF.
      Maximum side dimension of pour to be less than twice the length of the short side and 60 FT.

3.05 FINISH ON FORMED SURFACES

A. Uniform finish required on exposed concrete surfaces.

B. Texture on formed surfaces must be indicative of form material used, except for following limitations and requirements:
   1. Small isolated air bubbles will be allowed.
   2. Width and projection of form marks on exposed concrete must not be greater than 1/16", except no projections allowed on inside channel or conduit walls and slabs; grind off projections as required.

C. Finish exposed top surface of formed members as closely as possible to finish on formed surfaces.

D. Repair defective concrete and damaged areas as follows:
   1. Cut back to solid concrete all weak concrete around holes and at honeycomb.
   2. Thoroughly wet area to be repaired and brush coat with neat cement grout.
   3. Fill large voids with cement mortar composed of 1 part cement, 2 parts fine aggregate and water; place in compacted layers to finish flush with adjacent surfaces.
   4. On exposed concrete:
      a. Remove excess grout, after it is partially set, by working with float and rubbing with burlap; leave no visible filler or grout.
      b. Patched areas must match adjacent surface.

E. Where form ties are used, fill cutback holes as specified above for repairing defective concrete.

F. Smooth form finish all exposed concrete surfaces, completely remove fins.

G. Rough-Form Finish
   1. No additional finishing is required.

H. Rubbed Finish
   1. While the wall is still damp apply a thin coat of medium consistency neat cement slurry by means of bristle brushes to provide a bonding coat within all pits, air holes or blemishes in the parent concrete. Avoid coating large areas with the slurry at one time.
   2. Before the slurry has dried or changed color, apply a dry (almost crumbly) grout proportioned by volume and consisting of 1 part cement to 1-1/2 parts of clean masonry sand having a fineness modulus of approximately 2.3 and complying with the gradation requirements of ASTM C33 for such a material. Grout shall be uniformly applied by means of damp pads of coarse burlap approximately 6" square used as a float. Scrub grout into the pits and air holes to provide a dense mortar in all imperfections.
   3. Allow the mortar to partially harden for 1 or 2 hours depending upon the weather. If the air is hot and dry, keep the wall damp during this period using a fine, fog spray. When the grout has hardened sufficiently so it can be scraped from the surface with the edge of a steel trowel without damaging the grout in the small pits or holes, cut off all that can be removed with a trowel. (Note: Grout allowed to remain on the wall too long will harden and will be difficult to remove.)
   4. Allow the surface to dry thoroughly and rub it vigorously with clean dry burlap to completely remove any dried grout. No visible film of grout shall remain after this rubbing. The entire cleaning operation for any area must be completed the day it is started. Do not leave grout on surfaces overnight. Allow sufficient time for grout to dry after it has been cutoff with the trowel so it can be wiped off clean with the burlap.
   5. On the day following the repair of pits, air holes and blemishes, the walls shall again be wiped off clean with dry, used pieces of burlap containing old hardened mortar which will act as a mild abrasive. After this treatment, there shall be no built-up film

remaining on the parent surface. If, however, such a film is present, a fine abrasive stone shall be used to remove all such material without breaking through the surface film of the original concrete. Such scrubbing shall be light and sufficient only to remove excess material without changing the texture of the concrete.

6. A thorough wash-down with stiff bristle brushes shall follow the final bagging or stoning operation. No extraneous materials shall remain on the surface of the wall. The wall shall be sprayed with a fine fog spray periodically to maintain a continually damp condition for at least 3 days after the application of the repair grout.

3.06 PROTECTING AND CURING

A. Protect exposed surfaces from premature drying.

B. Protect freshly placed concrete against wash by rain.

C. Keep concrete continuously cured for 7 consecutive days after placement, including weekends and holidays (3 days if Type III Portland cement is used.

D. Approved methods of curing:
   1. Wet cure using continuous sprinklers or submerging concrete; alternate cycles of wetting and drying not permitted; exercise special care when surrounding air is heated during cold weather operations.
   2. Cover with fabric mats and keep wet during curing period.
   3. Cover with waterproof paper which meets requirements of ASTM C171. Waterproof paper shall remain in place for duration of curing period.
   4. Cover with clear or white polyethylene sheets, 0.004" thick; lap edges minimum 4" and seal with tape. Polyethylene sheets shall remain in place for duration of curing period.
   5. Seal with liquid applied curing and sealing compound applied in accordance with manufacturer's directions; do not apply compound on construction joints.
   6. Do not use Methods 1, 2, and 5 in unheated areas during cold weather operations if exposed concrete is protected with blanket insulation.

E. Vertical surfaces:
   1. Wood forms, kept wet, and metal forms provide satisfactory curing; cure exposed top surfaces as specified above.
   2. When forms are removed before end of curing period, exposed concrete must be cured by one of first four approved methods included under Item D.

3.07 INTERIOR SLABS ON GRADE

A. Thickness as shown on drawings.

B. Place over vapor barrier as specified in Section 07110; 6" minimum well graded and

compacted granular leveling course under membrane.

C. Isolation joint where shown on drawings and as specified herein under JOINTS.

D. Unless otherwise shown, place exposed slab either:
   1. In strips, maximum 15' wide with control joints centered on columns and saw across strips, as specified herein, under JOINTS, at maximum 15' spacings on column centers.
   2. Place alternate panels checkerboard with control joints on column centers in each direction and maximum 15' oc.

E. Finish as specified herein under FLATWORK FINISHING.

F. Note requirements for drains and process equipment.

3.08 SURFACE COURSES

A. Remove all debris and sweep cured slab base with heavy wire broom; dry brush to remove dust; wash and keep slab wet for 12 hours prior to placement of fill.

B. Remove any excess water 15 to 30 min. prior to placement of surface course.

C. Finish as specified herein under FLATWORK FINISHING.

3.09 FLATWORK FINISHING

A. Screed and float.

B. After floating, check surface with straight edge and eliminate high and low spots; interior slab must be level or flat within 1/4" in 10'; 3/8" in 20'; 3/4" in 40', and drain to floor drains; remove and replace any concrete slabs not meeting these requirements; replacement limits determined by extent of deficiencies and by structural considerations.

C. Do not use dust coat and add no water.

D. Trowel interior slabs, surface courses and concrete fillets not otherwise specified to smooth, polished surface:
   1. Delay troweling until concrete has hardened sufficiently to prevent excess fines form working to surface; avoid excessive troweling.
   2. After topping has set to ring trowel, trowel second time to produce burnished finish.

E. Fine float finish structural slabs over which waterproofing will be placed; floors in rooms, with vehicular access, steps and platforms.

F. Non-slip floor surfaces:
   1. Required for concrete fill of steel stairs and where shown on drawings.
   2. After concrete floor surfaces have been floated and troweled, but while still plastic, sprinkle abrasive aggregate evenly onto the surface and work it into the surface during finishing so that the grains are securely imbedded in the concrete at the surface. Application rate 25 to 40 lbs./100 SF as recommended by the manufacturer.

G. Liquid floor hardener:
   1. Required for interior floors not scheduled to receive floor coverings and for concrete fill of steel stairs.
   2. Do not use curing compounds for curing these slabs.
   3. Apply in 3 coats to thoroughly cured floor over clean dry surface in accordance with manufacturer's directions.
   4. Dilute with water, as recommended by manufacturer, for heavy duty dense floors.
   5. Unless otherwise recommended on directions furnished with material, dilute fluosilicate based liquid applied hardener (parts by volume) as follows:

Coat	Water	Hardener
First	3	1
Second	2	1
Third	1	1

3.10 EQUIPMENT BASES

A. Furnish bases for all mechanical and electrical equipment where shown on drawings or specified.

B. Where required, anchor bolts and template to ensure proper location must be furnished by subcontractor concerned.

C. Finish as specified herein under FLATWORK FINISHING.

D. Grout under base of equipment; pack grout to completely fill voids.

3.11 SEALING EXTERIOR SLABS

A. Required for exterior slabs placed between September 15 and May 1 which may be subjected to deicing agents.

B. After specified curing, seal slabs as follows:
   1. First coat 1/2 boiled linseed oil and 1/2 mineral spirits applied at rate of approximately 450 SF per gallon.
   2. After first coat has dried, apply second coat of uncut boiled linseed oil at rate of approximately 540 SF per gallon.

3.12 SCHEDULE OF FINISHES

A. Concrete shall be finished as specified either to remain as natural concrete to receive an additional applied finish or material under another section.

B. Concrete for the following conditions shall be finished as noted on the drawings and as further specified herein:
   1. Concrete to receive dampproofing or waterproofing: Rough-form finish.
   2. Concrete not exposed to view and not scheduled to receive an additional applied finish or material: Rough-form finish.
   3. Exterior vertical concrete above grade exposed to view: Rubbed finish.
   4. Interior vertical concrete exposed to view except in water containment areas: Rubbed finish.
   5. Vertical concrete in water containment areas. Rubbed finish on exposed surfaces and extending to 2' below normal operating water level: Rough-form finish on remainder of submerged areas.
   6. Interior and exterior underside of concrete exposed to view: Rubbed finish.
   7. Interior or exterior horizontal concrete not requiring floor hardener or sealer: Floated finish.
   8. Concrete for exterior walks, interior and exterior stairs: Broomed finish perpendicular to direction of traffic.
   9. Concrete slabs on which process liquids flow or in contact with sludge: Steel trowel finish.

END OF SECTION

SECTION 15400

PLUMBING

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PART 1 - GENERAL

1.01 DESCRIPTION

A. This section describes plumbing systems complete, fully adjusted and ready for use.

B. Code requirements: plumbing systems shall comply with the local codes and ordinances.

PART 2 - PRODUCTS

2.01 LP PIPING SYSTEM

A. Pipe and fittings:
   1. Pipe material: copper, seamless, ASTM B88, hard temper or soft; Type K below grade or floor.
   2. Fittings: wrought copper or cast bronze.
   3. Solder: ASTM B32 alloy grade 95 TA solder or silverbrite containing 95.5% tin, 4% copper and 0.5% silver.

B. Gas pressure regulators: Fisher Controls Model 66, Rockwell, or equal, of sizes and capacities as required.

C. Gas cocks: bronze plug cock, straightway pattern; 150 lb. WOG; screwed; Lunkenheimer Figure 454, Crane, or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Gas piping system:
   1. Conform installation to local and other applicable codes.
   2. Install a union, gas cock and 6" dirt leg in each gas pipe connection to equipment.

3.02 TESTS

A. Air test gas piping system at 50 psi; use soap and water to detect leaks; piping to remain watertight for 24 hours.

END OF SECTION

SECTION 16050

ELECTRICAL REQUIREMENTS

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PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall provide electrical work, complete and operable, in accordance with the Contract Documents.

B. The provisions of this section apply to all sections in Division 16, except as indicated otherwise.

C. The work of this section is required for operation of electrically-driven equipment provided under specifications in other divisions. The Contractor's attention is directed to the requirement for proper coordination of the work of this section with the work of equipment specifications and the work of instrumentation sections.

D. Concrete, excavation, backfill, and steel reinforcement required for encasement, installation, or construction of the work of the various sections of Division 16 is included as a part of the work under the respective sections, including duct banks, manholes, handholes, equipment housekeeping pads, and light pole bases.

1.02 REFERENCE STANDARDS

A. The work of this section and all sections in Division 16 shall comply with the following as applicable:
   1. NEC (NFPA 70) National Electrical Code
   2. NETA International Electrical Testing Association

3. NEMA 250 Enclosure for Electrical Equipment (1000 Volts Maximum)

B. Electrical equipment shall be listed by and shall bear the label of Underwriters' Laboratories, Inc. (UL) or an independent testing laboratory acceptable to the local code enforcement agency having jurisdiction.

C. Installation of electrical equipment and materials shall comply with OSHA Safety and Health Standards (29 CFR 1910 and 29 CFR 1926, as applicable), state building standards, and applicable local codes and regulations.

D. Where the requirements of the specifications conflict with UL, NEMA, NFPA, or other applicable standards, the more stringent requirements shall govern.

1.03 SIGNAGE AND MARKINGS

A. Identification: Provide danger, caution, and warning signs and equipment identification markings in accordance with applicable federal and state OSHA and NEC requirements.

B. Local Disconnect Switches:
1. Each local disconnect switch for motors and equipment shall be legibly marked to indicate its purpose unless the purpose is indicated by the location and arrangement.

C. Warning Signs:
1. 600 volts nominal, or less: Entrances to rooms and other guarded locations that contain live parts shall be marked with conspicuous signs prohibiting unqualified persons to enter.

D. Isolating Switches: Isolating switches not interlocked with an approved circuit interrupting device shall be provided with a sign warning against opening them under load.

1.04 PERMITS AND INSPECTION

A. Permits shall be obtained and inspection fees shall be paid according to the General Conditions.

B. The Contractor shall pay connection and turn-on service charges required by the utility companies.

1.05 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with Division 01.

B. Shop Drawings: Include the following:
   1. Complete material lists stating manufacturer and brand name of each item or class of material.
   2. Shop drawings for all grounding work not specifically indicated.
   3. Front, side, rear elevations, and top views with dimensional data.
   4. Location of conduit entrances and access plates.
   5. Component data.
   6. Connection diagrams, terminal numbers, internal wiring diagrams, conductor size, and cable numbers.
   7. Method of anchoring, weight.
   8. Types of materials and finish.
   9. Nameplates.
   10. Temperature limitations, as applicable.
   11. Voltage requirement, phase, and current, as applicable.
   12. Front and rear access requirements.
   13. Test reports.
   14. Grounding requirements.
   15. Catalog cuts or photocopies of applicable pages of bulletins or brochures for mass produced, non-custom manufactured material. Catalog data sheets shall be stamped to indicate the project name, applicable Section and paragraph, model number, and options. This information shall be marked in spaces designated for such data in the Engineer's stamp.

C. Shop drawings shall be custom prepared. Drawings or data indicating "optional" or "as required" equipment are not acceptable. Options not proposed shall be crossed out or deleted from shop drawings.

D. Owner's Manuals: Complete information in accordance with Division 01.

E. Record Drawings: The Contractor shall show invert and top elevations and routing of all duct banks and concealed below-grade electrical installations. Record drawings shall be prepared, be available to the Engineer, and be submitted according to Division 01.

1.06 AREA DESIGNATIONS

A. General
   1. Raceway system enclosures shall comply with Section 16110 - Electrical Raceway Systems.
      Electric work specifically indicated in sections within any of the Specifications shall comply with those requirements.

AREA	NEMA ENCLOSURE CLASSIFICATION						
	1	3R	4X	7	9	12	Notes
Well Control Building	X						
Facility Exterior		X	X				Wet Location

B. Material Requirements

1. NEMA 1, 3R, and 12 enclosures shall be steel coated with ANSI 61 grey paint unless noted otherwise on plans.
2. NEMA 4X: stainless steel unless specified otherwise.

1.07 TESTS

A. The Contractor shall be responsible for factory and field tests required by specifications in Division 16 and by the Engineer or other authorities having jurisdiction. The Contractor shall furnish necessary testing equipment and pay costs of tests, including replacement parts and labor, due to damage resulting from damaged equipment or from testing and correction of faulty installation.

B. Where test reports are indicated, proof of design test reports for mass-produced equipment shall be submitted with the shop drawings, and factory performance test reports for custom-manufactured equipment shall be submitted and be approved prior to shipment. Field test reports shall be submitted for review prior to Substantial Completion.

C. Equipment or material that fails a test shall be removed and replaced.

1.08 CONSTRUCTION SEQUENCING

A. Continuance of existing Well operation during construction is critical. Work shall be scheduled, subject to Owner's approval, to minimize any required shutdown time. The Contractor shall submit a written request, including sequence and duration of activities to be performed during any shutdown.

B. Switching, safety tagging, etc., required for equipment shutdown and power outages shall be performed by the Contractor. In no case shall the Contractor begin any work without written authorization by the Engineer.

C. The Contractor shall visit the Site before submitting a Bid to better acquaint itself with the work of this Contract. Lack of knowledge will not be accepted as a reason for granting extra compensation to perform the work.

PART 2 – PRODUCTS

2.01 GENERAL

A. Equipment and materials shall be new, shall be listed by UL, and shall bear the UL label where UL requirements apply. Equipment and materials shall be the products of experienced and reputable manufacturers in the industry. Similar items in the work shall be products of the same manufacturer. Equipment and materials shall be of industrial grade standard of construction.

B. Where a NEMA enclosure type is indicated in a non-hazardous location, the Contractor

shall utilize that type of enclosure, despite the fact that certain modifications such as cutouts for control devices may negate the NEMA rating.

C. On devices indicated to display dates, the year shall be displayed as 4 digits.

2.02 MOUNTING HARDWARE

A. Miscellaneous Hardware:
   1. Nuts, bolts, and washers shall be galvanized steel.
   2. Threaded rods for trapeze supports shall be continuous threaded, galvanized steel, 3/8" dia. minimum.
   3. Strut for mounting of conduits and equipment shall be galvanized steel. Where contact with concrete or dissimilar metals may cause galvanic corrosion, suitable non-metallic insulators shall be utilized to prevent such corrosion. Aluminum strut shall not be utilized for free standing support frames. Strut shall be as manufactured by Unistrut, B- Line, or equal.
   4. Anchors for attaching equipment to concrete walls, floors and ceilings shall be stainless steel expansion anchors, such as "Rawl-Bolt," "Rawl-Stud" or "Lok-Bolt" as manufactured by Rawl; similar by Star, or equal. Wood plugs shall not be permitted.
   5. Refer to Section 16070 – Hangers and Supports for additional details.

2.03 ELECTRICAL IDENTIFICATION

A. Nameplates: Nameplates shall be fabricated from white-letter, black-face laminated plastic engraving stock, Formica type ES-1, or equal. Each shall be fastened securely, using fasteners of brass, cadmium plated steel, or stainless steel, screwed into inserts or tapped holes as required. Engraved characters shall be block style with no characters smaller than 1/8" top to bottom.

B. Conductor and Equipment Identification: Conductor identification devices shall be either imprinted plastic-coated cloth marking devices such as manufactured by Brady, Thomas & Betts, or equal, or shall be heat-shrink plastic tubing, imprinted split-sleeve markers cemented in place, or equal.

PART 3 – EXECUTION

3.01 GENERAL

A. Incidentals: The Contractor shall provide all materials and incidentals required for a complete and operable system, even if not required explicitly by the Specifications or the drawings. Typical incidentals are terminal lugs not furnished with vendor supplied equipment, compression connectors for cables, splices, junction, terminal and underground pull boxes, and control wiring required by vendor furnished equipment to connect with other equipment indicated in the Contract Documents.

B. Field Control of Location and Arrangement: The drawings diagrammatically indicate the desired location and arrangement of outlets, conduit runs, equipment, and other items. Exact locations shall be determined by the Contractor in the field based on the physical size and arrangement of equipment, finished elevations, and other obstructions. Locations on the drawings, however, shall be followed as closely as possible.
   1. Where "home runs" are shown, the Contractor shall route the conduits in accordance with the indicated installation requirements. Routings shall be exposed or encased as indicated, except that conduit in finished areas shall be concealed unless specifically indicated otherwise. Conduits encased in a slab shall be sized for conduit OD to not exceed one-third of the slab thickness and be laid out and spaced to not impede concrete flow.
   2. Conduit and equipment shall be installed in such a manner as to avoid all obstructions and to preserve head room and keep openings and passageways clear. Lighting fixtures, switches, convenience outlets, and similar items shall be located within finished rooms as indicated. Where the drawings do not indicate exact locations, such locations shall be determined by the Engineer. If equipment is installed without instruction and must be moved, it shall be moved without additional cost to the Owner. Lighting fixture locations shall be adjusted slightly to avoid obstructions and to minimize shadows.
   3. Wherever conduits and wiring for power circuits, lighting and receptacles are not indicated, it shall be the Contractor's responsibility to provide required conduits and wiring, based on the actual installed fixture layout and the circuit designations as indicated. Wiring shall be #12 AWG minimum, conduits shall be 3/4" minimum (exposed) and 1" minimum (encased). When circuits are combined in the same raceway, the Contractor shall derate conductor ampacities in accordance with NEC requirements.

C. Workmanship: Materials and equipment shall be installed in strict accordance with printed recommendations of the manufacturer. Installation shall be accomplished by workers skilled in the work. Installation shall be coordinated in the field with other trades to avoid interferences.

D. Protection of Equipment and Materials: The Contractor shall fully protect materials and equipment against damage from any cause. Materials and equipment, both in storage and during construction, shall be covered in such a manner that no finished surfaces will be damaged, marred, or splattered with water, foam, plaster, or paint. Moving parts shall be kept clean and dry. The Contractor shall replace or refinish damaged materials or equipment, including faceplates of panels and switchboard sections as part of the work.

3.02 CORE DRILLING

A. The Contractor shall perform core drilling required for installation of raceways through concrete walls and floors. Locations of floor penetrations, as may be required, shall be based on field conditions. Verify all exact core drilling locations based on equipment

actually furnished as well as exact field placement. To the extent possible, identify the existence and locations of encased raceways and other piping in existing walls and floors with the Owner prior to any core drilling activities. Damage to any encased conduits, wiring, and piping shall be repaired as part of the work.

3.03 CONCRETE HOUSEKEEPING PADS

A. Concrete housekeeping pads shall be provided for indoor and outdoor floor standing electrical equipment. Housekeeping pads for equipment, including future units, shall be 4" above surrounding finished floor or grade and 2" larger in both dimensions than the equipment, unless otherwise indicated.

B. Concrete housekeeping curbs shall be provided for conduit stub-ups in indoor locations that are not concealed by equipment enclosures. Such curbing shall be 3" above finished floor or grade.

3.04 EQUIPMENT ANCHORING

A. Floor supported, wall, or ceiling hung equipment and conductors shall be anchored in place by methods that will meet seismic requirements in the area where the project is located. Wall-mounted panels that weigh more than 500 lbs. or that are within 18" of the floor shall be provided with fabricated steel support pedestals. If the supported equipment is a panel or cabinet enclosed within removable side plates, it shall match supported equipment in physical appearance and dimensions. Transformers hung from 4" stud walls and weighing more than 300 lbs. shall have auxiliary floor supports.

B. Leveling channels anchored to the concrete pad shall be provided for switchgear and pad-mounted transformer installations.

C. Anchoring methods and leveling criteria in the printed recommendations of the equipment manufacturers are a part of the work of this Contract. Such recommendations shall be submitted as shop drawings under Division 01.

3.05 EQUIPMENT IDENTIFICATION

A. Equipment and devices shall be identified as follows:
   1. Nameplates shall be provided for panel boards, control and instrumentation panels, starters, switches, and pushbutton stations. In addition to nameplates, control devices shall be equipped with standard collar-type legend plates.
   2. Control devices within enclosures shall be identified as indicated. Identification shall be similar to the subparagraph above.
   3. Toggle switches which control loads out of sight of switch and multi-switch locations of more than 2 switches shall have suitable inscribed finish plates.

4. Equipment names and tag numbers, where indicated on the drawings, shall be utilized on nameplates.
5. The Contractor shall furnish typewritten circuit directories for panel boards; circuit directory shall accurately reflect the outlets connected to each circuit.

3.06 CLEANING

A. Before final acceptance, the electrical work shall be thoroughly cleaned. Exposed parts shall be thoroughly cleaned of cement, plaster, and other materials. Oil and grease spots shall be removed with a non-flammable cleaning solvent. Such surfaces shall be carefully wiped and cracks and corners scraped out. Touch-up paint shall be applied to scratches on panels and cabinets. Electrical cabinets or enclosures shall be vacuum-cleaned.

END OF SECTION

SECTION 16070

HANGERS AND SUPPORTS

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PART 1 – GENERAL

1.01 THE REQUIREMENT

A. Conduit and equipment supports.

B. Anchors and fasteners.

1.02 REFERENCES

A. NECA - National Electrical Contractors Association.

B. ANSI/NFPA 70 - National Electrical Code.

1.03 REGULATORY REQUIREMENTS

A. Conform to requirements of ANSI/NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.04 CONTRACTOR SUBMITTALS

A. The Contractor shall submit shop drawings in accordance with Division 01 and Section 16050 - Electrical Requirements.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Materials and Finishes: Provide galvanized steel hangers, supports and anchors to provide complete corrosion resistance.

B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit.

C. Anchors and Fasteners:
   1. Concrete Structural Elements:
      a. Use steel or malleable iron concrete inserts set in place prior to placing new concrete.
      b. Use expansion anchors not less than 1/4” bolt size and not less than 1-1/8" embedment in existing concrete.
         1) Use power set fasteners not less than 1/4 inch diameter with depth of penetration not less than 3 inches in existing concrete.
         2) Use vibration and shock resistant anchors and fasteners for attaching to concrete ceilings.
            a) Steel Structural Elements: Use beam clamps or spring steel clips.
            b) Concrete Surfaces: Use self-drilling anchors or expansion anchors.
            c) Hollow Masonry, Plaster and Gypsum Board Partitions: Use toggle bolts and hollow wall fasteners.
            d) Solid Masonry Walls: Use expansion anchors.
            e) Sheet Metal: Use sheet metal screws.
            f) Wood Elements: Use wood screws.

2.02 MANUFACTURERS

A. Superstrut, Unistrut, B-line, or equal.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify all channels, fasteners, anchors and miscellaneous equipment are suitable for the application.

3.02 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".

C. Do not fasten supports to pipes, ducts, mechanical equipment and conduit.

D. Obtain permission from Engineer before using powder-actuated anchors.

E. Obtain permission from Engineer before drilling or cutting structural members.

END OF SECTION

SECTION 16110

ELECTRICAL RACEWAY SYSTEMS

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3.02 CONDUIT

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall provide electrical raceway systems, complete and in place, in accordance with the Contract Documents.

1.02 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with Division 01, and Section 16050 - Electrical Requirements.

B. Shop Drawings
   1. Complete catalog cuts of raceways, fittings, boxes, supports, and mounting hardware, marked where applicable to show proposed materials and finishes.
   2. Dimensioned layout drawings of cable tray routings, including elevations.

PART 2 – PRODUCTS

2.01 GENERAL

A. Pull and junction boxes, fittings, and other indicated enclosures that are dedicated to the raceway system shall comply with this section.

B. Electrical raceways and associated fittings shall be UL listed and approved for the intended installation.

2.02 CONDUIT

A. Rigid Galvanized Steel (RGS) Conduit:

1. Rigid steel conduit shall be mild steel, hot-dip galvanized inside and out.
2. Rigid steel conduit shall be manufactured in accordance with ANSI C80.1 - Rigid Steel Conduit, Zinc Coated, and UL-6.
3. Suitable for use as exposed conduit in outdoor applications.
4. Manufacturers, or equal.
    a. LTV Steel
    b. Triangle
c. Wheatland Tube

B. Rigid Non-Metallic Conduit:
1. Rigid non-metallic conduit shall be Schedule 40 pvc, sunlight resistant.
2. Rigid non-metallic conduit shall be manufactured in accordance with NEMA TC-2 - Electrical Plastic Tubing and Conduit, and UL-651 - Standard for Rigid Non-Metallic Conduit.
3. Suitable for use as underground direct bury conduit.
4. Manufacturers, or equal.
    a. Carlon
    b. Condux

C. Electrical Metallic Tubing
1. Hot-dipped galvanized metallic conduit, listed to UL 797, compliant to NEC articles 358.
2. Conduit shall be manufactured in accordance with ANSI C80.3.
3. Suitable for use as exposed conduit within Control Building.
4. Manufacturers, or equal.
    a. Allied
    b. Wheatland

2.03 FITTINGS AND BOXES

A. General:
1. Cast and malleable iron fittings for use with metallic conduit shall be the threaded type with 5 full threads.
2. Fittings and boxes shall have neoprene gaskets and non-magnetic stainless steel screws. Covers shall be attached by means of holes tapped into the body of the fitting. Covers for fittings attached by means of clips or clamps will not be acceptable.
3. Boxes larger than standard cast or malleable types shall be 304 stainless steel, NEMA 4X.
4. In outdoor areas, conduit shall be terminated in raintight hubs as manufactured by Myers, O.Z. Gedney, Appleton, or equal. In other than outdoor areas, sealed locknuts and bushings shall be used.

B. Malleable Iron Fittings and Boxes:

1. Fittings and boxes for use with galvanized steel conduit shall be of malleable iron or gray-iron alloy with zinc plating.
2. Manufacturers, or equal.
    a. O.Z. Gedney
    b. Crouse-Hinds
    c. Appleton

C. PVC Fittings and Boxes:
1. Fittings for use with rigid non-metallic conduit shall be pvc, solvent welded type.
2. Boxes shall be pvc or fiberglass reinforced polyester (FRP).
3. Manufacturers, or equal.
    a. Carlon
    b. Crouse-Hinds
    c. Hoffman
4. Provide welding solvent as required for installation of non-metallic conduit and fittings.

D. Stainless Steel Boxes:
1. Stainless steel boxes shall be used with pvc coated RGS conduit and where indicated.
2. Stainless steel boxes shall be NEMA 4X, Type 304.
3. Stainless steel shall be minimum 14-gauge thickness, with a brushed finish.
4. Doors shall have full length stainless steel piano hinges. Non-hinged boxes are not acceptable.
5. Manufacturers, or equal.
    a. Hoffman
    b. Rohn
    c. Hammond

2.04 CONDUIT SCHEDULE

A. Refer to Section 16050 for conduit system environmental requirements.

PART 3 – EXECUTION

3.01 GENERAL

A. Wiring shall be run in raceway unless indicated otherwise.

B. Raceways shall be installed between equipment as indicated. Raceway systems shall be electrically and mechanically complete before conductors are installed. Bends and offsets shall be smooth and symmetrical, and shall be accomplished with tools designed for this purpose. Factory elbows shall be utilized wherever possible.

C. Where raceway routings are indicated on plan views, follow those routings to the extent

possible; Conduits shall be concealed in walls unless indicated otherwise; do not conceal conduits inside concrete floors unless shown specifically on drawings or authorized by the Engineer.

D. Where raceways are indicated but routing is not indicated, such as home runs, raceway routings shall be the Contractor's choice and in strict accordance with the NEC and customary installation practice. Raceway shall be encased, exposed, concealed, or under floor as indicated; conduits in finished areas (offices, hallways etc.) shall be concealed unless specifically indicated otherwise.

E. Routings shall be adjusted to avoid obstructions. Coordinate between trades prior to installation of raceways. Lack of such coordination shall not be justification for extra compensation, and removal and re-installation to resolve conflicts shall be by the Contractor as part of the work.

F. Exposed raceways shall be installed parallel or perpendicular to structural beams.

G. Install expansion fittings with bonding jumpers wherever raceways cross building expansion joints.

H. Exposed raceways shall be installed at least 1/2" from walls or ceilings except that at locations above finished grade where damp conditions do not prevail, exposed raceways shall be installed 1/4" minimum from the face of walls or ceilings by the use of clamp backs or struts.

I. Wherever contact with concrete or dissimilar metals can produce galvanic corrosion of equipment, suitable insulating means shall be provided to prevent such corrosion.

3.02 CONDUIT

A. Exposed outdoor conduit shall be rigid galvanized steel.
   1. Where galvanized conduit has to be cut, the galvanized coating shall be repaired per manufacturer's instructions.

B. Conduit concealed or encased in concrete, except for analog control conduit which shall be PVC coated RGS, shall be rigid Schedule 40 PVC; exterior buried conduit can be rigid Schedule 40 PVC. Where conduit emerges from concrete encasement, a pvc coated RGS elbow shall be utilized for transition from the concrete. Conduit shall emerge from the concrete perpendicular to the surface whenever possible.

C. Exposed conduit shall be 3/4" minimum trade size. Encased conduit shall be 1" minimum trade size. Supports shall be installed at distances required by the NEC.

D. Conduit shall not be encased in the bottom floor slab below grade.

E. Concrete cover for conduit and fittings shall not be less than 1-1/2" for concrete exposed to earth or weather, or less than 3/4" for concrete not exposed to weather or in contact with the ground.

F. Conduits passing through a slab, wall, or beam shall not impair significantly the strength of the construction.

G. Conduits embedded within a slab, wall, or beam (other than those merely passing through) shall satisfy the following in accordance with NEC and ACI standards:
   1. Conduits with their fittings embedded within a column shall not displace more than 4% of the gross area of cross section.
   2. Conduits shall not be larger in outside dimension than one third the overall thickness of slab, wall, or beam in which embedded.
   3. Conduits shall not be spaced closer than 3 outside diameters on centers.
   4. Install embedded conduits in middle 1/3 of concrete slab.

H. Conduit shall be placed so that cutting, bending, or displacing reinforcement from its proper location will not be required.

I. Threads shall be coated with a conductive lubricant before assembly.

J. Joints shall be tight, thoroughly grounded, secure, and free of obstructions in the pipe. Conduit shall be adequately reamed to prevent damage to the wires and cables inside. Strap wrenches and vises shall be used to install conduit to prevent wrench marks on conduit. Conduit with wrench marks shall be replaced.

K. Wherever possible, conduit runs shall slope to drain at one or both ends of run. Wherever conduit enters substructures below grade, the conduit shall be sloped to drain water away from the structure. Extreme care shall be taken to avoid pockets or depressions in conduit.

L. Installation of rigid steel conduit though a core-drilled hole in an exterior wall below grade shall utilize a sealing device as manufactured by Link Seal or equal.

M. Connections to lay-in type grid lighting fixtures shall be made using flexible metal conduit not exceeding 4' in length. Connections to motors and other equipment subject to vibration shall be made with liquid-tight flexible conduit not exceeding 3' in length. Equipment subject to vibration that is normally provided with wiring leads shall be provided with a cast junction box for the make-up of connections.

N. Conduit passing through walls or floors shall have plastic sleeves.

O. Conduit, fittings, and boxes required in hazardous classified areas shall be suitably rated

for the area and shall be provided in strict accordance with NEC requirements.

P. Empty conduits shall be tagged at both ends to indicate the final destination. Where it is not possible to tag the conduit, destination shall be identified by a durable marking on an adjacent surface. A pull-cord shall also be installed in each empty conduit. This shall apply to conduits in floors, panels, manholes, equipment, etc.

Q. Where conduit emerges from direct burial, a rigid conduit elbow shall be utilized below grade for transition to rigid conduit. Conduit shall emerge from the ground perpendicular to the surface whenever possible.

END OF SECTION

SECTION 16120

WIRES AND CABLES

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PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall provide wires and cable, complete and operable, in accordance with the Contract Documents.

1.02 CONTRACTOR SUBMITTALS

A. The Contractor shall submit shop drawings in accordance with Division 01 and Section 16050 - Electrical Requirements.

PART 2 – PRODUCTS

2.01 GENERAL

A. Conductors, include grounding conductors, shall be copper. Aluminum conductor wire and cable will not be permitted. Insulation shall bear UL label, the manufacturer's trademark, and identify the type, voltage, and conductor size. All conductors except flexible cords and cables, fixture wires, and conductors that form an integral part of equipment such as motors and controllers shall conform to the requirements of Article 310 of the National Electric Code, latest edition, for current carrying capacity. Flexible cords and cables shall conform to Article 400, and fixture wires shall conform to Article 402. Wiring shall have wire markers at each end.

2.02 POWER AND LIGHTING WIRE

A. Wire rated for 600 volts in duct or conduit for all power and lighting circuits shall be Class B Type XHHW cross-linked polyethylene conforming to UL-44 - UL Standard for Thermoset-Insulated Wires and Cables. THHN/THWN for all wires smaller than or equal to No. 4 AWG; XHHW insulation for all wires larger than No. 4 AWG.

B. Conductors for feeders as defined in Article 100 of the NEC shall be sized to prevent a voltage drop exceeding 3% at the farthest outlet of power, heating, and lighting loads, or combinations of such loads, and where the maximum total voltage drop on both feeders and branch circuits to the farthest connected load does not exceed 5%.

C. Conductors for branch circuits as defined in Article 100 of the NEC, shall be sized to prevent voltage drop exceeding 3% at the farthest connected load or combinations of such loads and where the maximum total voltage drop on both feeders and branch circuits to the farthest connected load does not exceed 5%.

D. Wiring for 600 volt class power and lighting shall be as manufactured by General Cable, Okonite, or Rome Cable.

2.03 CONTROL WIRE

A. Control wire in duct or conduit shall be the same type as power and lighting wire indicated above.

B. Control wiring shall be No.14 AWG.

C. Control wires at panels and cabinets shall be machine tool grade type MTW, UL approved, rated for 90 C. at dry locations, and be as manufactured by American, Carol Cable, or equal.

2.04 INSTRUMENTATION CABLE

A. Instrumentation cable shall be rated at 300 volts.

B. Instrumentation cables shall be composed of two 18 gauge stranded tinned copper conductors, 0.19” thick polyethylene insulation, an aluminum polyester foil outer shield, a No. 20 AWG stranded tinned copper drain wire, and a pvc outer jacket with a thickness of 0.028".

C. Manufacturer and model number: Belden 8760, or equal.

2.05 RS-485 CABLE

A. The cables shall be multi-twisted pairs with a common overall shield cable designed for use as low capacitance computer cable for EIA RS-485 applications.

B. Cable shall be a molded cable assembly with connector on one and capped cable on one end where required by equipment supplier.

C. Conductors:
   1. 22 AWG, seven-strand.
   2. Tinned copper, insulated, twisted pairs.
   3. Cable Shield: Overall aluminum-polyester shield.
   4. 24 AWG stranded, tinned copper drain wire.
   5. Overall tinned copper braid shield, 90% coverage.
   6. Jacket: PVC.
   7. Insulation: 300V Polyolefin.
   8. Number of Pairs: 2, or as required by the application.
   9. Outside Diameter: 0.424 inches, maximum.
   10. Belden Color Code: Chart No. 5.

D. Connectors:
   1. Type: Factory molded D-Subminiature (one end only where required).
   2. Positions (Number of Pins): Coordinate connector pin requirements with equipment supplier.
   3. Cable Pin-out: Coordinate requirements with equipment supplier.
   4. Gender: Coordinate requirements with equipment supplier.
   5. Retention System: Screw, horizontal slide lock or vertical slide lock; coordinate requirements with equipment supplier.
   6. Connector Style: Straight handled, right-angled or angled; coordinate requirements with equipment supplier.

E. RS-485 cable shall be Belden Part No. 3107A, or equal, or as required by the application.

2.06 ETHERNET DATA CABLE

A. Communication Cable
   1. Category 6 cable conforming to ANSI TIA/EIA-568-B.2-2001.
   2. Shielded with stranded conductors.
   3. 4 pair, 23 AWG; capable of transmitting data up to 1000 MBPS.
   4. Heavy duty oil and sunlight resistant PVC jacket with sequential markings at 2’ interval; NEC rated and UL listed.
   5. Belden or equal.

2.07 CABLE TERMINATIONS

A. Compression connectors shall be Burndy "Hi Lug", Thomas & Betts "Sta-Kon,", or equal. Threaded connectors shall be split bolt type of high strength copper alloy. Pressure type, twist-on connectors will not be acceptable.

B. Pre-insulated fork tongue lugs shall be Thomas & Betts, Burndy, or equal.

C. General purpose insulating tape shall be Scotch No. 33, Plymouth "Slip-knot", or equal. High temperature tape shall be polyvinyl as manufactured by Plymouth, 3M, or equal.

D. Labels for coding 600 volt wiring shall be computer printable or pre-printed, self-laminating, self-sticking, as manufactured by W.H. Brady, 3M, or equal.

PART 3 – EXECUTION

3.01 GENERAL

A. The Contractor shall provide and terminate all conductors except where indicated.

3.02 INSTALLATION

A. Conductors shall not be pulled into raceway until raceway has been cleared of moisture and debris.

B. Pulling tensions on raceway cables shall be within the limits recommended by the cable manufacturer. Wire pulling lubricant, where needed, shall be UL approved.

C. Instrumentation, telephone and RS-485 cables shall not be run in the same raceway with power and control wiring except where specifically indicated.

D. Wire in panels, cabinets, and wire ways shall be neatly grouped using nylon tie straps, and shall be fanned out to terminals.

3.03 SPLICES AND TERMINATIONS

A. General:
   1. Wire taps and splices shall be properly taped and insulated according to their respective classes.
   2. In general, there shall be no cable splices in underground manholes or pull boxes. If splices are necessary, the cables shall be brought aboveground and terminated in a NEMA 4X, stainless steel terminal or splice cabinet on a concrete pad. Splices in underground manholes and pull boxes may be made only with the approval of the Engineer.

3. Stranded conductors shall be terminated directly on equipment box lugs making sure that all conductor strands are confined within lug. Use forked-tongue lugs where equipment box lugs have not been provided.
4. Excess control and instrumentation wire shall be properly taped and terminated as spares.

B. Control Wire and Cable:
1. Control conductors shall be spliced or terminated only at the locations indicated and only on terminal strips or terminal lugs of vendor furnished equipment.
2. In junction boxes, motor control centers, and control panels, control wire and spare wire shall be terminated to terminal strips.

C. Instrumentation Wire and Cable:
1. Shielded instrumentation cables shall be grounded at one end only, preferably the receiving end on a 4-20 mA system.
2. Two- and three-conductor shielded cables installed in conduit runs which exceed available standard cable lengths may be spliced in pull boxes. Such cable runs shall have only one splice per conductor.

D. Power Wire and Cable:
1. All 120/208-volt, 120/240-volt, and 480/277-volt branch circuit conductors may be spliced in suitable fittings at locations determined by the Contractor.
2. Splices to motor leads in motor terminal boxes shall be wrapped with mastic material to form a mold and then shall be taped with a minimum of 2 layers of varnished cambric tape overtaped with a minimum of 2 layers of high temperature tape.

3.04 CABLE IDENTIFICATION

A. General: Wires and cables shall be identified for proper control of circuits and equipment and to reduce maintenance effort. Identification shall appear within 3" of conductor terminals and at each pull or junction box.

B. Identification Numbers: The Contractor shall assign to each control and instrumentation wire and cable a unique identification number. Numbers shall be assigned to all conductors having common terminals and shall be shown on "as built" drawings. "Control Conductor" shall be defined as any conductor used for alarm, annunciator, or signal purposes.
1. Multiconductor cable shall be assigned a number which shall be attached to the cable at intermediate pull boxes and at stub-up locations beneath free-standing equipment. It is expected that the cable number shall form a part of the individual wire number. Individual control conductors and instrumentation cable shall be identified at pull points as described above. The instrumentation cable numbers shall incorporate the loop numbers assigned in the Contract Documents.

2. All 120/208-volt conductors shall be color coded as follows: Phase A - black, Phase B - red, Phase C - blue, and Neutral - white.
3. All 120/240-volt system conductors shall be color coded as follows: Line 1 - Black, Line 2 - Red, and Neutral - White.
4. All 480/277- volt system conductors shall be color coded as follows: Phase A - Brown, Phase B - Orange, Phase C - Yellow, and Neutral - Gray.
5. Color coding tape shall be used where colored insulation is not available. Branch circuit switch shall be yellow. Insulated ground wire shall be green, and neutral shall be gray. Color coding and phasing shall be consistent throughout the Site, but bars at panelboards, switchboards, and motor control centers shall be connected Phase A-B-C, top to bottom, or left to right, facing connecting lugs.
6. General purpose AC control cables shall be red. General purpose DC control cables shall be blue.
7. Spare cable shall be terminated on terminal screws and shall be identified with a unique number as well as with destination.
8. Terminal strips shall be identified by computer printable, cloth, self-sticking marker strips attached under the terminal strip.

3.05 TESTING

A. Cable Assembly and Testing: Cable assembly and testing shall comply with applicable requirements of ICEA Publication No. S-68-516 - Ethylene-Propylene-Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy. Factory test results shall be submitted with the shop drawings. The following field tests shall be the minimum requirements:
   1. Power cable rated at 600 volts shall be tested for insulation resistance between phases and from each phase to a ground using a megohmeter.
   2. Field testing shall be done after cables are installed in the raceways.
   3. Field tests shall be performed by a certified test organization acceptable to the cable manufacturer. Test results shall be submitted to the Engineer for review and acceptance.
   4. Cables failing the tests shall be replaced with a new cable or be repaired. Repair methods shall be as recommended by the cable manufacturer and shall be performed by persons certified by the industry.

B. Continuity Test: Control and instrumentation cables shall be tested for continuity, polarity, undesirable ground, and origination. Such tests shall be performed after installation and prior to placing cables in service.

END OF SECTION

SECTION 16450

GROUNDING

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3.01 GROUNDING

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall provide the electrical grounding system, complete and operable, in accordance with the Contract Documents.

B. The requirements of Section 16050 - Electrical Requirements apply to this section.

C. Single Manufacturer: Like products shall be the end product of one manufacturer in order to achieve standardization of appearance, operation, maintenance, spare parts and manufacturer's services.

1.02 CONTRACTOR SUBMITTALS

A. Furnish submittals in accordance with Section 01300 - Submittals and Section 16050 - Electrical Requirements.

B. Shop Drawings: Manufacturer's product information for connections, clamps, and grounding system components, showing compliance with the requirements of this section.

PART 2 – PRODUCTS

2.01 GENERAL

A. Components of the grounding electrode system shall be manufactured in accordance with ANSI/UL 467 - Standard for Safety Grounding and Bonding Equipment, and shall conform to the applicable requirements of National Electrical Code Article 250 and local codes.

2.02 GROUNDING SYSTEM

A. Grounding loop conductors shall be bare annealed copper conductors suitable for direct burial. Conductors shall be No. 4/0 unless indicated otherwise.

B. Ground Rods:
   1. Unless indicated otherwise, the ground rod shall be a minimum of 3/4" in diameter, 10' long, and have a uniform covering of electrolytic copper metallically bonded to a rigid steel core. The copper to steel bond shall be corrosion resistant.
   2. Conform to ANSI/UL 467.
   3. Sectional type joined by threaded copper alloy couplings.

C. Buried cable-to-cable and cable-to-ground rod connections shall be made using exothermic welds by Cadweld, Enrico Products, or equal.

D. Exposed grounding connectors shall be of the compression type (connector to cable), made of high copper alloy, and be manufactured specifically for the particular grounding application. The connectors shall be Burndy, O.Z. Gedney, or equal.

E. Grounding clamps shall be used to bond each separately derived system to the grounding electrode conductors.

F. Equipment Grounding Circuit Conductors:
   1. These conductors shall be the same type and insulation as the load circuit conductors. The minimum size shall be as outlined in Table 250.122 of the National Electrical Code, unless indicated otherwise.
   2. Metallic conduit systems shall have equipment grounding wires as well as being equipment grounding conductors themselves.

G. Manufacturers of grounding materials shall be Copperweld, Blackburn, Burndy, or equal.

PART 3 – EXECUTION

3.01 GROUNDING

A. Provide a separate grounding conductor, securely grounded in each raceway independent of raceway material.

B. Provide a separate grounding conductor for each motor and connect at motor box. Do not use bolts securing motor box to frame or cover for grounding connectors.

C. Size as given on the conduit schedule and in accordance with the NEC-Article 250.

D. Route conductors inside raceway.

E. Provide a grounding type bushing for secondary feeder conduits which originate from the secondary section of each MCC section, switchboard, or panelboard.

F. Individually bond these raceways to the ground bus in the secondary section.

G. Provide a green insulated wire as grounding jumper from the ground screw to a box grounding screw and, for grounding type devices, to equipment grounding conductor.

H. Provide a separate grounding conductor in each individual raceway for parallel feeders.

I. Interconnect the secondary switchgear neutral bus to the ground bus in the secondary switchgear compartment only at service entrance point or after a transformer.

J. Bond cold water pipe system and building structure to separate grounding electrode per NEC.

K. Measure ground impedance in accordance with IEEE STD 81 after installation but before connecting the electrode to the remaining grounding system.

L. Low Voltage Grounded System (600V or less): A low voltage grounded system is a system where the local power supply is a transformer with the transformer secondary grounded.
   1. Grounding system connections for a premises wired system supplied by a grounded AC service shall have a grounding electrode connector connected to the grounded service conductor at each service, in accordance with the NEC.
   2. The grounded circuit conductor shall not be used for grounding non-current carrying parts of equipment, raceways, and other enclosures except where specifically listed and permitted by the NEC.

M. Embedded Ground Connections:
   1. Underground and grounding connections embedded in concrete shall be UL listed compression type ground grid connectors.
   2. The connection shall be made in accordance with the manufacturer's instructions.
   3. The Contractor shall not conceal or cover any ground connections until the Engineer or authorized representative has established that every grounding connection conforms to the Contract Documents and has given the Contractor written confirmation.

N. Ground Ring:
   1. Furnish trenching and materials necessary to install the ground ring as indicated.
   2. Bonding conductor shall be in direct contact with the earth and be of the size indicated.
   3. Minimum burial depth 36" or as indicated on the drawings, whichever is greater.
   4. Re-compact disturbed soils to original density in 6" layers.

P. Ground Rods:
   1. Locations shall be as indicated.
   2. Rods forming an individual ground array shall be equal in length.

Q. Shield Grounding:
   1. Shielded instrumentation cable shall have its shield grounded at one end only unless shop drawings indicate the shield will be grounded at both ends.
   2. The grounding point shall be at the control panel or otherwise at the receiving end of the signal carried by the cable.
   3. Termination of shield drain wire shall be on its own terminal screw.
   4. Terminal screws shall be jumpered together using manufactured terminal block jumpers.
   5. Connection to the ground bus shall be via a green No. 12 conductor to the main ground bus for the panel.

END OF SECTION

SECTION 16485

MISCELLANEOUS ELECTRICAL DEVICES

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3.01 INSTALLATION

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. The Contractor shall provide miscellaneous electrical equipment as indicated herein or in other sections of the Specifications.

B. All the equipment listed herein may not have been used on this project; refer to plans for type of equipment, locations and other details.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Miscellaneous electrical devices shall comply with the requirements of NEC, NEMA, and UL.

1.03 CONTRACTOR SUBMITTALS

A. Furnish shop drawings in accordance with Section 01300 - Submittals and Section 16050 - Electrical Requirements.
   1. Ladder diagrams and written descriptions explaining ladder diagram operation and system operation for local control stations.
   2. Include catalog cuts of all equipment including enclosures, overcurrent devices, relays, pilot devices, terminations, and wire troughs, etc.

PART 2 – PRODUCTS

2.01 CONTROL ENCLOSURES AND JUNCTION BOXES

A. Control Enclosures:

1. In finished rooms, enclosures shall be NEMA 12 steel enclosures painted with ANSI 61 exterior and white interior.
2. In all other non-hazardous areas and exterior mounted, enclosures shall be NEMA 4X stainless steel (prior to modifications) with brushed finish. Where possible, penetrations shall be made in such a manner to maintain the NEMA 4X rating. If this is not possible, the penetrations shall be made in such a manner to minimize entry of foreign materials into the enclosure.
3. Enclosures shall be freestanding, pedestal-mounted, or equipment skid-mounted, as indicated. Internal control components shall be mounted on a removable mounting pan. Mounting pan shall be finished white.
4. When required to maintain controlled temperature inside enclosure, outdoor mounted enclosures shall be provided with thermostatically-controlled heaters; insulate control panels when heaters are provided.
5. Provide screened weep holes for draining condensation.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Install miscellaneous electrical devices specified herein in accordance with Section 16050 and in accordance with the manufacturer's recommendations. All equipment specified herein may not have been used on the project. Refer to drawings for equipment used on this project.

B Conduit, conductors, and terminations shall be installed in accordance with Section 16050.

END OF SECTION

SECTION 16620

STANDBY GENERATOR

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PART 1 – GENERAL

1.01 SCOPE

A. Provide complete factory assembled one 480 voltage generator set with digital (microprocessor-based) electronic generator set controls, digital governors, and digital voltage regulators.

B. Provide factory test, startup by a supplier authorized by the equipment manufacturer(s), and on-site testing of the system.

C. The generator set manufacturer shall warrant all equipment provided under this section, whether or not it is manufactured by the generator set manufacturer, so that there is one source for warranty and product service. Technicians specifically trained and certified by the manufacturer to support the product and employed by the generator set supplier shall service the generator sets.

1.02 CODES AND STANDARDS

A. The generator set installation and on-site testing shall conform to the requirements of the following codes and standards, as applicable. The generator set shall include necessary features to meet the requirements of these standards.

1. CSA 282, 1989 Emergency Electrical Power Supply for Buildings.
2. IEEE446 – Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
3. NFPA37 – Installation and Use of Stationary Combustion Engines.
4. NFPA70 – National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
5. NFPA99 – Essential Electrical Systems for Health Care Facilities.
6. NFPA110 – Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1prototype tests required by this standard shall have been performed on a complete and functional unit, component level type tests will not substitute for this requirement.

B. The generator set and supplied accessories shall meet the requirements of the following standards:
   1. NEMA MG1. Alternator shall comply with the requirements of the current version this standard as they apply to AC alternators.
   2. UL1236 – Battery Chargers.
   3. UL2200. The generator set shall be listed to UL2200 or submit to an independent third party certification process to verify compliance as installed.

C. The control system for the generator set shall comply with the following requirements.
   1. CSA C22.2, No. 14 – M91 Industrial Control Equipment.
   2. EN50082-2, Electromagnetic Compatibility – Generic Immunity Requirements, Part 2: Industrial.
   3. EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
   4. FCC Part 15, Subpart B.
   5. IEC8528 part 4. Control Systems for Generator Sets.
   6. IEC Std 801.2, 801.3, and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions.
   7. UL508. The entire control system of the generator set shall be UL508 listed and labeled.

D. The generator set manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

1.03 SUBMITTALS

A. Furnish submittals in accordance with Division 01.

B. Shop Drawings
   1. Detailed, dimensioned shop drawings and data demonstrating adherence to the requirements of these specifications shall be submitted and approved before fabrication, shipment, or other work under this section begins.
   2. Certified custom drawings and custom wiring diagrams of each component in the system and a master wiring diagram showing the entire system on one sheet. This diagram shall include all AC and DC power control connections between the generator, engine, fuel tank system, batteries, and circuit breakers and shall be a custom drawing for this specific installation. A master drawing of the engine/generator set shall also be provided, showing general dimensions, bill of materials, location and size of all connections for fuel, cooling, exhaust, direct current connections, conduit locations, and connections for control and power wiring. Include wire and terminal numbers for all diagrams. Furnish KW output curves, fuel consumption curves, and certified air emission data sheets.
   3. Outline drawings and connection diagrams shall be complete enough to enable the installation to be designed completely, and connection diagrams shall give both internal and external connections. Include foundation loading and clearances.
   4. Certified emission data.
   5. Six copies of complete and detailed instructions for the operation, lubrication, and maintenance of equipment in the system. The manuals shall be furnished after final approval of Shop and working drawings but prior to shipment of equipment. Manuals shall be complete with wiring diagrams, lubrication schedules and recommended lubricants, drawings, cuts, parts lists, and other necessary data. All parts shall be numbered or otherwise clearly identified to facilitate ordering of replacements. Descriptions of all operational control devices and their functions shall also be included.

1.04 ACCEPTABLE MANUFACTURERS

A. Manufacturers: Cummins/Onan, Caterpillar, Kohler, Generac.

B. Equipment specifications for this project are based on microprocessor-based generator sets manufactured by Cummins Power Generation.

C. Complete compliance with specifications is required.

PART 2 – PRODUCTS

2.01 GENERATOR SET

A. Ratings
   1. Generator set shall operate at 1800 rpm and at a voltage of: 480 Volts AC, three phase, 4-wire, 60 hertz.

2. Generator set shall be rated at 60 kW, 75 kVA at 0.8 PF, standby rating, based on site conditions of: Altitude 1000 ft. and ambient temperatures up to 104°F.
3. The generator set rating shall be based on emergency/standby service.

B. Performance
1. Voltage regulation shall be plus or minus 0.5% for any constant load between no load and rated load for both parallel and non-parallel applications. Random voltage variation with any steady load from no load to full load shall not exceed plus or minus 0.5%.
2. Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.25%.
3. The engine-generator set shall be capable of single step load pick up of 100% nameplate kW and power factor, less applicable derating factors, with the engine-generator set at operating temperature.
4. Motor starting capability shall be a minimum of 171 kVA. The generator set shall be capable of sustaining a minimum of 90% of rated no load voltage with the specified kVA load at near zero power factor applied to the generator set.
5. The alternator shall produce a clean AC voltage waveform, with not more than 5% total harmonic distortion at full linear load, when measured from line to neutral, and with not more than 3% in any single harmonic, and no 3rd order harmonics or their multiples. Telephone influence factor shall be less than 40.
6. The generator set shall be certified by the engine manufacturer to be suitable for use at the installed location and rating, and shall meet all applicable exhaust emission requirements at the time of commissioning.
7. The generator set shall share real and reactive load proportionally within plus or minus 3% with all other generator sets in the system.
8. The time required to automatically start, accelerate to rated speed and voltage, synchronize and parallel all generator sets to the system bus on a normal power failure shall not exceed 15 seconds, assuming that the generator sets are in an ambient temperature of 40°F or greater, and water jacket heaters are operating properly.

C. Construction
1. The engine-generator set shall be mounted on a heavy-duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails.
2. All switches, lamps, and meters in the control system shall be oil-tight and dust-tight. There shall be no exposed points in the control (with the door open) that operate in excess of 50 volts.

D. Connections
   1. The generator set load connections shall be composed of silver or tin plated copper bus bars, drilled to accept mechanical or compression terminations of the number and type as shown on the drawings. Sufficient lug space shall be provided for use with cables of the number and size as shown on the drawings.
   2. Power connections to auxiliary devices shall be made at the devices, with required protection located at a wall-mounted common distribution panel.
   3. Generator set control interfaces to other system components shall be made on a common, permanently labeled terminal block assembly.

2.02 ENGINE AND ENGINE EQUIPMENT

A. The engine shall be liquid propane fueled, 4 cycle, radiator and fan cooled. Minimum displacement shall be 275 cubic inches, with inline 4 cylinders. The horsepower rating of the engine at its minimum tolerance level shall be sufficient to drive the alternator and all connected accessories. Two cycle engines are not acceptable.

B. An electronic governor system shall provide automatic isochronous frequency regulation. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The control system shall actively control the fuel rate and excitation as appropriate to the state of the generator set. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, accelerating to rated speed, and operating in various isochronous or parallel states.

C. Skid-mounted radiator and cooling system rated for full load operation in 104°F. (40°C.) ambient as measured at the generator air inlet, based on 0.5 in H_2O external static head. Radiator shall be sized based on a core temperature which is 20°F higher than the rated operation temperature, or prototype tested to verify cooling performance of the engine/radiator/fan operation in a controlled environment. Radiator shall be provided with a duct adapter flange. The cooling system shall be filled with a 50/50-ethylene glycol/water mixture by the equipment manufacturer. Rotating parts shall be guarded against accidental contact.

D. Electric starter(s) capable of three complete cranking cycles without overheating.

E. Positive displacement, mechanical, full pressure, lubrication oil pump.

F. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicator.

G. A gaseous fuel train, suitable for operation of the generator set at full rated load in the ambient temperature specified shall be provided if required for operation due to the design of the engine and the installation. Generator assembly shall accept liquid propane and provide for onboard vaporization or fuel.

H. Replaceable dry element air cleaner with restriction indicator.

I. Flexible fuel lines.

J. Engine mounted battery charging alternator, 40-amp. minimum, and solid-state voltage regulator.

K. Coolant Heater
   1. Engine mounted, thermostatically controlled, coolant heater. Heater voltage shall be 120 volt/1 phase. The coolant heater shall be UL499 listed and labeled; heater shall be factory wired to control panel (furnished and installed by manufacturer).
   2. The coolant heater shall be installed on the engine with high temperature silicone hose connections. Steel tubing shall be used for connections into the engine coolant system wherever the length of pipe run exceeds 12". The coolant heater installation shall be specifically designed to provide proper venting of the system. The coolant heaters shall be installed using quick disconnect couplers to isolate the heater for replacement of the heater element. The quick disconnect/automatic sealing couplers shall allow the heater element to be replaced without draining the engine cooling system or significant coolant loss.
   3. The coolant heater shall be provided with a 24VDC thermostat, installed at the engine thermostat housing. An AC power connection box shall be provided for a single AC power connection to the coolant heater system.
   4. The coolant heater(s) shall be sized as recommended by the engine manufacturer to warm the engine to a minimum of 100°F. (40°C.) in a 40°F. ambient, in compliance with NFPA110 requirements, or the temperature required for starting and load pickup requirements of this specification.

L. Provide vibration isolators, spring/pad type, quantity as recommended by the generator set manufacturer. Isolators shall include seismic restraints if required by site location.

M. Starting and Control Batteries shall be calcium/lead antimony type, 24 volt DC, sized as recommended by the engine manufacturer, complete with battery cables and connectors.

N. Provide an engine exhaust silencer of size and type as recommended by the generator set manufacturer and approved by the engine manufacturer. The mufflers shall be critical grade. Exhaust system shall be installed inside the genset enclosure according to the engine manufacturer's recommendations and applicable codes and standards.

O. A UL listed/CSA certified 10 amp. voltage regulated battery charger shall be provided for each engine-generator set. The charger will be wall mounted inside the sound attenuated genset enclosure. Input AC voltage shall be 120 VAC and DC output voltage shall be 24 VDC. Chargers shall be equipped with float, taper and equalize charge settings. Operational monitors shall provide visual output along with individual form C contacts rated at 4 amps, 120 FAC, 30VDC for remote indication of:
   1. Loss of AC power - red light.
   2. Low battery voltage - red light.
   3. High Battery voltage - red light.
   4. Power ON - green light (no relay contact).
   5. Charger shall include an Analog DC voltmeter and ammeter, 12 hour equalize charge timer, and AC and DC fuses.

2.03 AC GENERATOR

A. The AC alternator shall be synchronous, four pole, 2/3 pitch, revolving field, drip-proof construction, single pre-lubricated re-greasable bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc. All insulation system components shall meet NEMA MG1 temperature limits for Class F insulation system. Actual temperature rise measured by resistance method at full load shall not exceed 105°Centigrade.

B. The alternator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage not more than 5% above or below rated voltage.

C. A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to a single phase or three phase fault at approximately 300% of rated current for not more than 10 seconds.

D. Provide two embedded resistance temperature detectors per phase and temperature indication equipment. The control system shall annunciate high alternator temperature as a fault condition.

E. Provide anti-condensation heater for the alternator.

F. The subtransient reactance of the alternator shall not exceed 12%, based on the standby rating of the generator set.

G. The alternator shall be capable of operation with at least 0.15 per unit reverse kVAR.

2.04 GENERATOR SET CONTROL

A. Generator Set Control. The generator set shall be provided with a microprocessor-based control system that is designed to provide automatic starting, monitoring, and control functions for the generator set. The control system shall also be designed to allow local monitoring and control of the generator set, and remote monitoring and control as described in this specification.
   1. The control shall be mounted on the generator set. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered.
   2. The generator set mounted control shall include the following features and functions:

B. Control Switches
   1. Mode Select Switch. The mode select switch shall initiate the following control modes. When in the RUN or Manual position the generator set shall start, and accelerate to rated speed and voltage as directed by the operator. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.
   2. EMERGENCY STOP switch. Switch shall be Red "mushroom-head" push-button. Depressing the emergency stop switch shall cause the generator set to immediately shut down, and be locked out from automatic restarting.
   3. RESET switch. The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.
   4. PANEL LAMP switch. Depressing the panel lamp switch shall cause the entire panel to be lighted with DC control power. The panel lamps shall automatically be switched off 10 minutes after the switch is depressed, or after the switch is depressed a second time.

C. Generator Set AC Output Metering. The generator set shall be provided with a metering set including the following features and functions:
   1. Analog voltmeter, ammeter, frequency meter, and kilowatt (KW) meter. Voltmeter and ammeter shall display all three phases. Ammeter and KW meter scales shall be color coded in the following fashion: readings from 0-90% of generator set standby rating: green; readings from 90-100% of standby rating: amber; readings in excess of 100%: red.
   2. Digital metering set, 1% accuracy, to indicate generator RMS voltage and current, frequency, output current, output KW, KW-hours, and power factor. Generator output voltage shall be available in line-to-line and line-to-neutral voltages, and shall display all three phase voltages (line to neutral or line to line) simultaneously.

3. Both analog and digital metering are required. The analog and digital metering equipment shall be driven by a single microprocessor, to provide consistent readings and performance.

D. Generator Set Alarm and Status Display.
   1. The generator set shall be provided with alarm and status indicating lamps to indicate non-automatic generator status, and existing warning and shutdown conditions. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright room lighting conditions. The generator set control shall indicate the existence of the following alarm and shutdown conditions on an alphanumeric digital display panel:
      a. low oil pressure (alarm)
      b. low oil pressure (shutdown)
      c. oil pressure sender failure (alarm)
      d. low coolant temperature (alarm)
      e. high coolant temperature (alarm)
      f. high coolant temperature (shutdown)
      g. engine temperature sender failure (alarm)
      h. low coolant level (alarm or shutdown--selectable)
      i. fail to crank (shutdown)
      j. fail to start/overcrank (shutdown)
      k. overspeed (shutdown)
      l. low DC voltage (alarm)
      m. high DC voltage (alarm)
      n. weak battery (alarm)
      o. low fuel-daytank (alarm)
      p. high AC voltage (shutdown)
      q. low AC voltage (shutdown)
      r. under frequency (shutdown)
      s. over current (warning)
      t. over current (shutdown)
      u. short circuit (shutdown)
      v. ground fault (alarm)
      w. over load (alarm)
      x. emergency stop (shutdown)
   2. In addition, the control shall display all warning and shutdown messages produced by the electronic engine control module, if used.
   3. Provisions shall be made for indication of four customer-specified alarm or shutdown conditions. Labeling of the customer-specified alarm or shutdown conditions shall be of the same type and quality as the above specified conditions. The non-automatic indicating lamp shall be red, and shall flash to indicate that the generator set is not able to automatically respond to a command to start from a remote location.

E. Engine Status Monitoring.
   1. The following information shall be available from a digital status panel on the generator set control:
      a. engine oil pressure (psi or kPA)
      b. engine coolant temperature (degrees F. or C.)
      c. engine oil temperature (degrees F. or C.)
      d. engine speed (rpm)
      e. number of hours of operation (hours)
      f. number of start attempts
      g. battery voltage (DC volts)
   2. The control system shall also incorporate a data logging and display provision to allow logging of the last 10 warning or shutdown indications on the generator set, as well as total time of operation at various loads, as a percent of the standby rating of the generator set.

F. Engine Control Functions.
   1. The control system provided shall include a cycle cranking system, which allows for user selected crank time, rest time, and # of cycles. Initial settings shall be for 3 cranking periods of 15 seconds each, with 15-second rest period between cranking periods.
   2. The control system shall include an idle mode control, which allows the engine to run in idle mode in the RUN position only. In this mode, the alternator excitation system shall be disabled.
   3. The control system shall include an engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification. The governor control shall include adjustments for gain, damping, and a ramping function to control engine speed and limit exhaust smoke while the unit is starting. The governor control shall be suitable for use in paralleling applications without component changes.
   4. The control system shall include time delay start (adjustable 0-300 seconds) and time delay stop (adjustable 0-600 seconds) functions.
   5. The control system shall include sender failure monitoring logic for speed sensing, oil pressure, and engine temperature which is capable of discriminating between failed sender or wiring components, and an actual failure conditions.
   6. The control system shall include all interfaces necessary for proper operation with the paralleling equipment provided under this contract. The generator set supplier shall be responsible for complete compliance to all specification requirements for both the generator set and the paralleling equipment.

G. Alternator Control Functions:
   1. The generator set shall include an automatic digital voltage regulation system that is matched and prototype tested by the engine manufacturer with the governing

system provided. It shall be immune from mis-operation due to load-induced voltage waveform distortion and provide a pulse width modulated output to the alternator exciter. The voltage regulator shall be full wave rectified design. The voltage regulation system shall be equipped with three-phase RMS sensing and shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The system shall include a torque-matching characteristic, which shall reduce output voltage in proportion to frequency below a threshold of [58-59] HZ. The voltage regulator shall include adjustments for gain, damping, and frequency roll-off. Adjustments shall be broad range, and made via digital raise-lower switches, with an alphanumeric LED readout to indicate setting level. Rotary potentiometers for system adjustments are not acceptable.

2. Controls shall be provided to monitor the output current of the generator set and initiate an alarm (over current warning) when load current exceeds 110% of the rated current of the generator set on any phase for more than 60 seconds. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (over current shutdown). The protective functions provided shall be in compliance to the requirements of NFPA70 article 445. Performance of this function shall be 3rd party certified.
3. Controls shall be provided to individually monitor all three phases of the output current for short circuit conditions. The control/protection system shall monitor the current level and voltage. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (short circuit shutdown). The protective functions provided shall be in compliance to the requirements of NFPA70 article 445. Performance of this function shall be 3rd party certified.
4. Controls shall be provided to monitor the KW load on the generator set, and initiate an alarm condition (over load) when total load on the generator set exceeds the generator set rating for in excess of 5 seconds. Controls shall include a load shed control, to operate a set of dry contacts (for use in shedding customer load devices) when the generator set is overloaded.
5. A line to neutral AC over/under voltage monitoring system that responds only to true RMS voltage conditions shall be provided. The system shall initiate shutdown of the generator set when alternator output voltage exceeds 110% of the operator-set voltage level for more than 10 seconds, or with no intentional delay when voltage exceeds 130%. Under voltage shutdown shall occur when the output voltage of the alternator is less than 85% for more than 10 seconds.
6. A battery monitoring system shall be provided which initiates alarms when the DC control and starting voltage is less than 25VDC or more than 32 VDC. During engine cranking (starter engaged), the low voltage limit shall be disabled, and if DC voltage drops to less than 14.4 volts for more than two seconds a "weak battery" alarm shall be initiated.
7. The control System shall include a ground fault monitoring relay. The relay shall be adjustable from 3.8-1200 amps, and include adjustable time delay of 0-10.0 seconds.

The relay shall be for indication only, and not trip or shut down the generator set. Note bonding and grounding requirements for the generator set, and provide relay that will function correctly in system as installed.

8. The voltage regulation system shall include provisions for reactive load sharing and electronic voltage matching for paralleling applications. Motorized voltage adjust pot is not acceptable for voltage matching.

H. The generator set shall be provided with a network communication module to allow LonMark compliant communication with the generator set control by remote devices. The control shall communicate all engine and alternator data.

I. Generator set shall be furnished with a 200 amp., 3 pole, main line circuit breaker. The main line circuit breakers shall incorporate an electronic trip unit that operates to protect the alternator under all overcurrent conditions, or a thermal-magnetic trip with other overcurrent protection devices that positively protect the alternator under overcurrent conditions. The supplier shall submit time overcurrent characteristic curves and thermal damage curve for the alternator, demonstrating the effectiveness of the protection provided. Alternator overcurrent protection that is integrated into the genset mounted paralleling control is also acceptable. A 24 volt shunt trip, aux and trip contacts shall also be included.

J. Control Interfaces for Remote Monitoring:

1. All control and interconnection points from the generator set to remote components shall be brought to a separate connection box. No field connections shall be made in the control enclosure or in the AC power output enclosure. Provide the following features in the control system:
2. Form "C" dry common alarm contact set rated 2A @ 30VDC to indicate existence of any alarm or shutdown condition on the generator set.
3. One set of contacts rated 2A @ 30VDC to indicate generator set is ready to load. The contacts shall operate when voltage and frequency are greater than 90% of rated condition.
4. A fused 10 amp switched 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit whenever the generator set is running.
5. A fused 20 amp 24VDC power supply circuit shall be provided for customer use. DC power shall be available from this circuit at all times from the engine starting/control batteries.

6. The control shall be provided with a direct serial communication link for the Modbus communication network interface as described elsewhere in this specification and shown on the drawings.

K. Provide engine mounted Onan/Cummins Power Command 2.2, or equal Control System unit HMI 220 or equal, Power Command Human Machine Interface.

2.05 OUTDOOR WEATHER-PROTECTIVE ENCLOSURE

A. The generator set shall be provided with a steel outdoor rated enclosure with the entire package listed under UL2200. The package shall comply with the requirements of the National Electrical Code for all wiring materials and component spacing. Provide sound barrier skid bottom for additional soundproofing. The total assembly of generator set, enclosure shall be designed to be lifted into place using spreader bars. Housing shall provide ample airflow for generator set operation at rated load in an ambient temperature of 100°F. The housing shall have hinged access doors as required to maintain easy access for all operating and service functions. All doors shall be lockable, and include retainers to hold the door open during service. Enclosure roof shall be cambered to prevent rainwater accumulation. Openings shall be screened to limit access of rodents into the enclosure. All electrical power and control interconnections shall be made within the perimeter of the enclosure.

B. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturer's standard color using a 2-step electro coating paint process, or equal meeting the performance requirements specified below. All surfaces of all metal parts shall be primed and painted.
   1. Painting of hoses, clamps, wiring harnesses, and other non-metallic service parts shall not be acceptable. Fasteners used shall be corrosion resistant, and designed to minimize marring of the painted surface when removed for normal installation or service work.
   2. Enclosure shall be constructed of minimum 12 gauge steel for framework and 14 gauge steel for panels. All hardware and hinges shall be stainless steel.
   3. A factory-mounted critical grade exhaust silencer shall be installed inside the enclosure. The exhaust shall exit the enclosure through a rain collar and terminate with a rain cap. Exhaust connections to the generator set shall be through seamless flexible connections.
   4. Provide flexible coolant and lubricating oil drain lines that extend to the exterior of the enclosure, with internal drain valves and External radiator fill provision.
   5. The generator set shall be provided with a sound-attenuated housing which allows the generator set to operate at full rated load in an ambient temperature of up to 100°F.
   6. The enclosure shall be insulated with non-hygroscopic materials.

2.06 AUTOMATIC TRANSFER SWITCH

A. Ratings:
   1. Service Entrance transfer switches shall be 240V/3-phase; heavy duty construction; 3-pole with neutral bus and lugs and contain the following minimum ratings
      a. Well Control Building: 200 amp; NEMA 1.
   2. Main contacts shall be rated for 600 Volts AC minimum.
   3. Transfer switches shall be rated to carry 100% of rated current continuously in the enclosure supplied, in ambient temperatures of -40 to +60°C., relative humidity up to 95% (non-condensing), and altitudes up to 10,000' (3000M).
   4. Transfer switch equipment shall have withstand and closing ratings (WCR) in RMS symmetrical amperes greater than the available fault currents shown on the drawings and at the specified voltage. The transfer switch and its upstream protection shall be coordinated. The transfer switch shall be third party listed and labeled for use with the specific protective device(s) installed in the application.

B. Manufacturer: Cummins/Onan, Caterpillar, Kohler, ASCO, Generac.

C. Construction
   1. Transfer switches shall be double-throw, electrically and mechanically interlocked, and mechanically held in the source 1 and source 2 positions. The transfer switch shall be specifically designed to transfer to the best available source if it inadvertently stops in a neutral position.
   2. Transfer switches rated through 1000 amp. shall be equipped with permanently attached manual operating handles and quick-break, quick-make over-center contact mechanisms. Transfer switches over 1000 amp. shall be equipped with manual operators for service use only under de-energized conditions.
   3. Main switch contacts shall be high-pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishing. Arc chutes shall have insulating covers to prevent inter-phase flashover.
   4. Transfer switch internal wiring shall be composed of pre-manufactured harnesses that are permanently marked for source and destination. Harnesses shall be connected to the control system by means of locking disconnect plug(s), to allow the control system to be easily disconnected and serviced without disconnecting power from the transfer switch mechanism.
   5. Power transfer switch shall be provided with flame retardant transparent covers to allow viewing of switch contact operation but prevent direct contact with components that could be operating at line voltage levels.
   6. Transfer switches designated on the drawings as 4-pole shall be provided with a switched neutral pole. The neutral pole shall be of the same construction and have the same ratings as the phase poles. All poles shall be switched simultaneously using a common crossbar. Substitute equipment using overlapping neutral contacts is not acceptable.

7. Transfer switches that are designated on the drawings as 3-pole shall be provided with a neutral bus and lugs. The neutral bus shall be sized to carry 100% of the current designated on the switch rating.

D. Connections
   1. Field control connections shall be made on a common terminal block that is clearly and permanently labeled.
   2. Transfer switch shall be provided with AL/CU mechanical lugs sized to accept the full output rating of the switch. Lugs shall be suitable for the number and size of conductors shown on the drawings.

2.07 AUTOMATIC TRANSFER SWITCH CONTROL

A. Operator Panel. Each transfer switch shall be provided with a control panel to allow the operator to view the status and control operation of the transfer switch. The operator panel shall be a sealed membrane panel rated NEMA 3R/IP53 or better (regardless of enclosure rating) that is permanently labeled for switch and control functions. The operator panel shall be provided with the following features and capabilities.
   1. High intensity LED lamps to indicate the source that the load is connected to (source 1 or source 2); and which source(s) are available. Source available LED indicators shall operate from the control microprocessor to indicate the true condition of the sources as sensed by the control.
   2. High intensity LED lamps to indicate that the transfer switch is "not in auto" (due to control being disabled or due to bypass switch (when used) enabled or in operation) and "Test/Exercise Active" to indicate that the control system is testing or exercising the generator set.
   3. "OVERRIDE" pushbutton to cause the transfer switch to bypass any active time delays for start, transfer, and retransfer and immediately proceed with its next logical operation.
   4. "TEST" pushbutton to initiate a preprogrammed test sequence for the generator set and transfer switch. The transfer switch shall be programmable for test with load or test without load.
   5. "RESET/LAMP TEST" pushbutton that will clear any faults present in the control, or simultaneously test all lamps on the panel by lighting them.
   6. The control system shall continuously log information on the number of hours each source has been connected to the load, the number of times transferred, and the total number of times each source has failed. This information shall be available via a PC-based service tool and an operator display panel.
   7. Security Key Switch to allow the user to inhibit adjustments, manual operation or testing of the transfer switch unless key is in place and operated.
   8. Analog AC meter display panel, to display 3-phase AC Amps, 3-phase AC Volts, Hz, KW load level, and load power factor. The display shall be color-coded, with green scale indicating normal or acceptable operating level, yellow indicating conditions

nearing a fault, and red indicating operation in excess of rated conditions for the transfer switch.

9. Vacuum fluorescent alphanumeric display panel with push-button navigation switches. The display shall be clearly visible in both bright (sunlight) and no light conditions. It shall be visible over an angle of at least 120°. The Alphanumeric display panel shall be capable of providing the following functions and capabilities:
    a) Display source condition information, including AC voltage for each phase of normal and emergency source, frequency of each source. Voltage for all three phases shall be displayed on a single screen for easy viewing of voltage balance. Line to neutral voltages shall be displayed for 4-wire systems.
    b) Display source status, to indicate source is connected or not connected.
    c) Display load data, including 3-phase AC voltage, 3-phase AC current, frequency, KW, KVA, and power factor. Voltage and current data for all phases shall be displayed on a single screen.
    d) The display panel shall allow the operator to view and make the following adjustments in the control system, after entering an access code:
        1) Set nominal voltage and frequency for the transfer switch.
        2) Adjust voltage and frequency sensor operation set points.
        3) Set up time clock functions.
        4) Set up load sequence functions.
        5) Enable or disable control functions in the transfer switch, including program transition.
        6) Set up exercise and load test operation conditions, as well as normal system time delays for transfer time, time delay start, stop, transfer, and retransfer.
    e) Display Real time Clock data, including date, and time in hours, minutes, and seconds. The real time clock shall incorporate provisions for automatic daylight savings time and leap year adjustments. The control shall also log total operating hours for the control system.
    f) Display service history for the transfer switch. Display source connected hours, to indicate the total number of hours connected to each source. Display number of times transferred, and total number of times each source has failed.
    g) Display fault history on the transfer switch, including condition, and date and time of fault. Faults to include controller checksum error, low controller DC voltage, ATS fail to close on transfer, ATS fail to close on retransfer, battery charger malfunction, network battery voltage low, network communications error.

B. Internal Controls
    1. The transfer switch control system shall be configurable in the field for any operating voltage level up to 600VAC. Provide RMS voltage sensing and metering that is accurate to within plus or minus 1% of nominal voltage level. Frequency sensing shall be accurate to within plus or minus 0.2%. Voltage sensing shall be monitored based on the normal voltage at the site. Systems that utilize voltage

monitoring based on standard voltage conditions that are not field configurable are not acceptable.

2. Transfer switch voltage sensors shall be close differential type, providing source availability information to the control system based on the following functions:
   a) Monitoring all phases of the normal service (source 1) for under voltage conditions (adjustable for pickup in a range of 85 to 98% of the normal voltage level and dropout in a range of 75 to 98% of normal voltage level).
   b) Monitoring all phases of the emergency service (source 2) for under voltage conditions (adjustable for pickup in a range of 85 to 98% of the normal voltage level and dropout in a range of 75 to 98% of pickup voltage level).
   c) Monitoring all phases of the normal service (source 1) and emergency service (source 2) for loss of a single phase.
3. All transfer switch sensing shall be configurable from a Windows 95, 98, or NT PC-based service tool, to allow setting of levels, and enabling or disabling of features and functions. Selected functions including voltage sensing levels and time delays shall be configurable using the operator panel. Designs utilizing DIP switches or other electromechanical devices are not acceptable. The transfer control shall incorporate a series of diagnostic LED lamps.
4. The transfer switch shall be configurable to control the operation time from source to source (program transition operation). The control system shall be capable of enabling or disabling this feature, and adjusting the time period to a specific value. A phase band monitor or similar device is not an acceptable alternate for this feature.
5. The transfer switch shall incorporate adjustable time delays for generator set start (adjustable in a range from 0-15 seconds); transfer (adjustable in a range from 0-120 seconds); retransfer (adjustable in a range from 0-30 minutes); and generator stop (cooldown) (adjustable in a range of 0-30 minutes).
6. The transfer switch shall be configurable to accept a relay contact signal and a network signal from an external device to prevent transfer to the generator service.
7. The control system shall be designed and prototype tested for operation in ambient temperatures from -40°C to +70°C. It shall be designed and tested to comply with the requirements of the noted voltage and RFI/EMI standards.
8. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs, and relays on all outputs, to provide optimum protection from line voltage surges, RFI and EMI.

C. Control Interface
   1. The transfer switch will provide an isolated relay contact for starting of a generator set. The relay shall be normally held open, and close to start the generator set. Output contacts shall be form C, for compatibility with any generator set.
   2. Provide one set Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amps 250 VAC.
   3. Provide Modbus communication network interface.

4. Provide isolated relay contacts to operate shunt trip circuit breaker serving load bank. Load bank circuit breaker shall be isolated in the event of a power outage.

2.08 ACCESSORIES

A. Provide a set of dry contacts for each generator function rated at 10AMP/250V for use by SCADA.

2.09 SPARE PARTS

A. Two sets of the following spare parts shall be furnished:
   1. Air filters.
   2. Oil filters.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Equipment shall be installed by the contractor in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.

B. Equipment shall be installed on concrete pad where shown. Equipment shall be permanently fastened to the pad in accordance with manufacturer's instructions and seismic requirements of the site.

C. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections, under the supervision of the equipment supplier.

D. Equipment shall be initially started and operated by representatives of the manufacturer.

E. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to final testing of the system.

3.02 SEQUENCE OF OPERATION

A. Generator set shall start on receipt of a start signal from remote equipment. The start signal shall be via hardwired connection to the generator set control and a redundant signal over the required network connection.

B. The generator set shall complete a time delay start period as programmed into the control.

C. The generator set control shall initiate the starting sequence for the generator set. The starting sequence shall include the following functions:
   1. The control system shall verify that the engine is rotating when the starter is signaled to operate. If the engine does not rotate after two attempts, the control system shall shut down and lock out the generator set, and indicate "fail to crank" shutdown.
   2. The engine shall fire and accelerate as quickly as practical to start disconnect speed. If the engine does not start, it shall complete a cycle cranking process as described elsewhere in this specification. If the engine has not started by the completion of the cycle cranking sequence, it shall be shut down and locked out, and the control system shall indicate "fail to start".
   3. The engine shall accelerate to rated speed and the alternator to rated voltage. Excitation shall be disabled until the engine has exceeded programmed idle speed, and regulated to prevent over voltage conditions and oscillation as the engine accelerates and the alternator builds to rated voltage.

D. On reaching rated speed and voltage, the generator set shall operate as dictated by the control system in isochronous, synchronize, load share, load demand, or load govern state.

E. When all start signals have been removed from the generator set, it shall complete a time delay stop sequence. The duration of the time delay stop period shall be adjustable by the operator.

F. On completion of the time delay stop period, the generator set control shall switch off the excitation system and shall shut down.
   1. Any start signal received after the time stop sequence has begun shall immediately terminate the stopping sequence and return the generator set to isochronous operation.

3.03 FACTORY TESTING

A. The generator set supplier shall perform a complete operational test on the generator set prior to shipping from the factory. A certified test report shall be provided. Equipment supplied shall be fully tested at the factory for function and performance.

B. Generator set factory tests on the equipment shall be performed at rated load and rated power factor. Generator sets that have not been factory tested at rated power factor will not be acceptable. Tests shall include: run at full load, maximum power, voltage regulation, transient and steady-state governing, single step load pickup, and function of safety shutdowns.

3.04 ON-SITE ACCEPTANCE TEST

A. The complete installation shall be tested for compliance with the specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests.

B. Installation acceptance tests to be conducted on-site shall include a "cold start" test, a two hour full load test, and a one step rated load pickup test in accordance with NFPA 110. Provide a resistive load bank and make temporary connections for full load test, if necessary.

C. Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing proper operation of the system for at least 2 hours. Coordinate timing and obtain approval for start of test with site personnel.

3.05 TRAINING

A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than 4 hours in duration. Training date shall be coordinated with the facility owner.

3.06 SERVICE AND SUPPORT

A. The manufacturer of the generator set shall maintain service parts inventory at a central location which is accessible to the service location 24 hours per day, 365 days per year.

B. The generator set shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of

critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.

C. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

3.07 WARRANTY

A. The generator set and associated equipment shall be warranted for a period of not less than 5 years from the date of commissioning against defects in materials and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

END OF SECTION

SECTION 17100

PROCESS CONTROL AND INSTRUMENTATION SYSTEMS

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PART 1 – GENERAL

1.01 THE REQUIREMENT

A. This section describes process control and instrumentation systems.

B. The Contractor shall provide all Process Control and Instrumentation Systems (PCIS) complete and operable, in accordance with the Contract Documents.

C. The requirements of this section apply to all components of the PCIS unless indicated otherwise.

D. Related work specified elsewhere:
1. Division 16 - Electrical.
2. Section 17300 - Control Panels.
3. Section 17400 – Control Descriptions

1.02 REFERENCES

A. National Fire Protection Association (NFPA):
1. NFPA 70 - National Electrical Code (NEC), latest edition.

B. National Electrical Manufacturers Association (NEMA):
1. NEMA ICS-2 - Industrial Control Devices, Controllers, and Assemblies.
2. NEMA 250 - Enclosures for Electrical Equipment.

C. Underwriters Laboratories (UL):

1. UL 508 - Industrial Control Equipment.

1.03 GENERAL

A. The Contractor shall use a Controls Integrator (CI) and qualified electrical installers to furnish, install, and place into service process instrumentation, controls and appurtenant work as specified and shown.

B. Contractor shall assign to the CI full responsibility for the functional operation of instrumentation and integrated controls systems. The Controls Integrator shall:
   1. Perform engineering required to select, to furnish, to supervise installation and connection, to calibrate, and to place into operation additional sensors, instruments, controls, accessories, and other equipment as specified.
   2. Be responsible for the integration of related systems and shall ensure compatibility of components through the coordination of all hardware, signal converters, communications software and accessories.
   3. Be under direct, written agreement with the Contractor and comply with specified requirements of these Documents.
   4. Not be the employee of nor be affiliated with manufacturers or manufacturers' representatives of major equipment such that a conflict of interest could adversely affect progress of the Work.

C. Work specified in Division 17 includes furnishing, installing, start-up, testing and adjusting of all required equipment, including instruments, equipment, hardware, software, wiring, accessory equipment, and training to provide a completely operational process control and instrumentation system.

D. It shall be the responsibility of the Contractor through the use of the CI to furnish a complete and fully operating system; The Contractor shall be responsible for all details which may be necessary to properly install, adjust and place in operation the complete installation; The Contractor shall assume full responsibility for additional costs which may result from unauthorized deviations from the Contract Documents.

E. It shall be the responsibility of the CI to examine all new and existing equipment that is transmitting signals to, or receiving signals from, equipment specified in Division 17; The CI shall be responsible for providing signal converters, buffer amplifiers, and isolation devices to make signal levels, reference to ground, etc. compatible between devices specified in Division 17 and existing equipment.

1.04 CONTROLS INTEGRATOR EXPERIENCE AND CAPABILITIES

A. The CI shall be normally engaged in assembly, installation, repair, and maintenance of process control and instrumentation systems and must have been supplying similar types/quantities of control systems in municipal water and wastewater treatment industry for a minimum of 15 years; submit list of minimum 35 installations for which integrator has provided similar type/quantity of equipment, including name and telephone number of person responsible for operation and maintenance of each installation.

B. The CI shall have qualified, trained service personnel on staff who are capable of programming, maintaining and adjusting the system; The CI shall be capable of offering an extended service contract after completion of the warranty period, including 24 hour, 7 day a week emergency services; service personnel must be available within 8 hours of verbal notice on all days of week.

C. Submit:
1. 100% supply/performance/payment bond.
2. Certificate-showing evidence of $1,000,000 insurance coverage for professional liability/ errors and omissions.
3. Certificate-showing evidence of $1,500,000 insurance coverage for comprehensive general liability (All Risk Insurance).
4. Copy of liability insurance policy with same limits as comprehensive general liability policy to protect Owner and Engineer against any and all claims in liabilities for injury to or death of persons or damage to property caused whole or in part by any negligent acts or omissions of integrator arising from work on this project; name Owner and Engineer against as additional insured and maintain this policy in full force and effect for entire duration of this project.

D. The CI shall have service and parts office within 200 miles of project site and shall be able to provide service within time period acceptable to the Owner or shall have the capability to provide service to project site remotely by remote connection; the local office shall have full-time service personnel and answer telephone calls in person; provide cellular telephone numbers of management personnel for use in case of emergencies.

E. The Controls Integrator shall be one of following companies in full conformance with Specifications:
1. Automatic Systems Company; Contact: Jake McFarland, jmcfarland@automaticsystemsco.com , (515) 232-4770.
2. Jetco; Contact: John Whitacre, jwhitacre@jetcoelectric.com (515) 967-5874.
3. INControl; Contact: Curt Kattleman, curt.kattleman@incontrol.net (763) 783-9500.

1.05 SUBMITTALS

A. Submit informational literature/data for following materials and equipment in accordance with general procedures set forth in Specifications:
   1. All equipment and components indicated on Drawings and specified in this section.
   2. Software packages including complete description of features and capabilities.

B. Submit shop drawings for following materials and equipment in accordance with general procedures set forth in Specifications:
   1. Panel drawings including system schematic drawings, terminal numbering, component schematic drawings, dimension drawings, layout drawing and nameplate schedule.
   2. Overall system diagram showing all components, converters, cables, and connectors.
   3. Programmable Logic Controller (PLC) programs in ladder format including verbal description of each rung's function; assign point numbers to all inputs and outputs, and show point numbering in PLC program.
   4. Proposed graphic displays; submit actual hardcopy of programmed graphic screens.
   5. The submittal shall address all hardware and software to be supplied. In addition, include:
      a. Identification of the respective responsibilities of each party to the project. Including what is provided by the system manufacturer, what is to be subcontracted etc.
      b. Description of the major user related features and operating characteristics of the proposed system.
      c. Description of all master site hardware and software updates including examples of HMI and PC SCADA displays, control loops, reports, and how the operator will interface with the system to achieve each specified function.
      d. Description and operation of all required configuration features of the I/O and local and remote control loop characteristics.
      e. Description containing startup implementation plan, participant's responsibilities and a schedule of events.
      f. All significant equipment to be supplied shall be listed followed by descriptive data sheets. The equipment list shall include each component name, manufacturer, model number, a description of the operation, quantity supplied, and any special setup and operation and maintenance characteristics.
      g. Drawings of equipment to be supplied shall include as a minimum, overall dimension details for each unit including installation arrangements, door mounted operator devices and instruments. Wiring diagrams of all system components including field device connections shall be included and specific installation wiring responsibilities identified.

C. Operations and Maintenance (O&M) Manuals: submit minimum of five (5) sets of operation and maintenance manuals containing:

1. A detailed written description of system hardware, software, and system operation shall be provided. The description of hardware and software shall identify pertinent references to sections of standard hardware and software manuals where operational procedures are detailed. Control loops shall be fully described in the O&M manual.
2. Panel equipment, field devices and instruments, including "as-built" system schematics.
3. Final copy of PLC program on 8-1/2" x 11" sheets in ladder format including verbal description of each rung's function.
4. PLC program saved on USB flash drive.
5. Point lists for all PLC inputs/outputs; identify point number (tag), point description, point type, range in engineering units (if analog point), PLC number, rack and slot number, and point address.

D. Final as-built drawings.

E. All submittals bound in 3-ring binders with labeled tabs separating sections.

1.06 GUARANTEE

A. Contractor shall guarantee operation of system and that materials and workmanship of equipment be free from defects for period as defined in General Conditions of project manual providing equipment has been operated and maintained in accordance with manufacturer's recommendations.

1.07 WARRANTY

A. Controls Integrator shall provide a comprehensive two (2) year parts and labor warranty for complete control system.

1.08 TESTING

A. The controller and peripherals shall be tested as best possible at the factory as an integrated unit prior to shipment. The engineer shall be notified at least 2 weeks in advance of the system test. Include test results as an attachment to the equipment.

B. Panel furnished under this section constructed in accordance with UL 508.

C. Panel shop-inspected by UL or constructed in UL-recognized facility; completed panel shall bear serialized UL label indicating acceptance under Standard 508.

PART 2 – PRODUCTS

2.01 GENERAL

A. Code and Regulatory Compliance: PCIS work shall conform to or exceed the applicable requirements of the National Electrical Code. Conflicts between the requirements of the Contract Documents and any codes or referenced standards or specifications shall be resolved accordingly.

B. Current Technology: Meters, instruments, and other components shall be the most recent field-proven models marketed by their manufacturers at the time of submittal of the Shop Drawings unless otherwise required to match existing equipment.

C. Hardware Commonality: Instruments which utilize a common measurement principle (for example, d/p cells, pressure transmitters, level transmitters that monitor hydrostatic head) shall be furnished by a single manufacturer. Panel mounted instruments shall have matching style and general appearance. Instruments performing similar functions shall be of the same type, model, or class, and shall be from a single manufacturer.

D. Loop Isolators and Converters: Signal isolators shall be provided as required to ensure adjacent component impedance match where feedback paths may be generated, or to maintain loop integrity during the removal of a loop component. Dropping precision wirewound resistors shall be installed at all field side terminations in the control panels to ensure loop integrity. Signal conditioners and converters shall be provided where required to resolve any signal level incompatibilities or provide required functions.

E. Environmental Suitability: Indoor and outdoor control panels and instrument enclosures shall be suitable for operation in the ambient conditions associated with the locations designated in the Contract Documents. Heating, cooling, and dehumidifying devices shall be provided in order to maintain all instrumentation devices 20% within the minimums and maximums of their rated environmental operating ranges. The Contractor shall provide power wiring for these devices. Enclosures suitable for the environment shall be furnished. All instrumentation in hazardous areas shall be suitable for use in the particular hazardous or classified location in which it is to be installed.

F. Signal Levels: Analog measurements and control signals shall be as indicated herein, and unless otherwise indicated, shall vary in direct linear proportion to the measured variable. Electrical signals outside control panels shall be 4 to 20 ma. dc except as indicated. Signals within enclosures may be 1 to 5 volts dc. Electric signals shall be electrically or optically isolated from other signals. Pneumatic signals shall be 3 to 15 psig with 3 psig equal to 0% and 15 psig equal to 100%.

G. Control Panel Power Supplies: Control panels shall be provided with redundant power supplies which are configured in a fault-tolerant manner to prevent interruption of

service upon failure and interruption of service necessitated by the replacement of a power supply. Power supplies shall have an excess rated capacity of 40%. The failure of a power supply shall be annunciated at the control panel and repeated to the PLC.

H. Alternative Equipment and Methods: Equipment or methods requiring redesign of any project details are not acceptable without prior written approval of the Engineer through the "or equal" process of Section 01600 - Material and Equipment. Any proposal for approval of alternative equipment or methods shall include evidence of improved performance, operational advantage, and maintenance enhancement over the equipment or method indicated, or shall include evidence that an indicated component is not available.

2.02 OPERATING CONDITIONS

A. The PCIS shall be designed and constructed for satisfactory operation and long, low maintenance service under the following conditions:
   1. Environment: a water treatment plant facility.
   2. Temperature Range: 32 through 104°F.
   3. Thermal Shock: 1°F. per minute, max.
   4. Relative Humidity: 20 through 95%, non-condensing.

2.03 SPECIAL TOOLS

A. The CI shall furnish a priced list of any and all special tools required to calibrate and maintain the instrumentation provided under the Contract Documents. After approval the CI shall furnish the requested tools on that list.

B. Special tools shall be submitted before startup commences, suitably wrapped and identified.

PART 3 – EXECUTION

3.01 PROJECT MANAGEMENT

A. Supplier shall provide engineering and administrative services necessary to fulfill requirements of Specifications.

B. Supplier shall provide services of experienced project manager as overall coordinator during course of project.

3.02 INSTALLATION

A. General:
   1. Instrumentation, including instrumentation furnished under other divisions, shall be installed under Division 17 and the manufacturers' instructions.

2. Equipment Locations: The monitoring and control system configurations indicated are diagrammatic. The locations of equipment are approximate. The exact locations and routing of wiring and cables shall be governed by structural conditions and physical interferences and by the location of electrical terminations on equipment. Equipment shall be located and installed so that it will be readily accessible for operation and maintenance. Where job conditions require reasonable changes in approximated locations and arrangements, or when the Owner exercises the right to require changes in location of equipment which do not impact material quantities or cause material rework, the Contractor shall make such changes without additional cost to the Owner.

B. Conduit, Cables, and Field Wiring:
   1. Conduit shall be provided under Division 16 without delay to the work of Division 17.
   2. Process equipment control wiring, 4-20 mA signal circuits, signal wiring to field instruments, PLC input and output wiring and other field wiring and cables shall be provided under Division 16.
   3. Terminations and wire identification at PCIS equipment furnished under this or any other division shall be provided under Division 17.

C. Ancillary Devices: The Contract Documents show all necessary conduit and instruments required to make a complete instrumentation system. The Contractor shall be responsible for providing any additional or different type connections as required by the instruments and specific installation requirements. Such changes shall not be a basis of claims for extra work or delay.

D. Installation Criteria and Validation: Field-mounted components and assemblies shall be installed and connected according to the requirements below:
   1. Installation personnel have been instructed on installation requirements of the Contract Documents.
   2. Technical assistance is available to installation personnel at least by telephone.
   3. Installation personnel have at least 1 copy of the approved Shop Drawings and data.
   4. Instrument process sensing lines shall be installed in conduit under Section 16050 - Electrical General Provisions. Individual tubes shall be run parallel and near the surfaces from which they are supported. Supports shall be used at intervals of not more than 3' of rigid tubing.
   5. Bends shall be formed to uniform radii with the proper tool without deforming or thinning the walls of the tubing. Plastic clips shall be used to hold individual plastic tubes parallel. Ends of tubing shall be square cut and cleaned before being inserted in the fittings. Bulkhead fittings shall be provided at panels requiring pipe or tubing entries.
   6. Differential pressure elements shall have 3 valve manifolds.
   7. Flexible cables and capillary tubing shall be installed in flexible conduits. The lengths shall be sufficient to withdraw the element for periodic maintenance.
   8. Power and signal wires shall be terminated with crimped type lugs.
   9. Connectors shall be, as a minimum, water tight.

10. Wires shall be mounted clearly with an identification tag that is of a permanent and reusable nature.
11. Wire and cable shall be arranged in a neat manner and securely supported in cable groups and connected from terminal to terminal without splices unless specifically approved by the Engineer. Wiring shall be protected from sharp edges and corners.
12. Mounting stands and bracket materials and workmanship shall comply with requirements of the Contract Documents.
13. Verify the correctness of each installation, including polarity of electric power and signal connections, and make sure process connections are free of leaks. The Contractor shall certify in writing that discrepancies have been corrected for each system checked out.
14. The Owner will not be responsible for any additional cost of rework attributable to actions of the Contractor or the Controls Integrator.

3.03 CALIBRATION

A. General: Devices provided under Division 17 shall be calibrated according to the manufacturer's recommended procedures to verify operational readiness and ability to meet the indicated functional and tolerance requirements.

B. Calibration Points: Each instrument shall be calibrated at 20, 40, 60, 80 and 100% of span using test instruments to simulate inputs. The test instruments shall have accuracies traceable to National Institute of Standards and Testing.

C. Bench Calibration: Instruments that have been bench-calibrated shall be examined in the field to determine whether any of the calibrations are in need of adjustment. Such adjustments, if required, shall be made only after consultation with the Engineer.

D. Field Calibration: Instruments which were not bench-calibrated shall be calibrated in the field to ensure proper operation in accordance with the instrument data sheets.

E. Analyzer Calibration: Each analyzer system shall be calibrated and tested as a workable system after installation. Testing procedures shall be directed by the manufacturers' technical representatives. Samples and sample gases shall be furnished by the manufacturers.

F. Calibration Sheets: Each instrument calibration sheet shall provide the following information and a space for sign-off on individual items and on the completed unit:
   1. Project name.
   2. Tag number.
   3. Manufacturer.
   4. Model number.
   5. Serial number.
   6. Calibration range.
   7. Calibration data: Input, output, and error at 10%, 50%, and 90% of span.

8. Switch setting, contact action, and deadband for discrete elements.
9. Space for comments.
10. Space for sign-off by Controls Integrator and date.
11. Test equipment used and associated serial numbers.

G. Calibration Tags: A calibration and testing tag shall be attached to each piece of equipment or system at a location determined by the Engineer. The Contractor shall have the Instrumentation Supplier sign the tag when calibration is complete. The Engineer will sign the tag when the calibration and testing has been accepted.

3.04 START-UP

A. The Controls Integrator shall provide skilled programmer/instrumentation engineer or technician who shall complete troubleshooting and start-up to place entire system into satisfactory operation; engineer or technician shall make necessary inspection of completed installation, make necessary final field adjustments and make program revisions as required for start-up.

B. Demonstrate proper operation of all system features and functions to Owner and Engineer.

C. Coordinate start-up scheduling with Owner and Engineer.

END OF SECTION

SECTION 17300

CONTROL PANELS

INDEX

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1.02 CONTRACTOR SUBMITTALS
1.03 QUALITY ASSURANCE
1.04 WARRANTY

PART 2 – PRODUCTS
2.01 GENERAL
2.02 CONTROL PANELS
2.03 PROGRAMMABLE LOGIC CONTROLLER

PART 3 – EXECUTION
3.01 INSTALLATION
3.02 SIGNAL AND CONTROL WIRING
3.03 PROGRAMMING SERVICES
3.04 INSPECTION AND APPROVAL
3.05 EXHIBITS

PART 1 – GENERAL

1.01 THE REQUIREMENT

A. General: The Contractor shall provide a control panel, complete and operable, in accordance with the Contract Documents.

B. The requirements of Section 17100 - Process Control and Instrumentation Systems apply to this Section.

1.02 CONTRACTOR SUBMITTALS

A. General: Submittals shall be furnished in accordance with Section 01300 - Submittals.

B. Control Panel Engineering Submittal: The Contractor shall submit a control panel engineering submittal (CPES) for the control panel. The CPES shall completely define and document the construction, finish, layout, power circuits, signal and safety grounding circuits, fuses, circuit breakers, signal circuits, internally mounted instrumentation, face plate mounted instrumentation components, internal panel arrangements, and external panel arrangements. All panel drawings shall, as a minimum, be "B" size with all data sheets and manufacturer specification sheets being "A" size. The submittal shall be in conformance with ISA-S20 - Standard Forms for Process Measurement and Control Instruments, Primary Elements and Control Valves, shall be submitted as a singular complete bound volume or multi-volume package within 120 calendar days after Notice to Proceed, and shall have the following contents:

1. A complete index shall appear in the front of the bound volume. Panel tagging and nameplate nomenclature shall be consistent with the requirements of the Contract Documents.
2. Scaled physical arrangement drawings drawn to scale which define and quantify the physical groupings comprising control panel sections, auxiliary panels, subpanels, and racks. Cutout locations with nameplate identifications shall be shown.
3. Front of panel layout for the control panel.
4. Schematic/elementary diagrams shall depict all control devices and circuits and their functions.
5. Wiring/connection diagrams shall locate and identify electrical devices, terminals, and interconnecting wiring. These diagrams shall show interconnecting wiring by lines, designate terminal assignments, and show the physical location of all electrical and control devices.
6. Interconnection diagrams shall locate and identify all external connections between the control panel/control panel devices and associated equipment. These diagrams shall show interconnecting wiring by lines, designate terminal assignments, and show the physical location of all panel ingress and egress points.
7. A bill of material which enumerates all devices associated with the control panel.
8. Submit informational literature/data for all components including but not limited to Control Panel internal devices, PLC hardware and software, etc.
9. Programmable Logic Controller (PLC) programs in ladder format including notated description of each rung's function; assign point numbers to all inputs and outputs, and show point numbering in PLC program.
10. Proposed graphic displays; submit actual hard copy of programmed graphic screens.

C. Operations Manual: Provide operations and maintenance information for the following:
1. Panel equipment, field devices and instruments, including "as-built" system schematics.
2. Final copy of PLC program on 8-1/2" x 11" sheets in ladder format including verbal description of each rung's function.
3. USB flash drive containing final PLC program and final distributed control software program.
4. Complete software documentation including programming information and operator's guides.
5. Point lists for all PLC inputs/outputs; identify point number (tag), point description, point type, range in engineering units (if analog point), PLC number, rack and slot number, and point address.

D. All submittals shall be bound in 3-ring binders with labeled tabs separating each section.

1.03 QUALITY ASSURANCE

A. All materials, equipment and parts shall be new and unused of current manufacturer.

B. Control panel supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. All control panels shall be constructed in accordance with UL 508A standards and shall bear the UL listing.

1.04 WARRANTY

A. See Division 01 for additional requirements.

PART 2 – PRODUCTS

2.01 GENERAL

A. Environmental Suitability: The control panel shall be suitable for operation in the ambient conditions associated with the location designated in the Contract Documents. Heating, cooling, and dehumidifying devices shall be provided as necessary in order to maintain all instrumentation devices 20% within the minimums and maximums of their rated environmental operating ranges. The Contractor shall provide all power wiring for these devices. Enclosures suitable for the environment shall be provided.

B. The control panel controls shall be 120 VAC. Control conductors shall be provided in accordance with the indicated requirements.

C. Each source of foreign voltage shall be isolated by providing disconnecting or pull-apart terminal blocks or a disconnect operable from the control panel front. Each control panel shall be provided with identified terminal strips for the connection of all external conductors. The Contractor shall provide sufficient terminal blocks to connect 25% additional conductors for future use.

D. Control panel shall be modified to provide for monitoring of standby power system status and alarm signals.

2.02 CONTROL PANELS

A. Well Control Panel
   1. Modified by Controls Integrator.

2. Provide for monitoring of generator and automatic transfer switch status and alarm signals and make available to existing SCADA alarming system via existing radio network communication.
3. Provide necessary relays, terminal blocks and other accessories and panel internal wiring modifications to provide a complete and operable system.

B. Mounting of Instruments
1. Equipment mounted at the rear of panel shall be installed to allow for commissioning adjustments, servicing requirements, and cover removal.
2. Spare space shall be kept clear of wiring, etc., to give maximum space for future additions.

D. Panel Wiring
1. Wire type and sizes: Conductor shall be flexible stranded copper machine tool wire, UL listed Type MTW, and shall be rated 600 volts. Wires for power circuits within panel shall be No. 14 minimum and sized for the load. Wires for instrument signal circuits and alarm input circuits within panel shall be No. 16 AWG. All shielded cables, shall be No. 18 AWG minimum.
2. Wire Marking: Wire numbers shall be marked using white numbered wire markers made from plastic-coated cloth, Brady Type B 500 or equal, or shall be heat shrink plastic.
3. For case grounding, panels shall be provided with a 1/4" x 1" copper ground bus complete with solderless connector for one No. 4 AWG bare stranded copper cable. The copper cable shall be provided by the Contractor and be connected to a system ground loop.
4. Power Supply Wiring
   a. Unless otherwise indicated, instruments, and alarm systems shall operate on 120 volt, 60 Hz circuits.
   b. Each potentiometer type instrument, electronic transducer, controller, or analyzer shall have an individual disconnect switch. Disconnect switches shall have metal or plastic tags indicating instrument tag numbers. Individual plug and cord set power supply connections may be used without switches when indicated in the material specification.
5. Alarm Wiring: The panel vendor shall install and wire alarms including light cabinets, audible signal units, test and acknowledge switches, and remote logic units as indicated. Interconnecting wiring to panel mounted initiating devices shall also be wired by the panel vendor. The wiring from external initiating devices shall be provided by the Contractor. Where plug and cord sets are provided for component interconnection, the panel vendor shall harness and support the cables in neat and orderly fashion. Where separate wire is required, panel vendor shall install No. 16 AWG with THWN or THHN insulation between all components.
6. Signal Wiring
   a. Signal wire shall be twisted pair or triads. Cable shall be constructed of No. 16

AWG copper signal wires with THWN or THHN insulation.

b. Color code for instrument signal wiring shall be as follows:
Positive (+) – Black
Negative (-) – White

E. Labor and Workmanship: Panels shall be fabricated and wired by fully qualified workmen who are properly trained, experienced, and supervised.

2.03 PROGRAMMABLE LOGIC CONTROLLER

A. General:
1. Modify existing programmable logic controller (PLC) rack including but not limited to power supply, microprocessor, input modules, output modules and other associated equipment as specified herein and as shown on drawings.
2. PLC and all components shall be designed, manufactured and tested in accordance with latest applicable UL standards.
3. The PLC, I/O modules, power supply modules, communication interface devices, and peripheral equipment shall be mounted inside the control panel. Incoming I/O wiring from the field to the control panel shall be terminated on terminal blocks in the lower portion of the enclosure. A nameplate shall be mounted on the outside of the door of the enclosure and be engraved with "CP/PLC".
4. PLC to have following features:
   a. Modular construction, allowing I/O modules to be individually added or removed.
   b. Mounting equipment, racks, connecting cables, and other equipment included to provide functioning control system.
5. Input/output modules to have following features:
   a. Inputs and outputs modular, with 4, 8 or 16 circuits per module; status LEDs for each point, powered from field voltage, installed in each module.
   b. Field wiring to screw connectors attached to I/O mounting rack; removal and replacement of any I/O module without disturbing field wiring or any other I/O modules.

B. Qualifications:
1. Manufacturer: ISO 9000, 9001 or 9002 certified for equipment herein specified; produced similar electrical equipment for minimum period of 5 years.
2. When requested by Engineer, provide acceptable list of installations of similar equipment to demonstrate compliance with qualifications.

C. PLC
1. Minimum of 12K words (16-bit) of internal RAM memory provided for storage of control program plus additional data storage for up to 4K words; full memory of CPU usable for program or data storage.
2. Program functions include contacts, coils, timers, counters, math functions,

proportional-integral-derivative (PID) control, shift registers, bit and word operations.
3. Entire programmable controller system capable of operating in ambient temperatures of +32°F. to +140°F.; relative humidities of 5% to 95% non-condensing.
4. CPU capable of being networked to other programmable controllers or host computer.
5. Manufacturer of existing PLC: Allen-Bradley MicroLogix 1100 with RS Logic 5000 programming software unless shown otherwise on drawings.
6. All software is to be licensed to the Owner.

D. Input/output Units
1. Analog Input/Output Characteristics: 4-20 milliamperes DC.
2. Digital Input/Output Characteristics: 120 volts AC, LED isolated from main processor. Individual I/O shall be electrically isolated, 2-wire discrete, dry contact relay equivalent.
3. Required Hardware:
   a. Input/Output Rack, Processor, Communications Interface Module (programmer port), rack and module power supplies.
   b. Each type of module shall have 20% spare capacity.
4. Manufacturer, or equal: Allen-Bradley.
5. Digital input modules: Allen Bradley 1762-IA8, or equal.

E. Power Supply
1. Input Voltage: 120 volts, 60 Hz.
2. Memory Backup: E^2 PROM memory chip set programmed with final operational software.
3. Manufacturer, or equal: Allen-Bradley.

F. Operator Interface:
1. Modify operator interface to allow on-line data monitoring of new standby power system.

PART 3 – EXECUTION

3.01 INSTALLATION

A. Field Modification
1. Control panel testing and inspection shall be performed in the field following modification to PLC rack.
2. Control panel retrofits shall be installed in accordance with Section 17100.

3.02 SIGNAL AND CONTROL WIRING

A. Wiring Installation: Wires shall be run in plastic wireways except (1) field wiring, (2) wiring between mating blocks in adjacent sections, (3) wiring from components on a swing out panel to components on a part of the fixed structure, and (4) wiring to panel mounted components. Wiring run from components on a swing out panel to other components on a fixed panel shall be made up in tied bundles. These bundles shall be tied with nylon wire ties and shall be secured to panels at both sides of the "hinge loop" so that conductors are not strained at the terminals.

B. Wiring run to control devices on the panel front shall be tied together at short intervals with nylon wire ties and be secured to the inside face of the panel using adhesive mounts.

C. Wiring to rear terminals on panel-mount instruments shall be in plastic wireways secured to horizontal brackets above or below the instruments in about the same plane as the rear of the instruments.

D. Shop Drawings shall show conformance to the above wiring installation requirements.

E. Wire Marking: Each signal, control, alarm, and indicating circuit conductor connected to a given electrical point shall be designated by a single unique number which shall be shown on Shop Drawings. These numbers shall be marked on conductors at every terminal.

3.03 PROGRAMMING SERVICES

A. Program programmable logic controllers (PLCs) and operator interface terminal as required by functional descriptions.

B. Provide additional programming during start-up, training, and call-back periods as specified.

C. Control Integrator shall coordinate with standby power equipment manufacturer’s supplied PLCs and their field service representative to set up network and coordinate all aspects of acquiring and transmitting various control functions from vendor furnished PLCs.

3.04 INSPECTION AND APPROVAL

A. It shall be the responsibility of the Contractor to furnish all necessary testing devices and sufficient manpower to perform the tests required by the Engineer.

B. Field Testing: The control panel shall be tested again for functional operation in the field after the connection of external conductors and prior to equipment startup.

3.04 EXHIBITS

A. Existing Well Field Control Panel wiring schematics.

END OF SECTION

3360D DRAWINGS

WTP WELL CONTROL PANEL

LOGAN, IA

AS INSTALLED

9/28/2018

PRIMEX

13005 16TH AVE. NORTH • SUITE 100 • PLYMOUTH MN 55441
MAIN: 763-559-0568 • FAX: 763-559-2187 • www.primexcontrols.com

DRAWING INDEX

FILENAME	TITLE_1	TITLE_2	TITLE_3	TITLE_4	FILEDATE
3360D-NDX	LOGAN WTP WELL CONTROL PANEL	DRAWING INDEX			10/27/2016
3360D-SYM	LOGAN WTP WELL CONTROL PANEL	SYMBOL SHEET			10/27/2016
3360D-001	LOGAN WTP WELL CONTROL PANEL	ENCLOSURE			10/27/2016
3360D-002	LOGAN WTP WELL CONTROL PANEL	PLC I/O SCHEDULE			10/27/2016
3360D-100	LOGAN WTP WELL CONTROL PANEL	CONTROL POWER WIRING			10/27/2016
3360D-101	LOGAN WTP WELL CONTROL PANEL	DIGITAL OUTPUTS			10/27/2016
3360D-102	LOGAN WTP WELL CONTROL PANEL	DIGITAL INPUTS			10/27/2016

DATE LAST PLOTTED: 10/27/2016 2:55 PM PATH AND FILENAME: P:\3300-3399\3360 - LOGAN, IA - WTP TELEMETRY AND CONTROLS UPGRADE\ACAD\3360D-NDX.DWG

AS BUILT DRAWINGS
FINAL DRAWINGS SHOWING ANY CHANGES MADE IN MANUFACTURING
10/27/16

PRIMEX.
primexcontrols.com
13005 16th Avenue N - Suite 100 - Plymouth, MN 55441
763-559-2187

DATE	REVISION DESCRIPTION
9/9/16	RECORD/SHOP DRAWINGS
10/27/16	AS BUILT DRAWINGS

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13005 16th Avenue N - Suite 100 - Plymouth, MN 55441
763-559-0568

DATE	9/25/15
DWN	TJP
CKD.	JSS
ENGR.	TJP
ASSEM.	
SHEET	1 OF 7

PROJECT
LOGAN, IA WTP TELEMETRY AND CONTROLS UPGRADE

LOGAN WTP WELL CONTROL PANEL
DRAWING INDEX

PROJ. NO. 3360D

DWG. NO. NDX

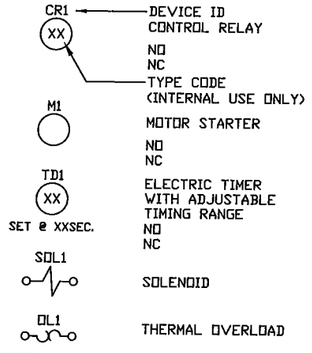
CONDUCTORS

- CONDUCTOR
- CONDUCTORS NOT CONNECTED
- CONDUCTORS CONNECTED
- CONDUCTOR SHIELD
- FIELD CONDUCTOR
- EARTH GROUND
- CHASSIS GROUND
- SHIELD GROUND (ISOLATED IF REQUIRED BY SPEC.)

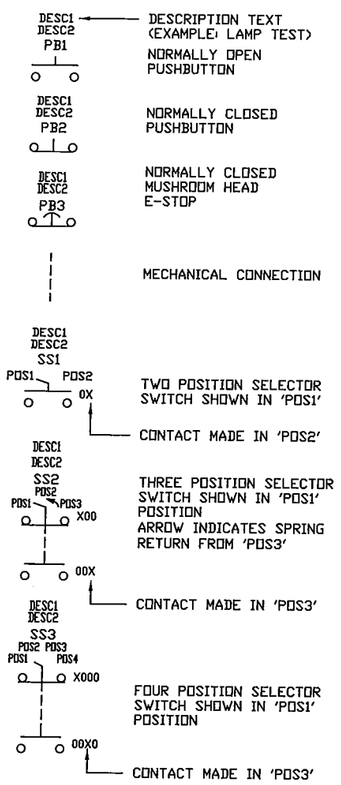
TERMINALS

- #### — TERMINAL BLOCK FOR FIELD TERMINATION
- #### — TERMINAL BLOCK FOR INTERNAL USE ONLY TERMINATION
- #### — DEVICE TERMINATION POINT

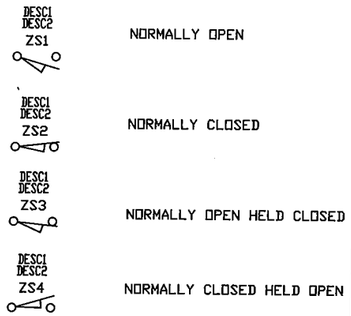
RELAY COILS



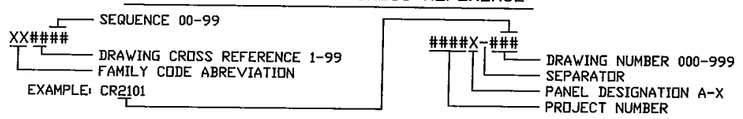
SWITCHES



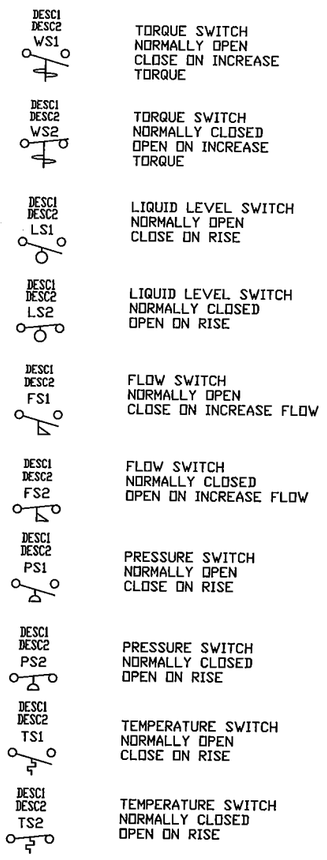
LIMIT SWITCHES



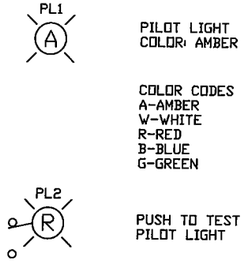
DEVICE ID / DRAWING CROSS REFERENCE



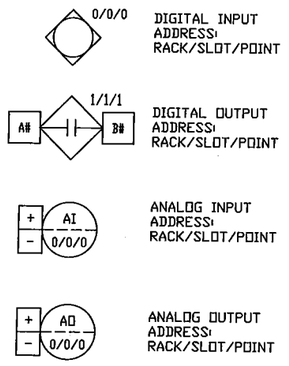
PROCESS SWITCHES



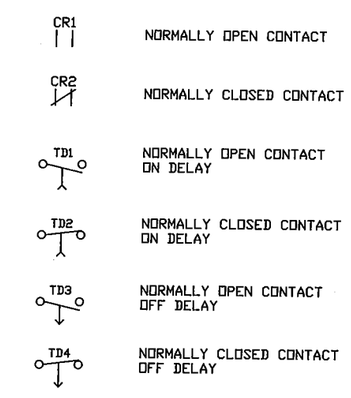
PILOT LIGHTS



INPUT/OUTPUT DEVICES



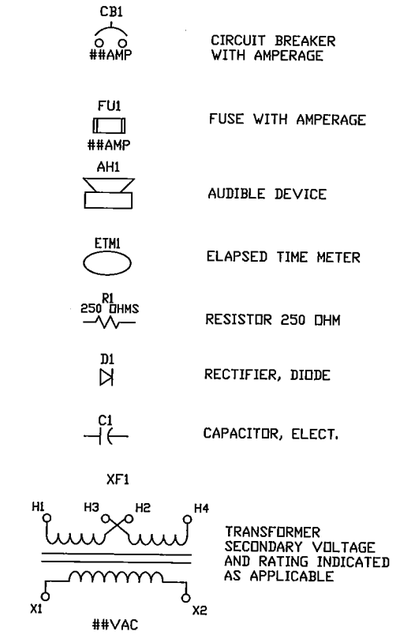
COIL CONTACTS



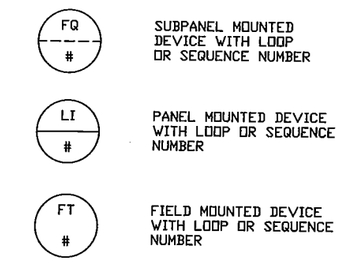
WIRE COLOR STANDARDS

BLK	BLACK, INCOMING POWER AC
WHT	WHITE, NEUTRAL AC
GRN	GREEN, GROUND
RED	RED, CONTROL POWER AC
BLU	BLUE, CONTROL POWER DC
BLU/S	BLUE WITH STRIP, CONTROL POWER COMMON DC
SHLD	SHIELDED 2 CONDUCTOR BLACK(+) WHITE(-), LOW SIGNAL CIRCUITS
YEL	YELLOW, SEPARATE EXTERNAL CONTROL POWER SOURCE

MISCELLANEOUS



INSTRUMENTATION DEVICES



ISA CODES

- FI - FLOW RATE INDICATOR
- LI - LEVEL INDICATOR
- FT - FLOW TRANSMITTER
- FY - FLOW INTEGRATOR
- FQ - FLOW QUANTITY

RESERVED WIRE NUMBERS

1	120VAC PANEL HOT	7	LOW VOLTAGE AC HOT
N	120VAC PANEL NEUTRAL	8	LOW VOLTAGE AC NEUTRAL
3	24V DC POSITIVE	10	GROUND FAULT CIRCUIT HOT
4	24V DC COMMON	N2	GROUND FAULT CIRCUIT NEUTRAL
5	12V DC POSITIVE		
6	12V DC COMMON		

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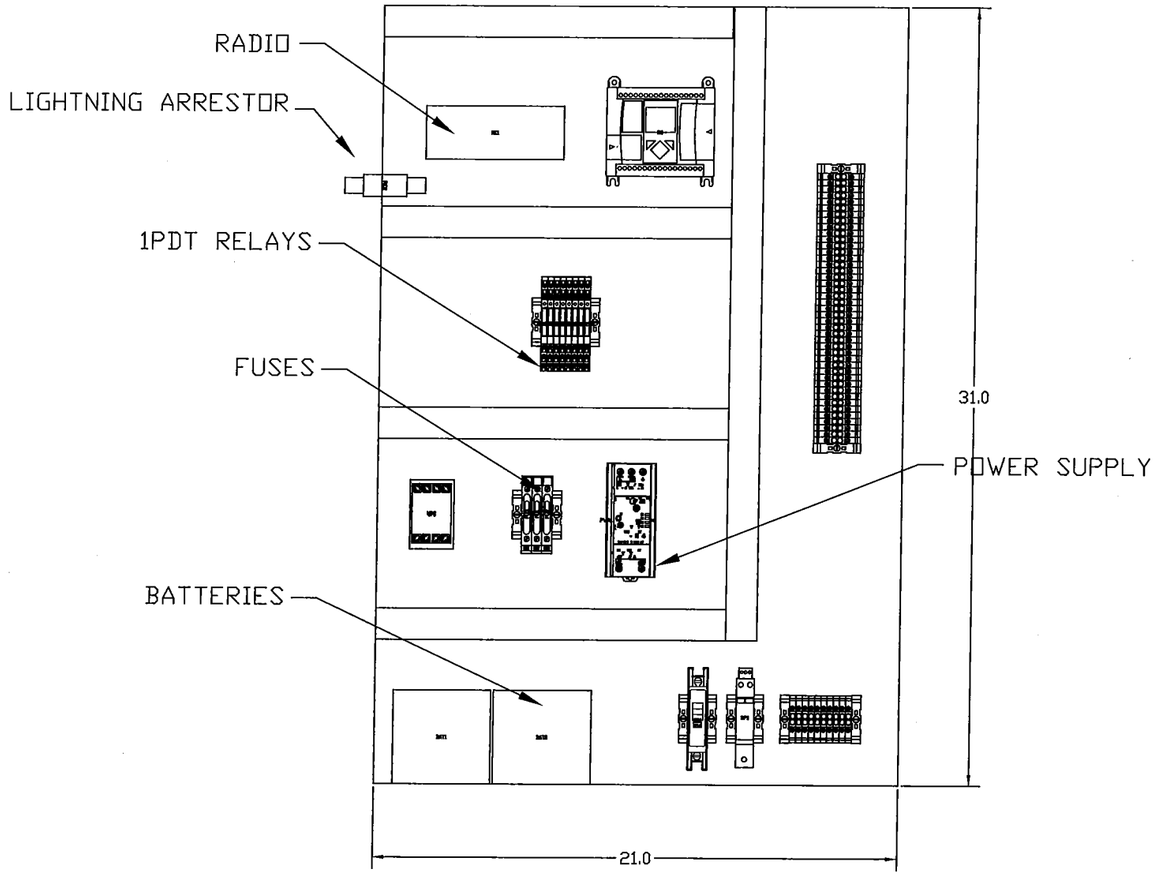
ASSEM.	
SHEET	2 OF 7

PROJECT
LOGAN, IA WTP TELEMETRY AND CONTROLS UPGRADE

LOGAN WTP WELL CONTROL PANEL SYMBOL SHEET

PROJ. NO. 3360D
DWG. NO. SYM



NOTES:

1. ENCLOSURE IS EXISTING AND WILL BE REUSED.
2. CUSTOM ALUMINUM CHASSIS.
3. UL 508A

SCALE

0 6" 12" 24"

NAMEPLATE SCHEDULE			
TAGNAME	DESC1	SIZE	REMARKS
1	LOGAN WTP WELL CONTROL	1.5X8	QTY 1
NAMEPLATES ARE BLACK WITH WHITE LETTERS			

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SHEET	3 OF 7

PROJECT
LOGAN, IA WTP TELEMETRY AND CONTROLS UPGRADE

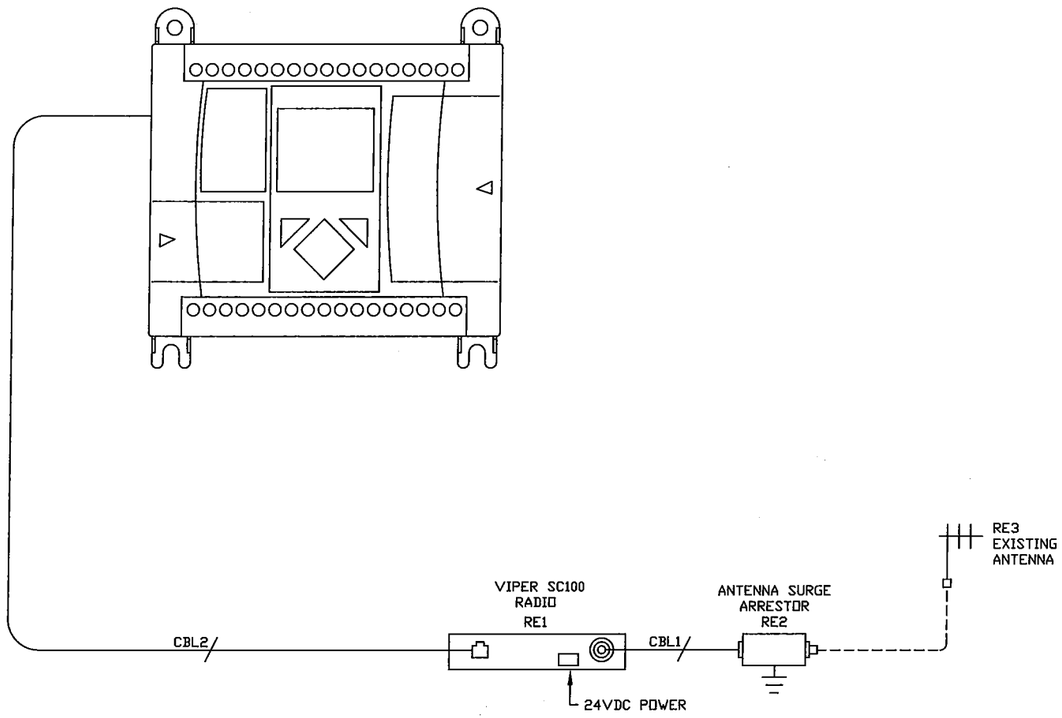
LOGAN WTP WELL CONTROL PANEL ENCLOSURE

PROJ. NO. 3360D

DWG. NO. 001

LC150 COMMUNICATION SCHEDULE

QTY	TAGS	DESCRIPTION	MFG	CATALOG
1	MICROLOGIX 1100 10DI 6DO	ALLEN BRADLEY	1763-L16BBB	W2T278195
1	RE1	LICENSED ETHERNET RADIO VIPER UHF 136-174 MHZ SERIAL, ETHERNET,TNC,10-30VDC	CALAMP	140-5018-502
1	CBL1	RADIO, ACCESSORY 24 INCH, LMR-195 TNC N-MALE	PULSTAR	PS195-24NMTM
1	CBL2	PATCH CABLE CAT-6 ETHERNET CABLE 500MHZ, BLACK, 3 FT, 24 AWG PATCH WITH MOLDEDBOOT	CABLE WHOLESALE	10X8-02203
1	RE2	LIGHTINING ARRESTOR DC TO 4 GHZ N-MALE N-MALE	CITEL	P8AX-09-N-FF



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ENGR.	TJP
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SHEET	4 OF 7

PROJECT
LOGAN, IA WTP TELEMETRY AND CONTROLS UPGRADE

LOGAN WTP WELL CONTROL PANEL
PLC I/O SCHEDULE

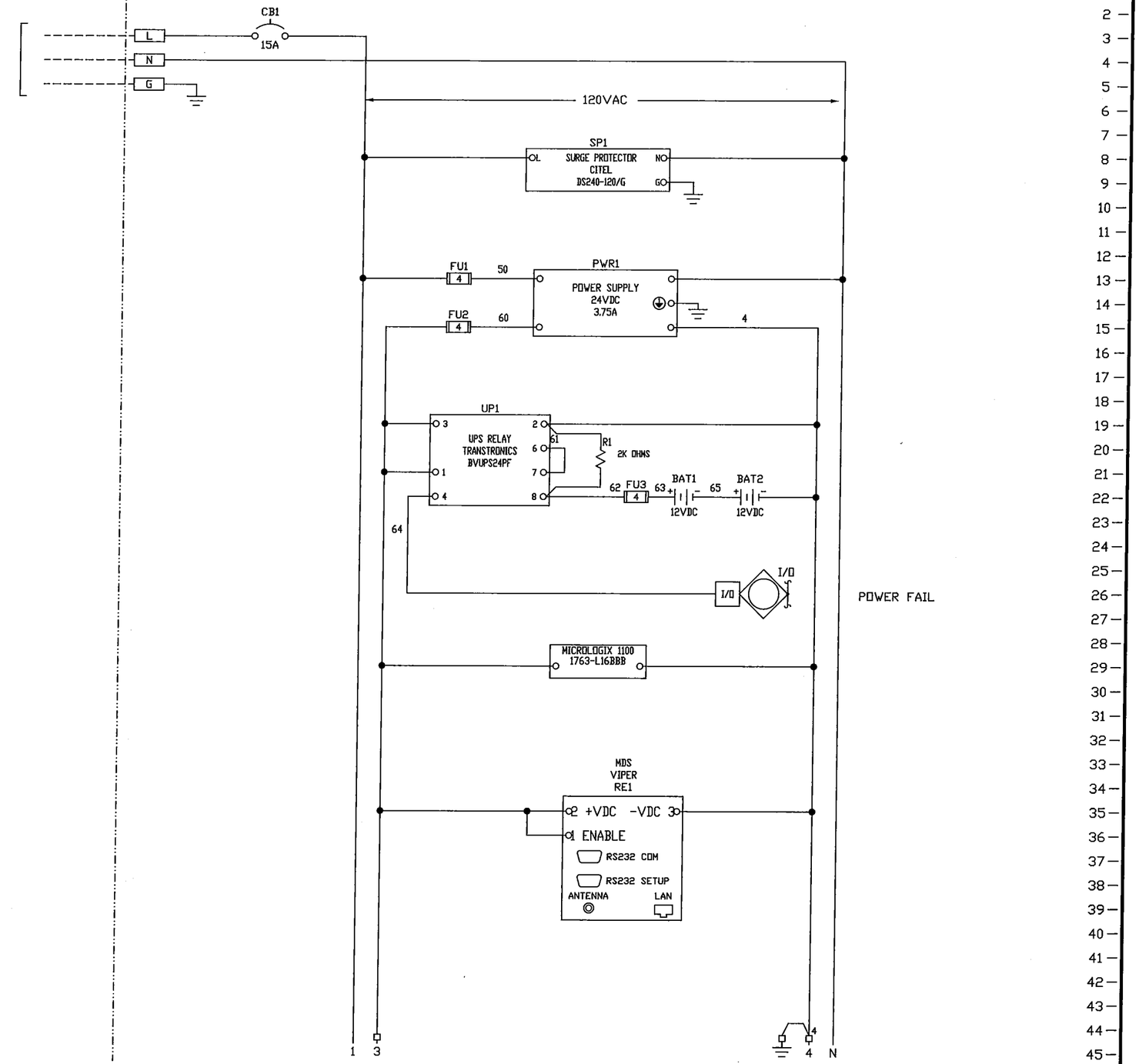
PROJ. NO. 3360D
DWG. NO. 002

FIELD OR AS NOTED

CONTROL PANEL

MAIN DISCONNECT AND BRANCH CIRCUIT PROTECTION TO BE PROVIDED BY OTHERS

120VAC, 1ø, 60HZ POWER FROM



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SHEET	5 OF 7

PROJECT
LOGAN, IA WTP TELEMETRY AND CONTROLS UPGRADE

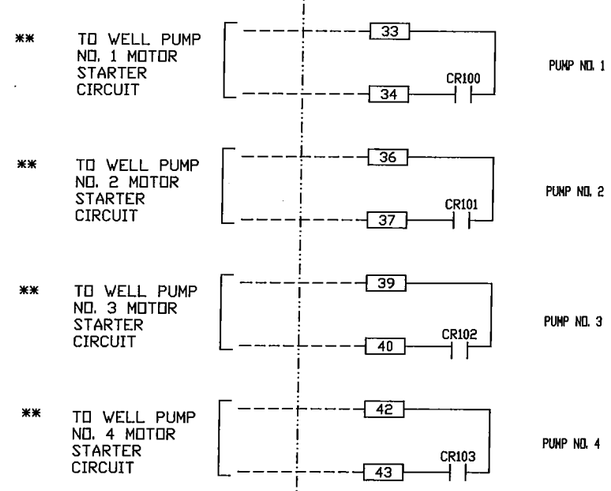
LOGAN WTP WELL CONTROL PANEL
CONTROL POWER WIRING

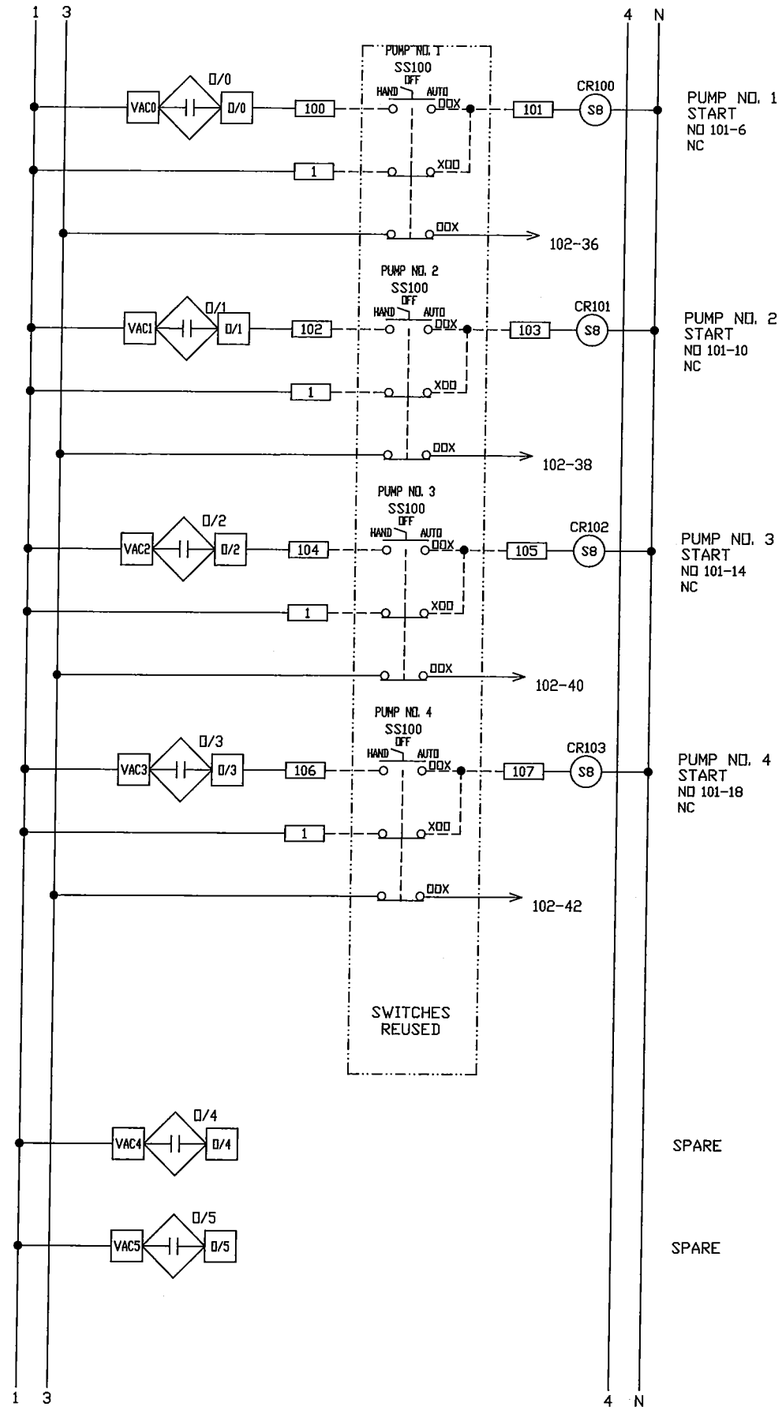
PROJ. NO. 3360D

DWG. NO. 100

FIELD OR AS NOTED

CONTROL PANEL





** PROVIDED BY OTHERS

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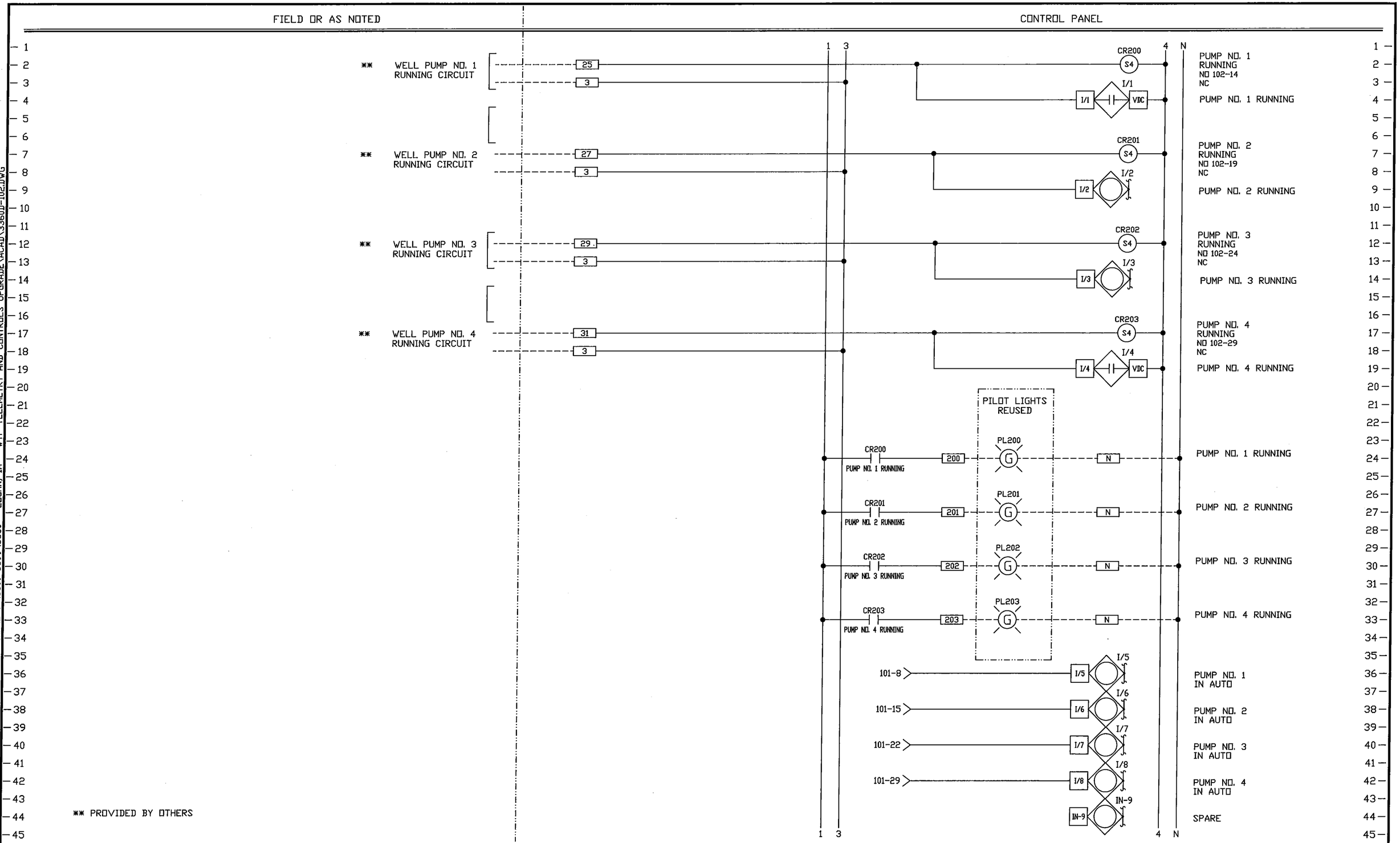
SHEET	6 OF 7

PROJECT
LOGAN, IA WTP TELEMETRY AND CONTROLS UPGRADE

LOGAN WTP WELL CONTROL PANEL
DIGITAL OUTPUTS

PROJ. NO. 3360D

DWG. NO. 101



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SHEET	7 OF 7

PROJECT
LOGAN, IA WTP TELEMETRY AND CONTROLS UPGRADE

LOGAN WTP WELL CONTROL PANEL DIGITAL INPUTS

PROJ. NO. 3360D

DWG. NO. 102

SECTION 17400

CONTROL DESCRIPTIONS

INDEX

PART 1 – GENERAL
1.01 DESCRIPTION
1.02 GENERAL REQUIREMENTS

PART 2 – FUNCTIONAL DESCRIPTIONS
2.01 GENERAL
2.02 STANDBY POWER

PART 3 – EXECUTION
NOT APPLICABLE

PART 1 – GENERAL

1.01 DESCRIPTION

A. This section describes how each portion of control system operates.

B. The functional descriptions, in conjunction with the drawings and technical requirements for products as described in Section 17300 - Control Panels, define the minimum requirements for installation.

C. All products used to meet the functional descriptions shall be those specified in Section 17300.

D. Related work specified elsewhere:
1. Division 16 - Electrical.
2. Section 17100 - Process Control and Instrumentation System.
3. Section 17300 - Control Panels.

1.02 GENERAL REQUIREMENTS

A. Alarm/Event Logging. All alarms and events shall be logged to a tabular display on the display screen with date, time, tag name, description, status, value, and priority of alarms/events. The tabular display screen shall allow the Operator to acknowledge all alarms. Events shall include start/stop of equipment, open/close or position change of valves, operator initiated changes, setpoint changes, etc. Up to an Operator adjustable setpoint number of current events and alarms shall be displayed on the tabular screen with the older events and alarms beyond that setpoint number being stored in the historical database log.

B. General Monitoring and Displaying of Discrete Input Signals. Discrete input signals which

represent equipment status shall be displayed on the display screens.

C. General Monitoring, Displaying, and Recording of Analog Input Signals. Process variable signals shall be displayed on the display screens. They shall be scaled in engineering units. All alarm limits are assigned to the associated process variable. Values shall be historically logged and trended as required.

D. Process Status. All process alarms, equipment status, and process variable values shall be available at any of the computer software display screens. Failures of any PLC on the digital communications network shall also be alarmed.

E. All computer display screens that allow an Operator to enter setpoints and to change software switches shall be password protected. An Operator must successfully log in with his password before any changeable setpoints are allowed.

F. Provide an Operator adjustable time delay setpoint with all setpoints throughout the control system.

G. Provide de-bounce timers or other programming logic throughout the system to prevent all alarms, setpoints, or controls repeat; and nuisance or otherwise unneeded alarms, starts, stops, etc.

H. Provide scan rate time delays or other programming logic throughout the system to prevent all alarms, setpoints, or controls repeat; and nuisance or otherwise unneeded alarms, starts, stops, etc.

I. Provide testing and logic to positively ensure that no lockout conditions can develop in anyway or in any form of operation, be it standard, non-standard, or emergency.

J. Monitor communications status of all remote facilities and plant panels.

K. Where alarms are called for provide High and High-High, Low and Low-Low, and others if specifically required.

L. Provide software Hand/Off/Auto switches, Duty/Standby switches, Local/Off/Remote switches, On-line/Off-line switches, Open/Close switches, Open/Stop/Close switches, Open/Stop/Close/Auto switches, Manual/Auto switches, On/Off pushbuttons, etc. for each equipment item.

M. In the Off or Off-line position, provide a software pop-up "tag-out" box with descriptor lines for Operator entry of wording describing the reason for the device being out of service, for each item of equipment, instrumentation, etc. Provide a yellow tag on the equipment device on the applicable screens to visually indicate that it is off-line and

tagged out, and cannot be operated through the control system as long as tagged out. The Off-Line switch and Tag-Out shall be used to isolate the particular device, but shall not affect the operation of the particular treatment process or plant as a whole.

N. Change piping/valves/equipment/building color to indicate flowing or not, working or not, operational or not, running or not, opened or closed, etc.

O. Screens shall be fully dynamic.

P. Provide a Microsoft Word file of the written functional description for each process element as a pop-up embedded window on each SCADA screen.

PART 2 – FUNCTIONAL DESCRIPTIONS

2.01 GENERAL

A. Control descriptions included herein are generic in nature, but reflect design intent. Descriptions may not include all functions, status and alarms; these descriptions will be modified during submittal stage; Controls Integrator shall develop algorithms based on the input/output point schedule and control descriptions.

2.02 STANDBY POWER

A. Provide for monitoring of Well Field standby generator system. Generator shall be furnished with automatic transfer switch and standalone controls.

B. Control system shall transmit status and alarm data to existing SCADA alarming system via existing radio telemetry connection. Monitor existing Well Field control panel to accept standby power system status and alarms.

C. Provide the following inputs to the existing Well Field Control Panel:
   1. Generator Running (DI).
   2. Generator Fail (DI).
   3. ATS in Normal mode (DI).
   4. ATS in Standby mode (DI).

PART 3 – EXECUTION

Not Applicable.

END OF SECTION