SPECIAL PROVISIONS

NORTHWEST SANITARY SEWER SERVICE AREA RECONSTRUCTION

ILLINOIS EPA LOAN NUMBER L17#5109
VERMILION COUNTY
CITY OF DANVILLE
JUNE 15, 2020

DANVILLE BID NUMBER 658
SECTION 1 - ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
WATER POLLUTION CONTROL LOAN PROGRAM
CERTIFICATION OF PLANS AND SPECIFICATIONS FOR COMPLIANCE WITH
THE WPCLP RULES AND FRONT END DOCUMENTS

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APPENDICIES

APPENDIX A: AQUA ILLINOIS STANDARD SPECIFICATIONS FOR THE CONSTRUCTION OF WATER MAIN
APPENDIX B: LOCATION MAP FOR THE ABANDON AND REMOVE VALVE BOX
Illinois Environmental Protection Agency - Water Pollution Control Loan Program (WPCLP)
Loan Applicant’s Certification of Plans/Specifications Compliance with WPCLP Rules
(Rev 09/21/18)

Loan Applicant:  City of Danville  L17# 5109

Project Description:
This project consists of sanitary sewer reconfiguration improvements in the Northwest Sanitary Service Area. Specific work includes the reconstruction of two lift stations (Rose Hill and Chateau), installing new forcemain to redirect their flows, and installing new gravity sewer and forcemain.

Section I – Loan Program Requirements
Provide page number(s) for location of the information below in the bidding documents/specifications.

Page #’s
1.   6 Advertisement for Bids includes notification to bidders that procurement is subject to regulations contained in the IEPA loan program rules, the Davis-Bacon Act (40 USC 276a through 276a-5), the Employment of Ill. Workers on Public Works Act and DBE Policy per 40 CFR Part 33, as amended, and the “Use of American Iron and Steel” requirements as originally contained in Section 436 of the Consolidated Appropriations Act, 2014 [Loan Rules Section 365.350(e)(1)(D)].
2.   7 Sealed Bids are required.
3.   7 Public bid opening will be held.
4.   8 Method of bid evaluation. In accordance with Section 365.350(d)(3).
5.   9 Criteria for evaluating bidders. In accordance with Section 365.350(d)(5).
6.   7 Bidders are allowed to modify/withdraw bids prior to opening.
7.   8 Award shall be made to the low, responsive, responsible bidder in accordance with Section 365.350(d)(7).
8.   9 Non-collusion and certification statement [verbatim per Section 365.350(d)(6)]. Language is attached. See attached page 9, I and II.
9.   7 Minimum 5% bid bond in accordance with Section 365.350(e)(7).
10.  7 100% performance/payment bonds.
11.   75-77 Equal Opportunity Clauses (federal Executive Order 11246).
12.  75-77 DBE provisions per 40 CFR Part 33.
13.  77-123 DBE specifications and forms. A DBE guidance package is available from the Agency. A guidance package for following DBE requirements is available from the Agency.
14.  44 The Non-Discrimination Clause is contained within the contract 365.620(a)(8). See Item 7 page 22 of the attached document.
15.  17-32 Davis-Bacon Wage Act language wages and clauses are included in the bidding documents and specifications. Contractor(s) shall pay prevailing wages at rates not less than those prevailing under the Davis-Bacon Wage Act.
16.  70 Change orders – Method for handling in accordance with Section 365.420(b)(2)
17.  70-72 Audit; access to records (verbatim per Section 365.620(a)(1, A-G)).
18.  72 Covenant against contingent fees in accordance with Section 365.620(a)(2).
19.  68,72 Certification regarding debarment in accordance with Section 365.620(a)(5).
20.  73 Contracts for Subcontractors will be in accordance with Section 365.620(b).
21.  73 Contractor Bankruptcy in accordance with Section 365.620(c).
22.  73 Remedies per Section 365.640(c).
23.  73 Access to work site allowed per Section 365.620(d).
24.  9 Substantial Completion (project is operational) specified: 300 calendar days
25. 9  Final Completion (if applicable) specified: 340 calendar days
26. 74  Certification regarding compliance with criminal code of 2012 [Section 365.350(d)(6)(A)(iii)].
27. 50  Notice of Intent to Award form [Section 365.350(e)(4)].
28. 51  Notice of Award Form.
29. 52  Notice to Proceed Form.
30. 53  Change Order Form.
31. 67  Certification of Non-Segregated Facilities Form [Section 365.620(a)(6)].
32. 54  Nondiscrimination in Employment Notice (per federal Executive Order 11246).
33. 68  Certification Regarding Debarment, Suspension, and other Responsibility Matters Form [Section 365.620(a)(5)].
34. N/A  Experience Clause requirements, if utilized, are justified in submittal dated N/A. Section 365.350(d)(5).
35. 84  Certification that all iron and steel products used in the project are produced in the United States per Section 436 of H.R. 3547, “The Consolidated Appropriations Act, 2014” [Section 365.620(a)(7)].

Section II – Approved Scope of Work
The WPCLP can only provide funding for the project scope approved in the Facilities Plan. ALL changes must be explained and justified in writing and receive Agency approval. Changes to the approved scope of work may require a Facilities Plan amendment.

YES NO  Plans and specifications have been prepared consistent with the Facilities Plan approved by
(Circle One) the Agency in a letter dated 12/1/2016. If any changes have been made to the scope
of the project after Facilities Planning approval, please identify below (include attachments
with a detailed narrative of any changes if necessary):

Section III – Loan Eligibility
In general, extended warranties, spare parts, and allowances are not eligible to receive loan funding. If this project includes any Warranties, Spare Parts, Allowances or other possible ineligible items, provide an explanation and the page number in the bidding documents where the ineligible item is located.

1. Warranties: The Loan Program can only fund the normal industry standard warranty. Any extended, special or additional warranties are not eligible in the loan program. If any warranty is more than the industry standard, please provide the cost for the warranty in excess of the industry standard.

Does this project include the purchase of any extended warranties? YES or NO (Circle One)
If YES, provide the page number and an explanation.

2. Spare Parts: Spare parts and extra materials are normally not loan eligible as they are viewed as maintenance related. To be eligible, spare parts must be justified as critical parts of major system components which are not immediately available and/or whose procurement involves an extended lead time.

Does this project include the purchase of any spare parts? YES or NO (Circle One)
If YES, provide the page number and an explanation.
3. **Allowances** (a fixed price to perform a specific scope of work) may be eligible at the time of the loan award provided justification for the allowance(s) is provided to the Agency along with a description of the scope of work and the basis for the establishment of the allowance amount. **Allowances are not allowed for equipment purchases which must be competitively bid.**

**Does this project include any allowances?** **YES** or **NO** (Circle One)

If YES, provide the page number for each allowance along with an explanation.

4. **Site Restoration**: The loan program can only fund site restoration to pre-construction conditions. For underground work, restoration is normally limited to the width of the trench. Costs for any site restoration beyond pre-construction conditions or for work outside the width of the trench should be identified.

**Does this project include any restoration costs above and beyond pre-construction conditions?** **YES** or **NO** (Circle One)

If YES, provide the page number and an explanation.

5. **Does the project include other items that may be ineligible?** Examples include costs outside the project scope, or costs considered normal operating expenses.

**YES** or **NO** (Circle One)

If YES, provide the page number and an explanation.

![Table](image)

Section IV – Labor Agreements

Are contractors bidding this project required to be or become party to a Project Labor Agreement or Multi-Project Labor Agreement?

**YES** or **NO** (Circle One)

If YES, provide a page number where the agreement is located or attach a copy of the document. Agreements may not significantly restrict competition.

Section V – Certification of Plans and Specifications

I do hereby certify that the Bidding documents and Plans and Specifications for the project entitled: **Northwest Sanitary Sewer Service Area Reconstruction** have been prepared in accordance with the requirements of Ill. Adm. Code 365, Procedures for Issuing Loans from the Water Pollution Control Loan Program for the purpose of obtaining loan funds.

**Consulting Engineer: Lee Bloome, P.E.**

**Phone Number: 217-747-9254**

**Signature**

**Date: 6/19/20**

**Loan Applicant’s Authorized Representative:** Rickey Williams Jr.

**Signature**

**Date: June 9, 2020**
DOCUMENTATION REQUIRED IN PLANS AND SPECIFICATIONS
FOR PROJECTS TO BE CONSTRUCTED UNDER THE
WATER POLLUTION CONTROL LOAN PROGRAM

The attached “front-end document package” may be utilized by the loan applicant to comply
with regulations for loans issued under the Water Pollution Control Loan Program. The loan
applicant’s use of the front-end document package and the completion and certification of the
review checklist denoting the specific location of the required items as part of the submittal of the
plans/specifications and permit application will help expedite the overall review of your project’s
contract documents.

Rev. April 2000
Rev. January 2002
Rev. March 2003
Rev. May 2003
Rev. April 2006
Rev. April 2007
Rev. April 2009
Rev. June 2010
Rev. February 2013
Rev. February 2014
Rev. December 2014
Rev. March 2016
Rev. March 2017
Rev. December 2017
Rev. September 2018 (AIS)

IL532-2564
WPC 688
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ADVERTISEMENT FOR BIDS

City of Danville, Illinois

Owner
17 W. Main Street
Address
Danville, IL 61832

Separate sealed BIDS for the construction of (briefly describe nature, scope, and major elements of the work);
Project titled “Northwest Sanitary Sewer Service Area Reconstruction” includes sanitary sewer and Denmark Road improvements. Sanitary sewer improvements include renovating two exiting lift stations, decommissioning an existing lift station, constructing a new lift station with control building and restroom, and rerouting forcemains and gravity sewers.

will be received by: The City of Danville

at the office of: City Clerk, Lisa Monson

until: 10 AM, (Standard Time-Daylight Savings Time) Friday, August 7, 2020, and then at said office publicly opened and read aloud.

“Any contract or contracts awarded under this invitation for bids are expected to be funded in part by a loan from the Illinois Environmental Protection Agency (Illinois EPA). Neither the State of Illinois nor any of its departments, agencies, or employees is or will be a party to this invitation for bids or any resulting contract. The procurement will be subject to regulations contained in the Procedures for Issuing Loans from the Water Pollution Control Loan Program (35 IAC Part 365), the Davis-Bacon Act (40 USC 276a through 276a-5) as defined by the United States Department of Labor, the Employment of Illinois Workers on Public Works Act (30 ILCS 570), and the “Use of American Iron and Steel” requirements as contained in Section 436 of H.R. 3547, The Consolidated Appropriations Act, 2014. This procurement is also subject to the loan recipient’s policy regarding the increased use of disadvantaged business enterprises. The loan recipient’s policy requires all bidders to undertake specified affirmative efforts at least sixteen (16) days prior to bid opening. The policy is contained in the specifications. Bidders are also required to comply with the President’s Executive Order No. 11246, as amended. The requirements for bidders and contractors under this order are explained in 41 CFR 60-4.”

The CONTRACT DOCUMENTS may be examined at the following locations: ____________________________________________

www.cityofdanville.org/bids-rfps.html Reference Bid #658

Copies of the CONTRACT DOCUMENTS may be obtained at the Office of: City Engineer

located at: 1155 E. Voorhees, Danville, IL 61832 upon payment of $500 for each set.

June 19, 2020
DATE

Fricky Williams, Jr.
SIGNATURE
INFORMATION FOR BIDDERS

BIDS will be received by City of Danville
(herein called the "OWNER"), at 17 West Main, Danville, IL 61832
until 10 AM, April 19, 2019, and then at said office publicly opened and read aloud.

Each BID must be submitted in a sealed envelope, addressed to City Clerk, Lisa Monson
at City of Danville. Each sealed envelope containing a BID must be plainly
marked on the outside as BID for Northwest Sanitary Sewer Service Area Reconstruction and the
envelope should bear on the outside the name of the BIDDER, his/her address, his/her license number if
applicable and the name of the project for which the BID is submitted. If forwarded by mail, the sealed
envelope containing the BID must be enclosed in another envelope addressed to the OWNER at
City of Danville, 17 West Main, Danville, IL 61832.

All BIDS must be made on the required BID form. All blank spaces for BID prices must be filled in, in ink
or typewritten, and the BID form must be fully completed and executed when submitted. Only one copy of
the BID form is required.

Any BID may be modified or withdrawn prior to the above scheduled time for the opening of BIDS or
authorized postponement thereof. Any BID received after the time and date specified shall not be
considered. No BIDDER may withdraw a BID within 10 days after the actual date of the opening thereof.
Should there be reasons why the contract cannot be awarded within the specified period, the time may be
extended by mutual agreement between the OWNER and the BIDDER.

BIDDERS must satisfy themselves of the accuracy of the estimated quantities in the BID Schedule by
examination of the site and a review of the drawings and specifications including ADDENDA. After BIDS
have been submitted, the BIDDER shall not assert that there was a misunderstanding concerning the
quantities of WORK or of the nature of the WORK to be done.

The OWNER shall provide to BIDDERS prior to BIDDING, all information that is pertinent to, and
delineates and describes, the land owned and rights-of-way acquired or to be acquired.

The CONTRACT DOCUMENTS contain the provisions required for the construction of the
PROJECT. Information obtained from an officer, agent, or employee of the OWNER or any other person
shall not affect the risks or obligations assumed by the CONTRACTOR or relieve him from fulfilling any
of the conditions of the contract.

A BID bond payable to the OWNER must accompany each BID for five percent of the total amount of
the BID. As soon as the BID prices have been compared, the OWNER will return the BONDS of all except
the three lowest responsible BIDDERS. When the Agreement is executed the bonds of the two remaining
unsuccessful BIDDERS will be returned. The BID BOND of the successful BIDDER will be retained until
the payment BOND and performance BOND have been executed and approved, after which it will be
returned. A certified check may be used in lieu of a BID BOND.

A performance BOND and a payment BOND, each in the amount of 100 percent of the CONTRACT
PRICE, with a corporate surety approved by the OWNER, will be required for the faithful performance of
the contract.

Attorneys-in-fact who sign BID BONDS or payment BONDS and performance BONDS must file with
each BOND a certified and effective dated copy of their power of attorney.

Any contract entered into by the loan recipient and any sub-agreement hereunder, shall provide that
representatives of the Agency will have access to the work whenever it is in preparation or progress and
that the contractor or subcontractor will provide proper facilities for such access and inspection. Such
contract or sub-agreement must also provide that the Agency or any authorized representative shall have
access to any books, documents, papers, and records of the contractor or subcontractor, which are pertinent to the project for the purpose of making audit, examination, excerpts, and transcriptions thereof.

The party to whom the contract is awarded will be required to execute the Agreement and obtain the performance BOND and payment BOND within ten (10) calendar days from the date when NOTICE OF AWARD is delivered to the BIDDER. The necessary Agreement and BOND forms shall accompany the NOTICE OF AWARD. In case of failure of the BIDDER to execute the Agreement, the OWNER may at his option consider the BIDDER in default, in which case the BID BOND accompanying the proposal shall become the property of the OWNER.

The OWNER within ten (10) days of receipt of acceptable performance BOND, payment BOND and Agreement signed by the party to whom the Agreement was awarded shall sign the Agreement and return to such party an executed duplicate of the Agreement. Should the OWNER not execute the Agreement within such period, the BIDDER may by WRITTEN NOTICE withdraw his signed Agreement. Such notice of withdrawal shall be effective upon receipt of the notice by the OWNER.

The OWNER shall issue the NOTICE TO PROCEED within ten (10) days of the execution of the Agreement. Should there be reasons why the NOTICE TO PROCEED cannot be issued within such period, the time may be extended by mutual agreement between the OWNER and CONTRACTOR. If the NOTICE TO PROCEED has not been issued within the ten (10) day period or within the period mutually agreed upon, the CONTRACTOR might terminate the Agreement without further liability on the part of either party.

The OWNER may make such investigations as he deems necessary to determine the ability of the BIDDER to perform the WORK, and the BIDDER shall furnish to the OWNER all such information and data for this purpose as the OWNER may request. The OWNER reserves the right to reject any BID if the evidence submitted by, or investigation of, such BIDDER fails to satisfy the OWNER that such BIDDER is properly qualified to carry out the obligations of the Agreement and to complete the WORK contemplated therein.

A conditional or qualified BID will not be accepted.

Award will be made to the low, responsive, responsible BIDDER.

All applicable laws, ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the PROJECT shall apply to the contract throughout including the Employment of Illinois Workers on Public Works Act (30 ILCS 570) and the Davis-Bacon Wage Act (40 USC 276a through 276a-5) as defined by the United States Department of Labor.

All BIDDERS will comply with Sec. 436 of H.R. 3547, “The Consolidated Appropriations Act, 2014”, which specifies that all “iron and steel products” used in the project are produced in the United States.

BIDDER shall not discriminate on the basis of race, color, national origin or sex in the performance of this contract. The contractor shall carry out applicable requirements of 40 CFR Part 33 in the award and administration of contracts awarded under EPA financial assistance agreements. Failure by the contractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract or other legally available remedies.

Each BIDDER is responsible for inspecting the site and for reading and being thoroughly familiar with the CONTRACT DOCUMENTS. The failure or omission of any BIDDER to do any of the foregoing shall in no way relieve any BIDDER from any obligation in respect to his BID.

Each BIDDER shall supply a list of all subcontractors that submitted proposals and if requested by the OWNER all major material suppliers.

Inspection trips for prospective BIDDERS will leave from the office of the Not Applicable

The ENGINEER is Lee Bloome, P.E.  . His/her address is 1525 South 6th Street, Springfield, IL 62703
BID FORM OR PROPOSAL

Proposal of _______________________________ (hereinafter called "BIDDER"), organized and existing under the laws of the State of _______________________________ doing business as _______________________________ (hereinafter called "OWNER").

In compliance with your Advertisement for Bids, BIDDER hereby proposes to perform all WORK for the construction of Northwest Sanitary Sewer Service Area Reconstruction in strict accordance with the CONTRACT DOCUMENTS, within the time set forth therein, and at the prices stated below.

BIDDER hereby agrees to commence WORK under this contract on or before a date to be specified in the NOTICE TO PROCEED and to substantially complete the project in 300 consecutive calendar days and to fully complete the PROJECT within 340 consecutive calendar days thereafter. BIDDER further agrees to pay as liquidated damages, the sum of $500 for each consecutive calendar day thereafter.

BIDDER certifies that all iron and steel products used in the project for the construction, alteration, maintenance, or repair of a public water system are produced in the United States in compliance with Section 436. (a) – (f) of H. R. 3547, “The Consolidated Appropriation Act, 2014”.

* Insert “a corporation”, “a partnership”, or “an individual” as applicable.

(I) By submission of the bid, each bidder certifies, and in the case of a joint bid each party thereto certifies as to his own organization, that in connection with the bid:

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

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

   (iii) No attempt has been made or will be made by the bidder to induce any other person or firm to submit or not to submit a bid for the purpose of restricting competition.

(II) Each person signing the bid shall certify that:

   (i) He is the person in the bidder’s organization responsible within that organization for the decision as to the prices being bid and that he has not participated, and will not participate, in any action contrary to (I)(i) through (I)(iii) above; or

   (ii) He is not the person in the bidder’s organization responsible within that organization for the decision as to the prices being bid but that he has been authorized to act as agent for the persons responsible for such decision in certifying that such persons have not participated, and will not participate, in any action contrary to (I)(i) through (I)(iii) above, and as their agent shall so certify; and shall also certify that he has not participated, and will not participate, in any action contrary to (I)(i) through (I)(iii) above.

BIDDER acknowledges receipt of the following ADDENDUM (where applicable):

____________________________________________________________________
____________________________________________________________________
BIDDER certifies that wages paid in connection with the PROJECT shall be paid at prevailing rates not less than those prevailing under the Davis-Bacon Wage Act. Bidder further certifies that the provisions contained in the following clauses will be exercised in the performance of any contract resulting from this BID and are made a part of the CONTRACT DOCUMENTS thereto by their inclusion in the BID as follows:

(1) Minimum wages.
   (i) All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in §5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer’s payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers. Sub recipients may obtain wage determinations from the U.S. Department of Labor’s web site, www.dol.gov.

(ii) (A) The sub-recipient, on behalf of USEPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The USEPA award official shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:
   (1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
   (2) The classification is utilized in the area by the construction industry; and
   (3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

   (B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the sub-recipient agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the sub-recipient to IEPA. IEPA shall forward the report to the Administrator of the Wage and Hour Division, U.S. Department of Labor, Washington,
DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise IEPA or will notify IEPA within the 30-day period that additional time is necessary.

(C) In the even the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the sub-recipient do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), IEPA shall refer the questions, including the views of all interested parties and the recommendation of the sub-recipient, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise IEPA or will notify IEPA within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The sub-recipient shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the sub-recipient may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis Bacon Act), daily and weekly number of hours worked, deductions made and actual wages
paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii) (A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the sub-recipient. Such documentation shall be available upon request of IEPA or USEPA. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee’s social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site https://www.dol.gov/whd/forms/index.htm. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the sub-recipient, for transmission to the IEPA, USEPA, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sub-recipient.

(B) Each payroll submitted shall be accompanied by a “Statement of Compliance,” signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

1. That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

2. That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

3. That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the “Statement of Compliance” required by paragraph (a)(3)(ii)(B) of this section.
(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of IEPA, USEPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid no less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman’s hourly rate) specified in the contractor’s or subcontractor’s registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice’s level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.
(ii) **Trainees.** Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by form certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee’s level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) **Equal employment opportunity.** The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) **Compliance with Copeland Act requirements.** The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) **Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the USEPA may by appropriate instruction require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) **Contract termination: debarment.** A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) **Compliance with Davis Bacon and Related Act requirements.** All rulings and interpretations of the Davis Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) **Disputes concerning labor standards.** Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any
of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor’s firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements in prescribed in the U.S. Criminal Code, 18 U.S.C. 1001

Contract Provision for Contracts in Excess of $100,000 - clauses (1) through (4) shall be inserted in full in any contract in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act.

Contract Work Hours and Safety Standards Act

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanics receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanics, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of $25 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The sub-recipient, shall upon its own action or upon written request of the USEPA award official or an authorized representative of the Department of Labor, withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for
compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

The following shall be inserted into any contract subject only to the Contract Work Hours and Safety Standards Act.

The contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the USEPA and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

*****Insert applicable current Davis-Bacon Wage Rates Here*****
"General Decision Number: IL20200002 06/12/2020

Superseded General Decision Number: IL20190002

State: Illinois

Construction Type: Building


BUILDING CONSTRUCTION PROJECTS (does not include residential construction consisting of single family homes and apartments up to and including 4 stories)

Note: Under Executive Order (EO) 13658, an hourly minimum wage of $10.80 for calendar year 2020 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least $10.80 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2020. If this contract is covered by the EO and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must pay workers in that classification at least the wage rate determined through the conformance process set forth in 29 CFR 5.5(a)(1)(ii) (or the EO minimum wage rate, if it is higher than the conformed wage rate). The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.
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**ALEXANDER, CHRISTIAN, DE WITT, FAYETTE, JACKSON, JEFFERSON,**

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**CHAMPAIGN, CLARK, DOUGLAS, EDGAR, AND VERMILION COUNTIES**

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**CHAMPAIGN, DE WITT, FORD, IROQUOIS, and VERMILION COUNTIES**

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BRIL0008-015 05/01/2019

CHAMPAIGN, COLES, DOUGLAS, EDGAR, FORD(South of Roberts), PIATT & VERMILION COUNTIES

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CARP0243-002 05/01/2017

CHAMPAIGN, EDGAR AND VERMILION COUNTIES

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CARP1051-004 05/01/2017

CHAMPAIGN, CHRISTIAN, CLARK, COLES, CRAWFORD, CUMBERLAND, DOUGLAS, EDGAR, EFFINGHAM, JASPER, MOULTRIE, PIATT, SHELBY AND VERMILION COUNTIES

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ELEC0538-003 01/01/2020

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and WABASH COUNTIES

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BUILDING

IROQUOIS (Southeastern side), and VERMILION COUNTIES

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<td>ELEV0003-003 01/01/2020</td>
<td></td>
</tr>
</tbody>
</table>

FOOTNOTES:
a) Employer contributes 8% of regular basic hourly rate as vacation pay credit for employees with more than 5 years of service, and 6% for less than 5 years of service.


---

<table>
<thead>
<tr>
<th>Rates</th>
<th>Fringes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELEVATOR MECHANIC.................$ 49.57</td>
<td>34.765+a+b</td>
</tr>
</tbody>
</table>

FOOTNOTES:

a) Employer contributes 8% of regular basic hourly rate as vacation pay credit for employees with more than 5 years of service; and 6% for 6 months to 5 years of service.

b) Paid Holidays: New Year's Day; Memorial Day; Independence Day; Labor Day; Thanksgiving Day; the Friday after Thanksgiving Day; Veterans' Day and Christmas Day.

---

<table>
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<tr>
<th>Rates</th>
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<tbody>
<tr>
<td>ELEVATOR MECHANIC.................$ 47.72</td>
<td>34.765+a+b</td>
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</table>

FOOTNOTES:

A. Employer contributes 8% of regular basic hourly rate as vacation pay credit for employees with more than 5 years of service, and 6% for under 5 years of service.

B. Paid Holidays: New Year's Day; Memorial Day; Independence Day; Labor Day; Thanksgiving Day; Day after Thanksgiving; Veterans' Day & Christmas Day.

---

CHAMPAIGN, CLARK, COLES, CUMBERLAND, DOUGLAS, EDGAR, MOULTRIE,
and VERMILION COUNTIES

<table>
<thead>
<tr>
<th>OPERATOR: Power Equipment</th>
<th>Rates</th>
<th>Fringes</th>
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<tbody>
<tr>
<td>GROUP 1</td>
<td>$41.65</td>
<td>22.00</td>
</tr>
<tr>
<td>GROUP 2</td>
<td>$26.55</td>
<td>22.00</td>
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POWER EQUIPMENT OPERATOR CLASSIFICATIONS

GROUP 1: Power Cranes, Draglines, Derricks, Shovels, Gradalls, Mechanics, Tractor Highlift, Tournadozer, Concrete Mixers with Skip, Tournamixer, Two-Drum Machine, One-Drum Hoist with Tower or Boom, Cableways, Tower Machines, Motor Patrol, Boom Tractor, Boom or Winch Truck, Winch or Hydraulic Boom Truck, Truck Crane, Tournapull, Tractor Operating Scoops, Bulldozer, Push Tractor, Asphalt Planer, Finishing Machine on Asphalt, Large Rollers on Earth, Rollers on Asphalt Mix, Ross Carrier or Similar Machine, Gravel Processing Machine, Asphalt Plant Engineer, Paver Operator, Farm Tractor with Half Yard Bucket and/or Backhoe Attachments, Dredge Engineer, or Dredge Operator, Central Mix Plant Engineer, CMI or Similar Type Machine, Truck or Skid Mounted Concrete Pump, Tower Crane, Engine or Rock Crusher Plant, Concrete Plant Engineer, Ditching Machine with Dual Attachment, Tractor Mounted Loaders, Cherry Picker, Hydro Crane, Standard or Dinney Locomotives, Scoopmobiles, Euclid Loader, Soil Cement Machine, Back Filler, Elevating Machine, Power Blade, Drilling Machines Including Well Testing, Caissonts, Shaft or Any Similar Type Drilling Machines, Motor Driven Paint Machine, Pipe Cleaning Machine, Pipe Wrapping Machine, Pipe Bending Machine, Apsco Paver, Boring Machine, (Head Equipment Greased), Barber- Greene Loaders, Formless Paver, (Well Point System), Concrete Spreader, Hydra Ax, Span Saw and Similar Types, Marine Scoops, Brush Mulcher, Brush Burner, Mesh Placer, Tree Mover, Helicopter Crew (3), Piledriver - Skid or Crawler, Stump Remover, Root Rake, Tug Boat Operator, Refrigerating Machine, Freezing Operator, Chair Cart- Self Propelled, Hydra Seeder, Straw Blower, Power Sub Grader, Bull Float, Finishing Machine, Self-Propelled Pavement Breaker (Backhoe Attached), Lull (or Similar Type Machine), Two Air Compressors, Compressors Hooked in Manifold, Overhead Crane, Chip Spreader, Mud Cat, Sull-Air Fork Lifts (Except When Used For Landscaping Work), Soil Stabilazer (Seaman Tiller, Bo Mag, Rago Gator and Similar Types or Equipment), Tube Float, Spray Machine, Curing
GROUP 2: Concrete Mixers Without Skips, Rock Crusher, Ditching Machine Under 6', Curbing Machine, one Drum Machines without Tower or Boom, Air Tugger, Self-Propelled Concrete Saw, Machine-Mounted Post Hole Digger, Two to Four Generators, Water Pumps, or Welding Machines, within 400ft., Air Compressor 600 cu. ft. and Under, Rollers on Aggregate and Seal Coat Surfaces, Fork Lifts (When Used For Landscaping Work, Concrete and Blacktop Curb Machine, Farm Tractor with less than Half Yard Bucket, One Water Pump, Oilers, Air Valves or Steam Valves, One Welding Machine, Truck Jack, Mud Jack, Gunnite Machine, House Elevators when used for Hoisting Material, Engine Tenders, Wagon Drill, Flex Plane, Conveyor, Siphons and Pulsometer, Switchman, Fireman on Paint Pots, Fireman on Asphalt Plants, Distributor Operators on Trucks, Tampers, Self-Propelled Power Broom, Striping Machine (Motor Driven), Form Tamper, Bulk Cement Plant Equipment Greaser, Deck Hands, Truck Crane Oiler-Driver, Cement Blimps, Form Grader, Temporary Heat, Throttle Valve, Farm Tractor, Super Sucker (and Similar Type of Equipment)

IRON0380-001 05/01/2018

CHAMPAIGN, DE WITT (Eastern Half), DOUGLAS, EDGAR, FORD, IROQUOIS, MOULTRE, PIATT, and VERMILION COUNTIES

<table>
<thead>
<tr>
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<tr>
<td>IRONWORKER.......................$ 32.86</td>
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LABO0703-007 05/01/2020

VERMILION COUNTY

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<tr>
<td>LABORERS</td>
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<tr>
<td>Asbestos Abatement Worker...$ 31.39</td>
<td>26.17</td>
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<tr>
<td>General Laborer..............$ 28.89</td>
<td>26.07</td>
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</table>

LABORER CLASSIFICATIONS
GROUP 1: General Laborer and Skilled Laborer - Handling of materials treated with oil, creosote, asphalt and/or foreign material harmful to skin or clothing; Track Laborers; Cement Handlers; Chloride Handlers; Unloading and Laborers with Steel Workers and Re-bars; Concrete Workers (wet); Batch Dumpers; Mason Tenders; Kettle and Tar Men; Tank Cleaners; Plastic Installers; Scaffold Workers; Motorized buggies or motorized unit used for wet concrete or handling of building materials; Laborers with de-watering systems; Sewer workers plus depth; Vibrator Operators; Motor Mixer Operators; Cement Silica, clay, fly ash, lime and plasters, handlers (bulk or bag); Cofferdam Workers plus depth; Concrete paving, placing, cutting and tying of reinforcing; Deck hand, dredge hand and shore laborers; Bankmen on floating plant; Asphalt Workers with machine and layers; Grade checker; Power Tools; Driving all stakes, stringlines for all machinery; Setting and building of manholes and catch basins; Stripping of all concrete forms except paving forms; All concrete paving and slope walls, placing, cutting and tying of reinforcing (re-bars and wire mesh); Caisson Workers plus depth; Gunnite Nozzle Men; Lead Man on Sewer Work; Welders, Cutters, Burners, & Torchmen; Chain Saw Operators; Paving Breaker, Jackhammer & Drill Operators; Layout Man and/or Tile Layer; Steel Form Setters (Street & Hwy); Air Tamping hammerman; Signalman on Crane; Concrete Saw Operator; Screenman on Asphalt Pavers; Front End Man on Chip Spreader; Laborers Tending Masons with hot materials or where foreign materials are used; Multiple Concrete duct-leadman; Luteman; Asphalt Raker; Curb Asphalt Machine Operator; Ready mix scalemen, permanent, portable or temporary plant; Laborers Handling Masterplate or similar materials; Laser Beam Operator; Coring Machine Operator; Plasterer Tenders; Underpinning and Shoring of Building; Material selector when working with firebrick or castable materials; Fire Watch; Signaling of all power equipment; Tree Topper or Trimmer; Tunnel Helpers in free air; Rod and Chainmen with Lead Surveyors, Surveyors, and Technical Engineers; Concrete Burning Machine Operator

GROUP 2: Asbestos Abatement Worker and Hazardous Waste Worker; Dynamite man; Lead Base Paint Abatement Worker

PAIN0363-001 05/01/2017

CHAMPAIGN, COLES, CUMBERLAND, DOUGLAS, and VERMILION COUNTIES
<table>
<thead>
<tr>
<th>Rates</th>
<th>Fringes</th>
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<tbody>
<tr>
<td>$ 35.29</td>
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Epoxy or Toxic-Lead-Based Paint Work—$1.00 Premium

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<table>
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<th>Rates</th>
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<tr>
<td>$ 36.85</td>
<td>21.80</td>
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<table>
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<tbody>
<tr>
<td>$ 21.50</td>
<td>14.35</td>
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Spray, sandblasting and water blast units with 3500 PSI receive $.50 per hour premium. All work forty feet and above receive $1.00 per hour premium.

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<table>
<thead>
<tr>
<th>Rates</th>
<th>Fringes</th>
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</thead>
<tbody>
<tr>
<td>$ 33.40</td>
<td>24.80</td>
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<table>
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<tbody>
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<td>$ 33.40</td>
<td>24.80</td>
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CLARK, EDGAR, and VERMILION COUNTIES

<table>
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<tbody>
<tr>
<td>GLAZIER........</td>
<td>$ 28.21</td>
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PLAS0143-001 05/01/2018

CHAMPAIGN, CLARK, COLES, CRAWFORD, CUMBERLAND, DOUGLAS, EDGAR, EFFINGHAM, FORD, LAWRENCE, MOULTRIE, PIATT, VERMILION, AND WABASH COUNTIES

<table>
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<tr>
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<td>CEMENT MASON/CONCRETE FINISHER...</td>
<td>$ 33.16</td>
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<tr>
<td>PLASTERER..........................</td>
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PLUM0157-003 01/01/2020

Clark, Crawford, Douglas, Edgar, Richland, and Vermilion Counties

<table>
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<tr>
<th>Rates</th>
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<tbody>
<tr>
<td>PLUMBER, PIPEFITTER, STEAMFITTER...</td>
<td>$ 38.23</td>
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</table>

ROOF0097-001 06/01/2020

CHAMPAIGN, CLARK, COLES, CUMBERLAND, DOUGLAS, EDGAR, FORD (South of Piper City), PIATT (EAST SECTION OF PIATT, WEST OF & EXCLUDING THE CITIES OF MONTICELLO & LODGE), and VERMILION COUNTIES

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>ROOFER........</td>
<td>$ 34.18</td>
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</table>
CHAMPAIGN, COLES, CUMBERLAND, DOUGLAS, FORD, MOULTRIE, PIATT, SHELBY & VERMILION COUNTIES

Rates Fringes

Sheet metal worker...............$ 37.37 27.65

SHEE0265-002 12/01/2018

IROQUOIS COUNTY

Rates Fringes

Sheet metal worker...............$ 48.02 30.53

SHEE0268-003 07/01/2017

ALEXANDER, CLAY, EDWARDS, EFFINGHAM, FAYETTE, FRANKLIN, GALLATIN, HAMILTON, HARDIN, JACKSON, JASPER, JEFFERSON, JOHNSON, MARION, MASSAC, PERRY, POPE, PULASKI, RICHLAND, SALINE, UNION, WABASH, WAYNE, WHITE, and WILLIAMSON COUNTIES

Rates Fringes

Sheet metal worker...............$ 34.27 20.20

TEAM0026-002 05/01/2019

CHAMPAIGN, COLES, CUMBERLAND, DEWITT, DOUGLAS, EFFINGHAM, FORD (Southern Section - Elliot, Gibson City, Harpster, Melvin, Paxton, Roberts & Sibley), IROQUOIS (Fountain Creek, Lovejoy, Milford, Pigeon Grove, Prairie Green & Stockland), JASPER, MOULTRIE (East of a line from the Northeast corner of the county extending Southeast in the direction of Findlay (Shelby County) to a point that intersects the Shelby County line), PIATT (East of a line from where the DeWitt County line intersects Route 10 in a Southeast direction towards the Southeast corner of the county), SHELBY (East of an imaginary line beginning at the Northeast border with Moultrie County extending Southwest in the direction of Findlay and continuing to an imaginary point 2.5 miles South of Middlesworth that parallels the Cumberland County line), AND VERMILION COUNTIES

Rates Fringes
TRUCK DRIVER

Group 1 ......................... $ 38.06 19.62
Group 2 ......................... $ 38.61 19.62
Group 3 ......................... $ 38.87 19.62
Group 4 ......................... $ 39.23 19.62
Group 5 ......................... $ 40.27 19.62

CLASSIFICATIONS:

GROUP 1: Drivers on 2 axles hauling less than 9 tons; air compressor & welding machines and brooms, including those pulled by separate units; Truck Driver Helper, warehouse employees; Mechanic Helpers; greasers and tiremen; pick-up trucks when hauling material, tools, or workers to and from and on the job site; and forklifts up to 6,000 lb capacity.

GROUP 2: 2 or 3 axles hauling more than 9 tons but hauling less than 16 tons; A-frame winch trucks; hydrolift trucks; Vactor Trucks or similar equipment when used for transportation purposes; Forklift over 6,000 lb. capacity; winch trucks; and four axle combination units.

GROUP 3: 2, 3 or 4 Axles hauling 16 tons or more; 5-Axles or more combination units; drivers on water pulls; articulated dump trucks; mechanics and working forepersons.

GROUP 4: Low Boy and Oil Distributors.

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

----------------------------------------------------------------

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

================================================================

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

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

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

Union Rate Identifiers

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

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

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

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

Union Average Rate Identifiers

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

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

WAGE DETERMINATION APPEALS PROCESS

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

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

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

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

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

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

Wage and Hour Administrator  
U.S. Department of Labor  
200 Constitution Avenue, N.W.  
Washington, DC 20210

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

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

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

4.) All decisions by the Administrative Review Board are final.
END OF GENERAL DECISION"
BIDDER agrees to perform all the work described in the CONTRACT DOCUMENTS for the following unit prices or lump sum:

### BID SCHEDULE

<table>
<thead>
<tr>
<th>IDOT NO.</th>
<th>ITEM</th>
<th>UNIT</th>
<th>BASE QUANTITY</th>
<th>UNIT PRICE</th>
<th>TOTAL COST</th>
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<td>UNIT PRICE</td>
<td>TOTAL COST BASE BID</td>
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Bidder’s Proposal for making entire improvement, Base Bid $_________________

Date the Bidder’s responsibility for the temporary barrier ends per the Contract Coordination section of the Special Provisions Date:______________

Bidder is currently certified as an MBE or WBE under EPA’s DBE Program? Yes____ No ____
Respectfully submitted:

________________________________________
Signature      Address

________________________________________
Title          Date

________________________________________
Telephone #    E-mail Address

(SEAL - if BID is by a corporation)

Attest ________________________________
MAJOR ITEMS OF EQUIPMENT

It is hereby expressly agreed that the Contractor shall furnish and install in full compliance with the Plans and Contract Documents, the major items of equipment, as manufactured or supplied by the following listed manufacturers or suppliers:

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</tr>
</tbody>
</table>
BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned, ____________________________ as Principal, and ____________________________ as Surety, are hereby held and firmly bound unto ____________________________ as OWNER in the penal sum of ____________________________ for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors and assigns.

Signed, this ______ day of ____________________________, 20______

The Condition of the above obligation is such that whereas the Principal has submitted to ____________________________ a certain BID, attached hereto and hereby made a part hereof to enter into a contract in writing, for the

______________________________

______________________________

NOW, THEREFORE,

(a) If said BID shall be rejected, or

(b) If said BID shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attached hereto (properly completed in accordance with said BID) and shall furnish a BOND for his faithful performance of said contract, and for the payment of all persons performing labor or furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said BID, then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety for any and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.
The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its BOND shall be in no way impaired or affected by any extension of the time within which the OWNER may accept such bid; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and such of them as are corporations have caused their corporate seals to be hereto affixed and these presents to be signed by their proper officers, the day and year first set forth above.

______________________________ (L.S.)
Principal

______________________________
Surety

By: ____________________________

IMPORTANT-Surety companies executing BONDS must appear on the Treasury Department’s most current list (Circular 570 as amended) and be authorized to transact business in the state where the project is located.
AGREEMENT

THIS AGREEMENT, made this_________day of__________________, 20________, by and between__________________________________________________________, hereinafter called "OWNER" and ________________________________________ doing business as (an individual) or (a partnership) or (a corporation) hereinafter called "CONTRACTOR".

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned:

1. The CONTRACTOR will commence and complete the construction of __________________________

2. The CONTRACTOR will furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of the PROJECT described herein.

3. The CONTRACTOR will commence the work required by the Contract Documents within 10 calendar days after the date of the NOTICE TO PROCEED and will complete the same within 300 calendar days unless the period for completion is extended otherwise by the CONTRACT DOCUMENTS.

4. The CONTRACTOR agrees to perform all of the WORK described in the CONTRACT DOCUMENTS and comply with the terms therein for the sum of $____________, or as shown in the BID schedule.

5. The term "CONTRACT DOCUMENTS" means and includes the following:
   (A) Advertisement for BIDS
   (B) Information for BIDDERS
   (C) BID
   (D) BID BOND
   (E) Agreement
   (F) Payment BOND
   (G) Performance BOND
   (H) NOTICE OF AWARD
   (I) NOTICE TO PROCEED
   (J) CHANGE ORDER
   (K) DRAWINGS prepared by _______Hanson Professional Services Inc.________________________
6. The OWNER will pay to the CONTRACTOR in the manner and at such times, such amounts as required by the CONTRACT DOCUMENTS.

7. The contractor shall not discriminate on the basis of race, color, national origin or sex in the performance of this contract. The contractor shall carry out applicable requirements of 40 CFR Part 33 in the award and administration of contracts awarded under EPA financial assistance agreements. Failure by the contractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract or other legally available remedies.

8. This Agreement shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns.

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement in (__________________) each of which shall be deemed an original on the date first above written.
PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS: that

__________________________________________________________
(Name of Corporation)

__________________________________________________________
(Address of Corporation)

a . (Corporation, Partnership, or Individual) hereinafter called Principal and

__________________________________________________________
(Name of Surety)

__________________________________________________________
(Address of Surety)

hereinafter called Surety, are held and firmly bound unto __________________________

__________________________________________________________
(Name of Owner)

__________________________________________________________
(Address of Owner)

hereinafter called OWNER, in the penal sum of __________________________

__________________________________________________________
Dollars, $(________________________)

in lawful money of the United States, for the payment of which sum well and truly to be made, we bind
ourselves, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain
contract with the OWNER, dated the __________ day of __________ 20________, a copy
of which is hereto attached and made a part hereof for the construction of:

__________________________________________________________
__________________________________________________________
__________________________________________________________

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings,
covenants, terms, conditions, and agreements of said contract during the original term thereof, and any
extensions thereof which may be granted by the OWNER, with or without notice to the Surety and during
the one year guaranty period, and if he shall satisfy all claims and demands incurred under such contract,
and shall fully indemnify and save harmless the OWNER from all costs and damages which it may suffer
by reason of failure to do so, and shall reimburse and repay the OWNER all outlay and expense which the
OWNER may incur in making good any default, then this obligation shall be void; otherwise to remain in
full force and effect.

PROVIDED, FURTHER, that the said surety, for value received hereby stipulates and agrees that no
change, extension of time, alteration or addition to the terms of the contract or to WORK to be performed
hereunder or the SPECIFICATIONS accompanying the same shall in any wise affect its obligation on this
BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the
terms of the contract or to the WORK or to the SPECIFICATIONS.
PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in __________ counterparts, each one of which shall be deemed an original, this ______ day of _______________ 20 __________.

ATTEST:

__________________________________________

__________________________________________    By: ________________________________

(SEAL)

__________________________________________

__________________________________________

__________________________________________

__________________________________________

__________________________________________

ATTEST:

__________________________________________

(SEAL)

__________________________________________    By: ________________________________

__________________________________________

__________________________________________

__________________________________________

__________________________________________

NOTE: Date of BOND must not be prior to date of Contract.
If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department’s most current list (Circular 570 as amended) and be authorized to transact business in the state where the PROJECT is located.
PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS: that

________________________________________________________________________
(Name of Contractor)
________________________________________________________________________
(Address of Contractor)
a__________________________________________________________, hereinafter called Principal, and
______________________________________________________________, (Corporation, Partnership, or Individual)
________________________________________________________________________
(Name of Surety)
________________________________________________________________________
(Address of Surety)
hereinafter called SURETY, are held and firmly bound unto________________________
________________________________________________________________________
(Name of Owner)
________________________________________________________________________
(Address of Owner)
hereinafter called OWNER, in the penal sum of__________________ Dollars, ($__________) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.
THE CONDITION OF THIS OBLIGATION is such that whereas, the Principal entered into a certain contract with the OWNER, dated the__________________ day of____________________, 20___, a copy of which is hereto attached and made a part hereof for the construction of:
________________________________________________________________________
________________________________________________________________________
NOW, THEREFORE, if the Principal shall promptly make payment to all persons, firms, SUBCONTRACTORS, and corporations furnishing materials for or performing labor in the prosecution of the WORK provided for in such contract, and any authorized extension or modification thereof, including all amounts due for materials, lubricants, oil, gasoline, coal and coke, repairs on machinery, equipment and tools, consumed or used in connection with the construction of such WORK, and all insurance premiums on said WORK, and for all labor, performed in such WORK whether by SUBCONTRACTOR or otherwise, then this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, FURTHER, that the said Surety for value received hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the WORK to be performed hereunder or the SPECIFICATIONS accompanying the same shall in any wise affect its
obligation on this BOND, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the WORK or to the SPECIFICATIONS.

PROVIDED, FURTHER, that no final settlement between the OWNER and the CONTRACTOR shall abridge the right of any beneficiary hereunder, whose claim may be unsatisfied.

IN WITNESS WHEREOF, this instrument is executed in ____ counterparts, each one of which shall be deemed an original, this the ________________ day of ___________________ 20 ______.

ATTEST: ________________________________

_____________________________________
(SEAL) 

By: ________________________________

_____________________________________

_____________________________________

ATTEST: ________________________________

_____________________________________

_____________________________________

_____________________________________

_____________________________________

NOTE: Date of BOND must not be prior to date of Contract. If CONTRACTOR is Partnership, all partners should execute BOND.

IMPORTANT: Surety companies executing BONDS must appear on the Treasury Department’s most current list (Circular 570 as amended) and be authorized to transact business in the state where the PROJECT is located.
NOTICE OF INTENT TO AWARD

To: __________________________

____________________________

____________________________

Project Description: __________________________

____________________________

____________________________

The OWNER has considered the BID submitted by you for the above described WORK, in response to its Advertisement for Bids, dated ________________ and Information for Bidders.

You are hereby notified that your BID will be accepted, contingent upon Illinois Environmental Protection Agency (IEPA) approval, for items in the amount of ________________.

You will be required by the Information for Bidders to execute the Agreement and furnish the required CONTRACTOR’S Performance BOND, Payment BOND and certificates of insurance within (10) calendar days from the date of the final Notice to be sent upon IEPA approval, to you.

Dated this day of ________________

____________________________

OWNER

By: __________________________

Title: __________________________
NOTICE OF AWARD

To: __________________________

____________________________

____________________________

____________________________

____________________________

PROJECT Description: ___________________________________________

____________________________________

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

You are hereby notified that your BID has been accepted for items in the amount of $______.

You are required by the Information for Bidders to execute the Agreement and furnish the required CONTRACTOR’S Performance BOND, Payment BOND and certificates of insurance within ten (10) calendar days from the date of this Notice to you.

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

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

Dated this________________________day of____________________, 20______.

____________________________________

(Owner)

By ______________________________

Title ______________________________

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE OF AWARD is hereby acknowledged,

by _________________________________________________________________.

this the__________________________day of______________________, 20______.

By ______________________________

Title ______________________________
NOTICE TO PROCEED

To: _______________________________ Date: _______________________________

________________________________ Project: _______________________________

________________________________..................................................................

You are hereby notified to commence WORK in accordance with the Agreement dated ______
_______, 20_______, on or before___________, 20_______, and you are to complete the WORK within ______ consecutive calendar days thereafter. The date of completion of all WORK is therefore ________________, 20__________.

________________________________

(Owner)

By ______________________________

Title ______________________________

ACCEPTANCE OF NOTICE

Receipt of the above NOTICE TO PROCEED is hereby acknowledged by ______________

________________________________

this the _________________ day of

________________________________, 20_____.

By ______________________________

Title ______________________________
Change Order No. ______

Date of Issuance: ____________________________  Effective Date: ____________________________

Project: ____________________________  Owner: ____________________________  Owner's Contract No.: ____________________________

Contract: ____________________________  Date of Contract: ____________________________

Contractor: ____________________________  Engineer's Project No.: ____________________________

The Contract Documents are modified as follows upon execution of this Change Order:

Description:

Attachments: (List documents supporting change):

<table>
<thead>
<tr>
<th>CHANGE IN CONTRACT PRICE:</th>
<th>CHANGE IN CONTRACT TIMES:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original Contract Price:</td>
<td>Original Contract Times:</td>
</tr>
<tr>
<td>$________________________</td>
<td>☐ Working days  ☐ Calendar days</td>
</tr>
<tr>
<td></td>
<td>Substantial completion(days or date): ____________________________</td>
</tr>
<tr>
<td></td>
<td>Ready for final payment (days or date): ____________________________</td>
</tr>
<tr>
<td>[Increase] [Decrease] from previously approved Change Orders No.________ to No.________ :</td>
<td>[Increase] [Decrease] from previously approved Change Orders No.________ to No.________ :</td>
</tr>
<tr>
<td>$________________________</td>
<td>Substantial completion (days): ____________________________</td>
</tr>
<tr>
<td></td>
<td>Ready for final payment (days): ____________________________</td>
</tr>
</tbody>
</table>

Contract Price prior to this Change Order:

$________________________

Contract Times prior to this Change Order:

Substantial completion (days or date): ____________________________

Ready for final payment (days or date): ____________________________

Contract Price incorporating this Change Order:

$________________________

Contract Times with all approved Change Orders:

Substantial completion (days or date): ____________________________

Ready for final payment (days or date): ____________________________

RECOMMENDED: ____________________________  ACCEPTED: ____________________________  ACCEPTED: ____________________________

By: ____________________________  By: ____________________________  By: ____________________________

Engineer (Authorized Signature)  Owner (Authorized Signature)  Contractor (Authorized Signature)

Date: ____________________________  Date: ____________________________  Date: ____________________________

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

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Prepared by the Engineers' Joint Contract Documents Committee and endorsed by the Associated General Contractors of America and the Construction Specifications Institute.
NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY
(EXECUTIVE ORDER 11246)

1. The Offeror’s or Bidder’s attention is called to the "Equal Opportunity Clause" and the “Standard Federal Equal Employment Opportunity Construction Contract Specifications” set forth herein.

2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor’s aggregate workforce in each trade on all construction work in the covered area, are as follows:

<table>
<thead>
<tr>
<th>Timetables</th>
<th>Goals for minority participation for each trade</th>
<th>Goals for female participation in each trade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Insert goals for* each year 4.8%</td>
<td>Insert goals for* each year 6.9%</td>
</tr>
</tbody>
</table>

These goals are applicable to all the Contractor’s construction work (whether or not it is Federal or federally assisted) performed in the covered area.

The Contractor’s compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals established for the geographical area where the contract resulting from this solicitation is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor’s goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor; employer identification number; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed.

4. As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is **.

*goals and timetables published from time to time by the Director, Office of Federal Contract Compliance Programs (OFCCP)

**Insert description of the geographical areas where the contract is to be performed giving the state, county and city, if any.
CONSTRUCTION CONTRACTORS AFFIRMATIVE ACTION REQUIREMENTS
GOALS FOR MINORITY PARTICIPATION
(As published in the Friday, October 3, 1980 Federal Register)

FEMALE PARTICIPATION= 6.9% STATEWIDE

<table>
<thead>
<tr>
<th>County</th>
<th>Percent</th>
<th>County</th>
<th>Percent</th>
<th>County</th>
<th>Percent</th>
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</table>
60-4.1 Scope and Application.

This part applies to all contractors and subcontractors that hold any Federal or federally assisted construction contract in excess of $10,000. The regulations in this part are applicable to all of a construction contractor's or subcontractor's construction employees who are engaged in on site construction including those construction employees who work on a non-Federal or non-federally assisted construction site. This part also establishes procedures, which all Federal contracting officers and all applicants, as applicable, shall follow in soliciting for and awarding Federal or federally assisted construction contracts. Procedures also are established which administering agencies shall follow in making any grant, contract, loan, insurance, or guarantee involving federally assisted construction which is not exempt from the requirements of Executive Order 11246, as amended. In addition, this part applies to construction work performed by construction contractors and subcontractors for Federal non-construction contractors and subcontractors if the construction work is necessary in whole or in part to the performance of a non-construction contract or subcontract.


60-4.2 Solicitations.

(a) All Federal contracting officers and all applicants shall include the notice set forth in paragraph (d) of this section and the Standard Federal Equal Employment Opportunity Construction Contract Specifications set forth in § 60-4.3 of this part in all solicitations for offers and bids on all Federal and federally assisted construction contracts or subcontracts to be performed in geographical areas designated by the Director pursuant to § 60-4.6 of the part. Administering agencies shall require the inclusion of the notice set forth in paragraph (d) of this section and the specifications set forth in § 60-4.3 of this part as a condition of any grant, contract, subcontract, loan, insurance or guarantee involving federally assisted construction covered by this Part 60-4.

(b) All non-construction contractors covered by Executive Order 11246 and the implementing regulations shall include the notice in paragraph (d) of this section in all construction agreements, which are necessary in whole or in part to the performance of the covered non-construction contract.

(c) Contracting officers, applicants and non-construction contractors shall given written notice to the Director within 10 working days of award of a contract subject to these provisions. The notification shall include the name, address and telephone number of the contractor; employer identification number; dollar amount of the contract, estimated starting and completion dates of the contract; the contract number; and geographical area in which the contract is to be performed.

(d) The following notice shall be included in, and shall be a part of, all solicitations for offers and bids on all Federal and federally assisted construction contracts or subcontracts in excess of $10,000 to be performed in geographical areas designated by the Director pursuant to § 60-4.6 of this part (see 41 CFR 60-4.2(a)):
Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246)

1. The Offeror or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Specifications" set forth herein.

2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

<table>
<thead>
<tr>
<th>Time-Tables</th>
<th>Goals for minority participation for each trade</th>
<th>Goals for female participation in each trade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.8%</td>
<td>6.9%</td>
</tr>
</tbody>
</table>

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 6-43(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.

4. As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is (insert description of the geographical areas where the contract is to be performed giving the state, county and city, if any).
60-4.3 Equal Opportunity Clauses.

(a) The equal opportunity clause published at 41 CFR 60-1.4(a) of this chapter is required to be included in, and is part of, all nonexempt Federal contracts and subcontracts, including construction contracts and subcontracts. The equal opportunity clause published at 41 CFR 60-1.4(b) is required to be included in, and is a part of, all nonexempt federally assisted construction contracts and subcontracts. In addition to the clauses described above, all Federal contracting officers, all applicants and all non-construction contractors, as applicable, shall include the specifications set forth in this section in all Federal and federally assisted construction contracts in excess of $10,000 to be performed in geographical areas designated by the Director pursuant to § 60-4.6 of this part and in construction subcontracts in excess of $10,000 necessary in whole or in part to the performance of non-construction Federal contracts and subcontracts covered under the Executive order.

Standard Federal Equal Employment Opportunity Construction Contract Specifications (Executive Order 11246)

1. As used in these specifications:

a. "Covered area." means the geographical area described in the solicitation from which this contract resulted:

b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;


d. "Minority" includes:

   (i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);

   (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);

   (iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and

   (iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $10,000 the provisions of these specifications and the Notice which contains the applicable goals
for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7a through p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered Construction contractors performing construction work in geographical areas where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, nor the regulations promulgated pursuant thereto.

6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, the Contractor must employ such apprentices and trainees during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The Contractor shall take specific affirmative action to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The
Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefore; along with whatever additional actions the Contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.

f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with onsite supervisory personnel such as Superintendents, General Foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written
notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are non-segregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations, which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7a through p of these Specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the
Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).

10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

11. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws, which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).
(b) The notice set forth in 41 CFR 60-4.2 and the specifications set forth in 41 CFR 60-4.3 replace the New Form for Federal Equal Employment Opportunity Bid Conditions for Federal and Federally Assisted Construction published at 41 FR 32482 and commonly known as the Model Federal EEO Bid Conditions, and the New Form shall not be used after the regulations in 41 CFR Part 60-4 become effective.


60-4.4 Affirmative Action Requirements.

(a) To implement the affirmative action requirements of Executive Order 11246 in the construction industry, the Office of Federal Contract Compliance Programs previously has approved affirmative action programs commonly referred to as "Hometown Plans," has promulgated affirmative action plans referred to as "Imposed Plans" and has approved "Special Bid Conditions" for high impact projects constructed in areas not covered by a Hometown or an Imposed Plan. All solicitations for construction contracts made after the effective date of the regulations in this part shall include the notice specified in § 60-4.2 of this part and the specifications in § 60-4.3 of this part in lieu of the Hometown and Imposed Plans including the Philadelphia Plan and Special Bid Conditions. Until the Director has issued an order pursuant to § 60-4.6 of this part establishing goals and timetables for minorities in the appropriate geographical areas or for a project covered by Special Bid Conditions, the goals and timetables for minorities to be inserted in the Notice required by 41 CFR 60-4.2 shall be the goals and timetables contained in the Hometown Plan, Imposed Plan or Special Bid Conditions presently covering the respective geographical area or project involved.

(b) Signatories to a Hometown Plan (including heavy highway affirmative action plans) shall have 45 days from the effective date of the regulations in this part to submit under such a Plan (for the director's approval) goals and timetables for women and to include female representation on the Hometown Plan Administrative Committee. Such goals for female representation shall be at least as high as the goals established for female representation in the notice issued pursuant to 41 CFR 60-4.6. Failure of the signatories, within the 45-day period, to include female representation and to submit goals for women or a new plan, as appropriate, shall result in an automatic termination of the Office of Federal Contract Compliance Program's approval of the Hometown Plan. At any time the Office of Federal Contract Compliance Programs terminates or withdraws its approval of a Hometown Plan, or when the plan expires and another plan is not approved, the contractors signatory to the plan shall be covered automatically by the specifications set forth in § 60-4.3 of this part and by the goals and timetables established for that geographical area pursuant to § 60-4.6 of this part.

60-4.5 Hometown Plans

(a) A contractor participating, either individually or through an association, in an approved Hometown Plan (including heavy highway affirmative action plans) shall comply with its affirmative action obligations under Executive Order 11246 by complying with its obligations under the plan: Provided, That each contractor or subcontractor participating in an approved plan is individually required to comply with the equal opportunity clause set forth in 41 CFR 60-1.4; to make a good faith effort to achieve the goals for each trade participating in the plan in which it
has employees; and that the overall good performance by other contractors or subcontractors toward a goal in an approved plan does not excuse any covered contractor's or subcontractor's failure to take good faith efforts to achieve the plan's goals and timetables. If a contractor is not participating in an approved Hometown Plan it shall comply with the specifications set forth in § 60-4.3 of this part and with the goals and timetables for the appropriate area as listed in the notice required by 41 CFR 60-4.2 with regard to that trade. For the purposes of this part 60-4, a contractor is not participating in a Hometown Plan for a particular trade if it:

(1) Ceases to be signatory to a Hometown Plan covering that trade;

(2) Is signatory to a Hometown Plan for that trade but is not party to a collective bargaining agreement for that trade;

(3) Is signatory to a Hometown Plan for that trade but is party to a collective bargaining agreement with labor organizations, which are not or cease to be signatories to the same Hometown Plan for that trade;

(4) Is signatory to a Hometown Plan for that trade but is party to a collective bargaining agreement with a labor organization for that trade but the two have not jointly executed a specific commitment to minority and female goals and timetables and incorporated the commitment in the Hometown Plan for that trade;

(5) Is participating in a Hometown Plan for that trade which is no longer acceptable to the Office of Federal Contract Compliance Programs;

(6) Is signatory to a Hometown Plan for that trade but is party to a collective bargaining agreement with a labor organization for that trade and the labor organization and the contractor have failed to make a good faith effort to comply with their obligations under the Hometown Plan for that trade.

(b) Contractors participating in Hometown Plans must be able to demonstrate their participation and document their compliance with the provision of the Hometown Plan.


60-4.6 Goals and Timetables.

The Director, from time to time, shall issue goals and timetables for minority and female utilization, which shall be based on appropriate workforce, demographic, or other relevant data and which shall cover construction projects or construction contracts performed in specific geographical areas. The goals, which shall be applicable to each construction trade in a covered contractor's or subcontractor's entire workforce which is working in the area covered by the goals and timetables, shall be published as notices in the Federal Register, and shall be inserted by the contracting officers and applicants, as applicable, in the Notice required by 41 CFR 60-4.2. Covered construction contractors performing construction work in geographical areas where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed.

[45 FR 65978, OCT. 3, 1980]
60-4.7 Effect on Other Regulations.

The regulations in this part are in addition to the regulations contained in this chapter, which apply to construction contractors and subcontractors generally. See particularly, 41 CFR 60-1.4 (a), (b), (c), (d), and (e); 60-1.5; 60-1.7; 60-1.8; 60-1.26; 60-1.29; 60-1.30; 60-1.32; 60-1.41; 60-1.42; 60-1.43; and 41 CFR Part 60-3; Part 60-20; Part 60-30; Part 60-40; and Part 60-50.

60-4.8 Show Cause Notice.

If an investigation or compliance review reveals that a construction contractor or subcontractor has violated the Executive order, any contract clause, specifications or the regulations in this chapter and if administrative enforcement is contemplated, the Director shall issue to the contractor or subcontractor a notice to show cause which shall contain the items specified in paragraphs (i) through (iv) of 41 CFR 60-2.2(c)(1). If the contractor does not show good cause within 30 days, or in the alternative, fails to enter an acceptable conciliation agreement which includes where appropriate, make up goals and timetables, back pay, and seniority relief for affected class members, the OFCCP shall follow the procedure in 41 CFR 60-1.26(b): Provided, That where a conciliation agreement has been violated, no show cause notice is required prior to the initiation of enforcement proceedings.


60-4.9 Incorporation by Operation of the Order.

By operation of the order, the equal opportunity clause contained in §60-1.4, the Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246) contained in §60-4.2, and the Standard Federal Equal Employment Opportunity Construction Contract Specifications (Executive Order 11246) contained in §60-4.3 shall be deemed to be a part of every solicitation or of every contract and subcontract, as appropriate, required by the order and the regulations in this chapter to include such clauses whether or not they are physically incorporated in such solicitation or contract and whether or not the contract is written.
U.S. ENVIRONMENTAL PROTECTION

AGENCY CERTIFICATION OF

NONSEGREGATED FACILITIES

(Applicable to federally assisted construction contracts and related subcontracts exceeding $10,000 that are not exempt from the Equal Opportunity clause.)

The federally assisted construction contractor certifies that he does not maintain or provide for his employees any segregated facilities at any of his establishments, and that he does not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally assisted construction contractor certifies further that he will not maintain or provide for his employees any segregated facilities at any of his establishments, and that he will not permit his employees to perform their services at any location, under his control, where segregated facilities are maintained. The federally assisted construction contractor agrees that a breach of this certification is a violation of the Equal Opportunity clause in this contract. As used in this certification, the term "segregated facilities" means any waiting rooms, work areas, rest rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees which are segregated by explicit directive or are in fact segregated on the basis of race, creed, color, or national origin, because of habit, local custom or otherwise. The federally assisted construction contractor agrees that (except where he has obtained identical certifications from proposed subcontractors for specific time periods) he will obtain identical certifications from proposed subcontractors prior to the award of subcontracts exceeding $10,000 which are not exempt from the provisions of the Equal Opportunity clause, and that he will retain such certification in his files.

Signature Date

Name and Title of Signer (Please type)

Firm Name

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001.
NOTICE TO LABOR UNIONS OR OTHER ORGANIZATIONS OF WORKERS NONDISCRIMINATION IN EMPLOYMENT

To: ____________________________
   (Name of union or organization of workers)

The undersigned currently holds contract(s) with ____________________________
   (name of applicant) involving funds or credit of the U.S. Government or (a) subcontract(s) with a prime contractor holding such contract(s).

You are advised that under the provisions of the above contract(s) or subcontract(s) and in accordance with Executive Order 11246, as amended, dated September 24, 1965, as amended, the undersigned is obliged not to discriminate against any employee or applicant for employment because of race, color, creed or national origin. This obligation not to discriminate in employment includes, but is not limited to, the following:

HIRING, PLACEMENT, UPGRADING, TRANSFER OR DEMOTION, RECRUITMENT, ADVERTISING, OR SOLICITATION FOR EMPLOYMENT, TRAINING DURING EMPLOYMENT, RATES OF PAY OR OTHER FORMS OF COMPENSATION, SELECTION FOR TRAINING INCLUDING APPRENTICESHIP, LAYOFF OR TERMINATION.

This notice is furnished you pursuant to the provisions of the above contract(s) or subcontracts(s) and Executive Order 11246, as amended.

Copies of this notice will be posted by the undersigned in conspicuous places available to employees or applicants for employment.

________________________________________

________________________________________

________________________________________

(Contractor or Subcontractor)

________________________________________

(Date)
Certification Regarding Debarment, Suspension and Other Responsibility Matters

The prospective participant to the best of its knowledge and belief that it and its principles:

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

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

(c) Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1) (b) of this certification; and

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

I understand that a false statement on this certification may be grounds for rejection of this proposal or termination of the award. In addition, under 18 USC Sec. 1001, a false statement may result in fine of up to $10,000 or imprisonment for up to 5 years, or both.

________________________________________________________________________
(Typed Name & Title of Authorized Representative)

________________________________________________________________________
(Signature of Authorized Representative) (Date)

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

EPA FORM 5700-49 (11-88)
Instructions

Under Executive Order 12549 an individual or organization debarred or excluded from participation in Federal assistance or benefit programs may not receive any assistance award under a Federal program, or a sub-agreement thereunder for $25,000 or more.

Accordingly, each prospective recipient of an EPA grant, loan, or cooperative agreement and any contract or sub-agreement participant thereunder must complete the attached certification or provide an explanation why they cannot. For further details, see 40 CFR 32.510, Participants' responsibilities, in the attached regulation.

Where to Submit
The prospective EPA grant, loan, or cooperative agreement recipient must return the signed certification or explanation with its application to the appropriate EPA Headquarters or Regional office, as required in the application instructions.

A prospective prime contractor must submit a completed certification or explanation to the individual or organization awarding the contract.

Each prospective subcontractor must submit a completed certification or explanation to the prime contractor for the project.

How to Obtain Forms:
EPA includes the certification form, instructions, and a copy of its implementing regulation (40 CFR Part 32) in each application kit. Applicants may reproduce these materials as needed and provide them to their prospective prime contractor, who, in turn, may reproduce and provide them to prospective subcontractors.

Additional copies/assistance may be requested from:
Compliance Branch
Grants Administration Division (PM-216F)
U.S. Environmental Protection Agency
401 M Street, SW
Washington DC 20460
(Telephone: 202-475-8025)

EPA Form 5700-19 (11-88)
Section 365.420(b)(2) Change Orders

A) When the loan recipient authorizes the contractor to add, delete, or revise the work within the general scope of the contract documents, or authorizes an adjustment in the contract price or contract time, the loan recipient shall submit a change order to the Agency.

B) For each change order, the loan recipient shall submit to the Agency for approval the following documentation:

i) one copy of the fully executed change order signed by the loan recipient, construction engineer, and the contractor; and

ii) a description of any changes, with justification for the changes.

C) Prior approval by the Agency of a change order is required when a change order results in:

i) alterations in design scope that require a modification to a construction permit; or

ii) an increase in the amount of loan funds needed to complete the project.

D) Failure to give timely notice of proposed project changes or action by the loan recipient that is not consistent with the Agency’s determination on those changes may result in disallowance of loan participation for costs incurred that are attributable to the change.

Section 365.620(a) Required Construction Contract Provisions

Each construction contract shall include the following provisions:

1) Audit; access to records:

A) The contractor shall maintain books, records, documents and other evidence directly pertinent to performance on loan work in accordance with Generally Accepted Accounting Principles (GAAP). The contractor shall also maintain the financial information and data used by the contractor in the preparation or support of any cost submissions required under subsection (c) above, (Negotiation of Contract Amendments, Change Orders) and a copy of the cost summary submitted to the owner. The Auditor General, the owner, the Agency, or any of their duly authorized representatives shall have access to the books, records, documents, and other evidence for purposes of inspection, audit, and copying. The contractor will provide facilities for such access and inspection.

B) If this contract is a formally advertised, competitively awarded, fixed price contract, the contractor agrees to include access to records as specified in subsection (d)(1)(A)
above. This requirement is applicable to all negotiated change orders and contract amendments in excess of $25,000 that affect the contract price. In the case of all other prime contracts, the contractor also agrees to include access to records as specified above in all his or her contracts and all tier subcontracts or change orders in excess of $25,000 that are directly related to project performance.

C) Audits shall be consistent in accordance with auditing standards generally accepted in the United States of America.

D) The contractor agrees to the disclosure of all information and reports resulting from access to records pursuant to subsection (d)(1)(A) above. Where the audit concerns the contractor, the auditing agency will afford the contractor an opportunity for an audit exit conference and an opportunity to comment on the pertinent portions of the draft audit report. The final audit report shall include the written comments, if any, of the audited parties.

E) The records required by subsection (d)(1)(A) above shall be maintained and made available during performance of the work under the loan agreement and for three years after the date of the final loan audit. In addition, records that relate to any dispute or litigation or the settlement of claims arising out of any performance, costs or items to which an audit exception has been taken, shall be maintained and made available for three years after resolution of the dispute, appeal, litigation, claim or exception.

F) The right of access will generally be exercised with respect to financial records under:

i) Negotiated prime contracts;

ii) Negotiated change orders or contract amendments in excess of $25,000 affecting the price of any formally advertised, competitively awarded, fixed price contract; and

iii) Subcontracts or purchase orders under any contract other than a formally advertised, competitively awarded, fixed price contract.

G) The right of access will generally not be exercised with respect to a prime contract, subcontract, or purchase order awarded after effective price competition. In any event, the right of access shall be exercised under any type of contract or subcontract:

i) With respect to records pertaining directly to contract performance, excluding any financial records of the contractor; and

ii) If there is any indication that fraud, gross abuse, or corrupt practices may be involved in the award or performance of the contract or subcontract.
2) Covenant against contingent fees.

The contractor shall warrant that no person or selling agency has been employed or retained to solicit or secure the contract upon an agreement or understanding for a commission, percentage, brokerage, or contingent fee. For breach or violation of this warranty, the owner shall have the right to annul the contract without liability or in its discretion to deduct from the contract price or consideration, or otherwise recover, the full amount of such commission, percentage, brokerage, or contingent fee.

3) Wage provisions.

The Contractor shall pay prevailing wages in accordance with the Davis-Bacon Act (40 USC 276a through 276a-5 as defined by the U.S. Department of Labor. More information and guidance on the Davis-Bacon Wage Rate requirements is available on the IEPA website.

4) Disadvantaged business enterprise requirements.

The contractor shall provide evidence, including, but not limited to, a copy of the advertisement or advertisements and the record of negotiation, that the contractor has take affirmative steps in accordance with 40 CFR, Part 33 to assure that disadvantaged business enterprises are used when possible as sources of supplies, equipment, construction and services consistent with the provisions of the Agency’s Operating Agreement with USEPA.

5) Debarment and suspension provisions.

The contract shall require the successful bidder or bidders to submit a “Certificate Regarding Debarment, Suspension and Other Responsibility Matters” (EPA Form 5700-49) showing compliance with federal Executive Order 12549.

6) Non-segregated facilities provisions

The successful bidder shall be required to submit a certification of non-segregated facilities as prescribed by 18 USC 1001.

7) American Iron and Steel

The successful bidder shall be required to use American Iron and Steel, if required by USEPA for that fiscal year.

8) A clause that provides:

"No contractor or subcontractor shall discriminate on the basis of race, color, national origin or sex in the performance of this contract. The contractor or subcontractor shall carry out applicable requirements of 40 CFR 33 in the award and administration of contracts awarded under the WPCLP. Failure by the contractor or subcontractor to carry out these requirements is a material breach of this contract which may result in the termination of this contract or other legally available remedies."
Section 365.620(b) Subcontracts Under Construction Contracts

The award or execution of all subcontracts by a prime contractor and the procurement and negotiation procedures used by the prime contractor shall comply with:

1) All applicable provisions of federal, State and local law;

2) All provisions of this Part 365 with respect to fraud and other unlawful or corrupt practices;

3) All provisions of this Part 365 with respect to access to facilities, records and audit of records; and

4) All provisions of subsection (a)(5) that require a “Certification Regarding Debarment, Suspension, and Other Responsibility Matters (EPA Form 5700-49) showing compliance with federal Executive Order 12549.

Section 365.620(c) Contractor Bankruptcy

In the event of a contractor bankruptcy, the loan recipient shall notify the Agency and shall keep the Agency advised of any negotiations with the bonding company, including any proposed settlement. The Agency may participate in those negotiations and will advise the loan recipient of the impact of any proposed settlement to the loan agreement. The loan recipient shall be responsible for assuring that every appropriate procedure and incidental legal requirement is observed in advertising for bids and re-awarding a construction contract.

Section 365.620(d) Access

Every contract entered by the loan recipient for construction work, and every sub-agreement, shall provide the Agency representatives with access to the work. The contractor or subcontractor shall provide facilities for such access and inspection.

Section 365.640(c) Remedies

All claims, counter-claims, disputes and other matters in question between the loan applicant and the contractor arising out of, or relating to a sub-agreement or its breach shall be decided by arbitration if the parties agree, or in a court of competent jurisdiction within the State.
Bidder Certification
In Compliance with Article 33E-11 to the
"Criminal Code of 2012"

I ____________________________________________, do hereby certify that:

1. I am ___________________________ of the ____________________________________________
   Position Firm
   and have authority to execute this certification on behalf of the firm

2. This firm is not barred from bidding on this contract due to either a Bid-rigging or Bid Rotating
   violation as set forth in Article 33E-11 to the “Illinois Criminal Code of 2012 [720 ILCS 5/33E-
   11]”

Name of Firm _______________________________

Signature _________________________________

Title _________________________________

Date _________________________________

Corporate Seal (where appropriate)

On this _______ day of ______________________ 20 _____, before me appeared (Name)

_________________________________________ to me personally known, who, being duly sworn, did execute the foregoing affidavit, and did state that he or she was properly

authorized by (Name of Firm) ____________________________________________ to execute the affidavit and did so as his or her free act and deed.

Notary Public ______________________________Commission Expires __________________

Notary Seal
Specifications for Disadvantaged Business Enterprise Participation

(Name of Loan Recipient) City of Danville

I. Disadvantaged Business Enterprise Policy

A. It is the policy of the State of Illinois to award a fair share of sub-agreements to disadvantaged businesses (DBEs). In complying with this requirement, contractors are required to take affirmative steps to assure that disadvantaged businesses are used when possible as sources of supplies, equipment, construction, and services as explained herein.

B. These specifications define the terms, conditions, and requirements of the State Revolving Fund Loan Program, and the (Name of Loan Recipient) City of Danville’s policy and procedures for complying with these requirements.

C. As required by the award conditions of USEPA's Assistance Agreement with IEPA, the fair share percentages are 5% for MBEs and 12% for WBEs.

II. Pre-Contract Award Obligations

A. All bidders are required to advertise subcontracting opportunities and to negotiate with disadvantaged businesses prior to bid opening. Failure to document such affirmative efforts shall be deemed, relative to disadvantaged business compliance, non-responsive.

B. To establish a bid as responsible, the bidder will be required to document the proposed utilization of disadvantaged businesses with letters of intent signed by the bidder and by the disadvantaged business listed in the bid. The documentation requirements are outlined in Section III of this document.

C. (Name of Loan Recipient) City of Danville’s disadvantaged business policy clearly intends for bidders to contact and encourage the participation of disadvantaged businesses prior to bid opening. Affirmative efforts (the written record of conscientious and honest communications between the bidder and disadvantaged business) must be initiated and completed by the bidder prior to bid opening. All bidders must document compliance with the requirements of the disadvantaged business policy.

III. Evaluation of Disadvantaged Business Utilization and Affirmative Efforts

A. As a prerequisite to demonstrate compliance with the (Name of Loan Recipient) City of Danville’s disadvantaged business policy, ALL bidders shall provide the following with its bid:

1. Completed and signed certification from the bidder(s), attesting that the bidder will award no sub-agreements, including the procurement of equipment, materials, supplies and services, in the performance of this contract.

   OR
2. "Certification of publication," or adequate proof of publication, including an actual copy of the newspaper advertisement from a daily newspaper. The advertisement must run one day at least (16) days prior to bid opening. An example advertisement follows this section.

Bidders may publish the advertisement in an established, online bidder’s clearinghouse such as the “Dodge Report (http://construction.com/dodge/).” If an online advertisement is placed with the “Dodge Report” or an equivalent website, a screenshot of the advertisement along with the webpage address, and a payment receipt is required as documentation. The advertisement must run one day at least (16) days prior to bid opening.

3. List of all disadvantaged business enterprise (DBE) and non-DBE’s that submitted proposals to the bidder along with the date of the proposal. Names, addresses, phone number and/or e-mail are required.

4. List of disadvantaged businesses not being utilized and justification for non-utilization.

5. If DBE subcontractors will be utilized for the project, a completed and signed copy of IEPA DBE Form No. 3 (DBE Subcontractor Utilization Form) or an equivalent “Notice of Intent” is needed from each subcontractor.

6. If DBE subcontractors will be utilized for the project, a completed and signed certification from the bidder(s), attesting that the bidder has no controlling or dominating interest or conflict of interest with the disadvantaged business that will be utilized.

7. In instances where the bidder(s) does not receive any proposals from disadvantaged businesses prior to bid opening, the bidder(s) must provide a written certification attesting that no proposals were received.

Failure to submit the documentation pursuant to the requirements of A (1-7) above may cause rejection of the bid as non-responsive.

IV. Sanctions

A. The (Name of Loan Recipient) City of Danville may reject one or all bids when the information submitted by the bidder(s) fails to demonstrate compliance with the disadvantaged business requirements (i.e., the bidder fails to place their pre-bid advertisement in a daily newspaper, or approved website, at least 16 days prior to bid opening).

B. Upon finding that any Party has not complied with the requirements of these specifications, including misrepresenting a firm as a disadvantaged business, any one or a combination of the following actions may be taken.

1. Declare the bidder and/or subcontractor non-responsible and therefore, ineligible for contract award.

2. Disallow all contract costs associated with non-compliance.
3. Refer matters which may be fraudulent to the Illinois Attorney General.

V. Post-Contract Award Compliance

A. As required by the award conditions of USEPA's Assistance Agreement with IEPA, all sub-agreements of the prime contractor must identify that the fair share percentages are 5% for MBEs and 12% for WBEs.

B. After award of the prime contract, copies of all disadvantaged business related sub-agreements between the prime contractor and subcontractors shall be submitted to the owner.

C. Subsequent to bid submission, any changes in previously reported disadvantaged businesses utilization shall be handled in accordance with 40 CFR Part 33.302(b-h). If the contractor fails to initiate such actions, the owner may withhold payments and/or institute other appropriate sanctions.
Suggested Disadvantaged Business (DBE)
Advertisement for Construction Contractors

Notice to Disadvantaged Businesses

__________________________________________________________, is
(Name of Company)  (Address of Company)  (Telephone)

seeking disadvantaged businesses for the ________________________________
(Name of Loan Recipient)

Project for subcontracting opportunities in the following areas: ___________, ___________,
____________, ___________

All disadvantaged businesses should contact, IN WRITING, (certified letter, return receipt requested),
(Company Contact Person) to discuss the subcontracting opportunities. All negotiations must
be completed prior to bid opening _____________________.
(Date of Bid Opening)

*The advertisement must clearly state the method of evaluating the proposals or quotations, and the
relative importance attached to each criterion. Bidders must uniformly and objectively evaluate the
proposals submitted by disadvantaged business in response to the advertisement based upon the
evaluation criteria stated in the advertisement. The evaluation criteria must not be restrictive or
exclusionary.
Summary Report of Disadvantaged Business Enterprise Requirements for Contractors

1) Completed and signed certification from bidder(s), attesting that the bidder will award no sub-agreements, including the procurement of equipment, materials, supplies and services in the performance of this contract (may use IEPA DBE Form #1).

OR

"Certificate of publication, or adequate evidence of proof of publication, including an actual copy of the newspaper advertisement from a daily publication. For advertisements placed in a construction project clearinghouse such as www.construction.com, a screenshot of the advertisement, link to website, and receipt is required for proof of advertising.

2) List of all disadvantaged business enterprises (DBE) and non-DBE’s that submitted proposals to the bidder/prime contractor. Specify as DBE or non-DBE, type of DBE, and the other information listed below (DBE Form #4 may be used for this purpose).

   Name of Company
   Name of Owners
   Address of Company
   E-mail Address of Company
   Telephone Number
   Date of Proposal
   Type of Business
   Type of DBE
   Description of work to be performed

3) List of disadvantaged businesses that submitted proposals to the bidder but will not be utilized. Justification for non-utilization must be provided (may use IEPA DBE Form #1).

4) Completed and signed copies IEPA DBE Form #3 (Subcontractor Utilization Form) or equivalent “Notice of Intent”. Only applies if using DBE subcontractors.

5) Completed and signed certification from bidder(s) attesting that the bidder has no dominating or conflict of interest with the disadvantaged business to be utilized (IEPA DBE Form #1). Only applies if using DBE subcontractors.

6) In instances where the bidder(s) does not receive any proposals from disadvantaged businesses prior to bid opening, the bidder(s) must provide a written certification attesting that no proposals were received (IEPA DBE Form #1).

7) **Note**: DBE Form #2 is not included in this packet. It is for consultants/engineers to report DBE activity. It is for consultants/engineers to report DBE activity. This form may be found in IEPA’s DBE Guidance Manual which is available on the Agency’s website or mailed upon request by calling 217-782-2027.
IEPA Disadvantaged Business Enterprise (DBE) Program Form #1
Contractor Certification Form

(To be completed by all Prime Contractors)

Please check the appropriate boxes that apply and complete the information on the bottom of the form.

☐ This firm will award no subcontracts (including in the procurement of equipment, supplies, or services), in the performance of this contract.

☐ This firm advertised for DBE subcontractors according to the good faith efforts outlined in the IEPA DBE Guidance Document.

☐ This firm received proposals from DBE(s) that will not be utilized. A list of the DBEs not hired, along with their address, phone number, and reason(s) for non-utilization, is below.

☐ This firm did not receive any inquiries from DBEs.

I certify that the above is true. I further certify that this firm and its partners, directors, and officers do not possess a controlling interest in ownership or conflict of interest or any other authority to control the DBE to be used during the performance of the contracts.

By: __________________________
NAME: _______________________
TITLE: _______________________
Company: _____________________

Date: ___/___/____
EPA Disadvantaged Business Enterprise (DBE) Program Form #3
Subcontractor Utilization Form

(Only complete this form if DBE subcontractors or sub-consultants will be working on a project)

This form is intended to capture the DBE subcontractor’s description of work to be performed and the price of the work submitted to the prime contractor. All subcontractors must complete this form, and it must be included in the prime contractor’s bid package.

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<tr>
<th>Subcontractor Name</th>
<th>Project Name</th>
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<tr>
<th>Contact Person’s Name &amp; Title</th>
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**DBE Certified By:**

Select One:

- MBE
- WBE
- SBE
- DBE

<table>
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<th>Prime Contractor Name</th>
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<tr>
<th><strong>Type of Work to be Performed</strong></th>
<th><strong>Cost Estimate of Work</strong></th>
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I certify under penalty of perjury that the forgoing statements are true and correct. Signing this form does not signify a commitment to using the subcontractors above. I am aware that in the event of a replacement of a subcontractor, I will adhere to the replacement requirements set forth in 40 C.F.R. Part 33 Section 33.302(c).

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<th>Prime Contractor Signature:</th>
<th>Print Name:</th>
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IEPA Disadvantaged Business Enterprise (DBE) Program Form #4, Bidders List
(Only complete this form if subcontractors or sub-consultants will be working on a project)

Using this form/format is optional. Other formats are acceptable.

<table>
<thead>
<tr>
<th>Company Name &amp; Contact Person</th>
<th>Address</th>
<th>Phone No. w/ area code</th>
<th>Email</th>
<th>Proposed Work (supplies, paint, paint etc.)</th>
<th>DBE Status (MBE, WBE, DBE, SBE)</th>
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Bidder Certification Regarding the Use of American Iron and Steel Products

I hereby certify that:

Name ____________________________ (title) of the ________________ (company, partnership, etc.) and have authority to execute this certification on behalf of the firm.

1. I am __________________________ (title) of the __________________________ (company, partnership, etc.) and have authority to execute this certification on behalf of the firm.

2. This firm is aware that all iron and steel products used for this project must be produced in the United States per Section 436 (a) – (f) of the Consolidated Appropriations Act, 2014.

3. This firm is aware that the use of American iron and steel products applies to all projects for the construction, alteration, maintenance, or repair of publically owned treatment works (POTW) or public water systems.

4. This firm understands the term “iron and steel products” refers to the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

5. I am aware that this requirement applies to all portions of the project that are subcontracted.

Name of Company ____________________________

Signature ____________________________

Title ____________________________

Date ____________________________

Corporate Seal (where appropriate)
Requirements Specific to American Iron and Steel

The Consolidated Appropriations Act of 2014 (Public Law 113-76) first included an "American Iron and Steel (AIS)" requirement that requires Clean Water State Revolving Fund (CWSRF) and Drinking Water State Revolving Fund (DWSRF) loan recipients to use iron and steel products that are produced in the United States for projects involving the construction, alteration, maintenance, or repair of a public water system or treatment works if the project is funded through a CWSRF or a DWSRF loan. Guidance is available on USEPA’s website: http://water.epa.gov/grants_funding/aisrequirement.cfm. Waivers from the requirements are available under certain circumstances.

For CWSRF or DWSRF purposes, an iron or steel product is one of the following made primarily of iron or steel that is permanently incorporated into the public water system or treatment works:

- Pipes (lined or unlined) and fittings;
- Manhole Covers;
- Municipal Castings (defined in more detail below);
- Hydrants;
- Tanks;
- Flanges;
- Pipe clamps and restraints;
- Valves;
- Structural steel (defined in more detail below);
- Reinforced precast concrete; and
- Construction materials (defined in more detail below).

For one of the listed products to be considered subject to the AIS requirements, it must be made of greater than 50% iron or steel, measured by costs. The cost should be based on the material costs.

For the purposes of AIS, steel means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements. Metallic elements such as chromium, nickel, molybdenum, manganese, and silicon may be added during the melting of steel for the purpose of enhancing properties such as corrosion resistance, hardness, or strength. The definition of steel covers carbon steel, alloy steel, stainless steel, tool steel and other specialty steels.

For the purposes of AIS, production in the United States of the iron or steel products used in the project requires that all manufacturing processes, including application of coatings, must take place in the United States, except for metallurgical processes involving refinement of steel additives. All manufacturing processes includes processes such as melting, refining, forming, rolling, drawing, finishing, fabricating and coating. Further, if a domestic iron and steel product is taken out of the US for any part of the manufacturing process, it becomes foreign source material. However, raw materials such as iron ore, limestone and iron and steel scrap are not covered by the AIS requirement, and the material(s), if any, being applied as a coating are similarly not covered. Non-iron or steel components of
an iron and steel product may come from non-US sources. For example, for products such as valves and hydrants, the individual non-iron and steel components do not have to be of domestic origin. Raw materials, such as iron ore, limestone, scrap iron, and scrap steel, can come from non-US sources.

For AIS, municipal castings are cast iron or steel infrastructure products that are melted and cast. They typically provide access, protection, or housing for components incorporated into utility owned drinking water, storm water, wastewater, and surface infrastructure. They are typically made of grey or ductile iron, or steel. Examples of municipal castings are:

```
Access Hatches;
Ballast Screen;
Benches (Iron or Steel);
Bollards;
Cast Bases;
Cast Iron Hinged Hatches, Square and Rectangular;
Cast Iron Riser Rings;
Catch Basin Inlet;
Cleanout/Monument Boxes;
Construction Covers and Frames;
Curb and Corner Guards;
Curb Openings;
Detectable Warning Plates;
Downspout Shoes (Boot, Inlet);
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Drainage Greats, Frames and Curb Inlets;
Inlets;
Junction Boxes;
Lampposts;
Manhole Covers, Rings and Frames, Risers;
Meter Boxes;
Service Boxes;
Steel Hinged Hatches, Square & Rectangular;
Steel Riser Rings;
Trash receptacles;
Tree Grates;
Tree Guards;
Trench Grates; and
Valve Boxes, Covers and Risers.
```

For AIS, structural steel is rolled flanged shapes, having at least one dimension of their cross-section three inches or greater, which are used in the construction of bridges, buildings, ships, railroad rolling stock, and for numerous other constructional purposes. Such shapes are designated as wide-flange shapes, standard I-beams, channels, angles, tees and zees. Other shapes include H-piles, sheet piling, tie plates, cross ties, and those for other special purposes.

For AIS, construction materials are those articles, materials, or supplies made primarily of iron and steel, that are permanently incorporated into the project, not including mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered “structural steel.” This includes, but is not limited to, the following products: wire rod, bar, angles, concrete reinforcing bar, wire, wire cloth, wire rope and cables, tubing, framing, joists, trusses, fasteners (i.e., nuts and bolts), welding rods, decking, grating, railings, stairs, access ramps, fire escapes, ladders, wall panels, dome structures, roofing, ductwork, surface drains, cable handing systems, manhole steps, fencing and fence tubing, guardrails, doors, and stationary screens.

For the purposes of AIS, mechanical and electrical components, equipment and systems are not considered construction materials. Mechanical equipment is typically that which has motorized parts.
and/or is powered by a motor. Electrical equipment is typically any machine powered by electricity and includes components that are part of the electrical distribution system.

There are specific requirements for precast concrete to comply with AIS. While reinforced precast concrete may not be at least 50% iron or steel, in this case, the reinforcing bar and wire must be produced in the US and meet the same standards as for any other iron or steel product. Additionally, the casting of the concrete product must take place in the US. The cement and other raw materials used in concrete production are not required to be of domestic origin. If the reinforced concrete is cast at the construction site, the reinforcing bar and wire are considered a construction material and must be produced in the US.

**Recordkeeping for Iron and Steel Products:**

*Documenting the Country of Origin for Iron and Steel Products for Loan Programs*

Loan recipients with assistance from their general contractor must be able to verify that products used in their projects comply with the AIS requirements. USEPA recommends loan recipients use a “Step Certification” process to ensure that producers adhere to the AIS requirements. Step certification is a process under which each handler (supplier, fabricator, manufacturer, etc.) of the iron and steel products certifies that their step in the process was domestically performed. Each time a step in the manufacturing process takes place, the manufacturer delivers its work along with a certification of its origin. A certification can be quite simple as long as it includes the name of the manufacturer, the location of the manufacturing facility (not company headquarters), a description of the product or item being delivered, and a signature by a manufacturer’s responsible party. An example of this type of certification is attached.

Certification could be achieved by other methods such as requiring the final manufacturer, who delivers the iron/steel products to the worksite, to provide certification that all manufacturing processes occurred in the US. While this type of certification is easier and acceptable, it may not provide the same degree of assurance and additional documentation may be needed. USEPA auditors recommend keeping records of when and where the products were delivered. Examples include: Perry Water Plant on August 3, 2017, or Jankousky Construction Offices on October 5, 2017. Records from the manufacturer should refer to specific items such as pipes, valves, meters. Try to avoid records containing broad statements such as, “All products delivered were made in the USA.”

Regardless of the method, documents regarding the country of origin for iron and steel products should be collected and maintained by all loan recipients. Having a good paper trail is invaluable during an inspection or audit.

Sample Certification Letter

The following information is provided as a sample letter of step certification for AIS compliance. The completed letter is provided to the construction contractor or loan applicant from the supplier, fabricator, manufacturer, etc. of iron and steel products. Documentation must be provided on company letterhead. If e-mail is used, documents should be scanned so the company letterhead is visible.

Company Letterhead

Date

Company Name
Company Address
City, State, Zip

Subject: American Iron and Steel Step Certification for Project (xxx Identify Project Here xxx)

I, (company representative), certify that the (melting, bending, coating, galvanizing, cutting, etc.) process for (manufacturing or fabricating) the following products and/or materials shipped or provided for the subject project is in full compliance with the American Iron and Steel requirements as mandated in EPA’s State Revolving Fund Programs.

Item, Products, and/or Materials:

1. XXX
2. XXX
3. XXX

Such process took place at the following location (City and State must be included):

If any of the above compliance statements change while providing material to the project we will immediately notify the prime contractor and the engineer.

Signed by Company Representative
CITY OF DANVILLE
SPECIAL PROVISIONS

The following Special Provisions supplement the "Standard Specifications for Road and Bridge Construction," (SSRBC) adopted April 1, 2016 and the latest edition of the "Manual on Uniform Traffic Control Devices for Streets and Highways" (MUTCD) and the “Manual of Test Procedures for Materials” in effect on the date of invitation for bids; and the "Supplemental Specifications and Recurring Special Provisions," indicated on the Check Sheet, included herein, which apply to and govern the construction of the Northwest Sanitary Sewer Service Area Reconstruction, in Vermilion County. In case of conflict with any part or parts of said specifications, the said Special Provisions shall take precedence and shall govern. The proposed sewer improvements shall be constructed in accordance with the Standard Specifications for Water and Sewer Main Construction in Illinois, 7th Edition dated 2014 herein referred to as the Standard Specifications.

LOCATION OF PROJECT

The project is located along Rue Bienville Street in the Chateau Estates subdivision, along Old Ottawa Road from Denvale Drive to Denmark Road, and along Denmark Road from Rose Hill Cove to West Winter Avenue. The project is located on the northwest side of the City of Danville, IL.

DESCRIPTION OF IMPROVEMENT

The work of project is defined by the Contract Documents and consists of the following:

1. Denmark Road Lift Station
2. Chateau Estates Lift Station
3. Rose Hill Cove Lift Station
4. Denmark Road Gravity Sewer
5. Rose Hill Cove Forcemain
6. Chateau Estates Sanitary Forcemain
7. Denmark Road Sanitary Forcemain

CONSTRUCTION SEQUENCE AND SCHEDULE

The Contractor shall prepare a progress schedule as required by Section 108 of the SSRBC. The Contractor shall coordinate items of work in order to keep hazards, traffic inconvenience and limited access to residences and businesses along Denmark Road and Old Ottawa Road to a
minimum. In particular, construction shall be staged as shown on the Plans and as listed below to meet the following requirements:

Portions of the Work shall be constructed in stages to maintain the functionality of the existing infrastructure. Staging may be modified. Modifications of the staging shall not exceed the maximum length of a lane closure stipulated in the Contract Documents. The Plans identify the Construction Stage locations (S1 through S5). The staging is outlined here and discussed in greater detail in the respective specification sections.

1. The Old Ottawa and Chateau sanitary forcemain shall be constructed first. Chateau lift station construction can occur concurrently with the forcemain work. (Construction Stage S5)
2. Construction of the Denmark Road lift station and forcemain is required to be completed next in order to have a location for the new flow to be rerouted. (Construction Stages S1B and S2)
3. The Denmark Road gravity sewer can be constructed concurrent to the Denmark Hill lift station to a point short of the manhole connection (MH#17) to the sewer on Old Ottawa Road but cannot be connected until the station is operational. (Construction Stages S1A and S1B)
4. Upon the commissioning of the Denmark Road lift station, the proposed manhole (MH #17) can be installed and the Denmark Road gravity sewer can be connected to the system at Old Ottawa Road MH#17. The Denmark Road gravity sewer can continue north of Old Ottawa Road until the termination point shown on the plans. (Construction Stage S1C)
5. Once the connection is made to the gravity sewer on Old Ottawa Road, the Rose Hill lift station and forcemain construction can proceed. (Construction Stage S4)
6. Sanitary flows for the Rose Hill lift station will need to be bypass pumped for the duration of the lift station construction. (Construction Stage S4)

Contract Coordination:

The City of Danville has a contract for the construction of road improvements along Old Ottawa Road and Denmark Road. The roadwork contract is programmed to occur after the sanitary work. The roadwork along the Denmark Road causeway will follow the sewer work. At a point in the Contract when the sewer, causeway and bridge expansion joint work are complete, the Contractors responsibility for the rental of the barrier will cease. Contractor to provide a date to the Owner with the bid submittal which indicates the proposed date of transfer of barrier wall rental and maintenance to the roadway contractor. In no event will a date later than June 15, 2021 be allowed. The agreed date will serve as the date that the roadway contractor may commence work in all portions of the roadway project. These areas include, but are not limited to:

- Denmark Road from Winter Avenue to Old Ottawa Road.
- Old Ottawa Road to Denmark Road to Rue Bienville Street.
The Owner will incorporate that date into the roadwork contract prior to bidding that project. The barrier will be left on the shoulder of Denmark Road and the roadway contractor shall assume rental and removal costs for the barrier.

Roadway improvements to Denmark Road and Old Ottawa Road will occur after construction of the proposed sanitary improvements. There are points of coordination between the two that will need to occur. Coordination is as follows:

The embankment/sanitary improvements that occur along Denmark Road’s causeway shall be completed prior to roadway construction on the causeway.

Construction of the gravity sewer along Denmark Road will require removal of guard rail on the south side of the causeway and require the installation of temporary concrete barrier during construction. Upon installation of the gravity sewer, the barriers will be shifted to the shoulder and left in place until the road contractor is ready to start. At this point the responsibility of the barrier is transferred to the Roadway contractor who will utilize them for the roadway improvements. The date of transfer of responsibility will be included in the bid as part of the bid schedule.

The sanitary sewer work along Old Ottawa Road will occur prior to the roadway work but coordinated with the Roadway contractor. The curve on Old Ottawa is to be reconstructed by the road contractor. During the construction, the forcemain will need to be installed while maintaining one lane of traffic or if concurrent with the roadway work, while the road is closed and detoured.

The sanitary forcemain from Denmark Road lift station to the discharge location will require a partial shutdown of the intersection of Denmark Road and Winter Avenue. This will occur before the proposed road construction at this location on Denmark Road.

The gravity sewer from the old Denmark Road lift station to the new Denmark Road lift station shall occur during the proposed road construction on Denmark Road.

Where the sanitary construction along Denmark Road is to be concurrent to roadway construction on along a different portion of Denmark Road, there must be coordination between the two contracts regarding traffic control and lane closures needed for the two work areas. Maximum lane closure lengths shall be maintained. Consideration of the minimum space between two separate work areas along the same road shall be evaluated between contracts.

Construction of the Chateau Estates lift station and forcemain outside of Old Ottawa Right-of-Way and the Rose Hill lift station and gravity sewer can occur without coordination with the proposed road improvements.
The traffic control for the Rose Hill forcemain construction within Denmark Road’s right-of-way shall be coordinated with the roadway contractor in consideration of distance between traffic control work areas.

Full access to the Gao Grotto property on Denmark Road shall be provided for the first two weeks of July and on the day of their fireworks show. The contractor shall make contact with the property owner to confirm critical dates requiring full access.

No lane closures will be allowed on the Denmark Road causeway on July 1-6, 2021.

**TRAFFIC CONTROL PLAN**

**Description:** Traffic control shall be in accordance with the applicable sections of the SSRBC, the applicable guidelines contained in the MUTCD for Streets and Highways, the Manual on Uniform Traffic Control Devices, latest edition; these special provisions, and any highway standards contained herein and in the plans.

**General:** Special attention is called to Articles 107.09 and 107.14 and Sections 701 through 705 of the SSRBC and the traffic control related Highway Standards shown in the plans; Supplemental Specifications and Recurring Special Provisions; BDE Special Provisions; and other special provisions related to traffic control.

The Contractor shall be responsible for the traffic control devices at all times during construction activities and shall coordinate the items of work to keep traffic hazards and/or inconveniences to a minimum.

All advance-warning signs shall be in new or like new condition at the start of the project. If an advance warning sign is damaged or becomes unreadable, the sign shall be replaced by a new or like new sign.

All signing for traffic control shall meet current IDOT policy for retro-reflectivity requirements.

Standards, 701011-04, 701101-05, 701501-06 and 701321-18 shall be used for sanitary construction.

The Contractor shall provide the name and phone number of a contact on a 24-hour basis in the event an accident or other unforeseen damage occurs that necessitates replacement or resetting of traffic control items.

The Contractor shall use IDOT’s standard Traffic Control measures while working on City streets.

Only one lane of Denmark Road shall be closed at a time during construction. At no time shall both lanes be closed to traffic for sanitary sewer construction.
Where temporary lane closure with flaggers are utilized on Denmark Road during construction, the Contractor shall complete excavation/trench work each day to a point where a temporary drivable surface equal to existing ground is complete in place to continuously reopen the closed lane prior to leaving the site each day.

Access to the businesses, cemeteries and parks shall be maintained through construction.

Maximum length of Denmark lane closure shall be 2,000 ft. long. Maximum length of Old Ottawa lane closure shall be 1,000 ft. long. Maximum length includes the tapers on the ends of the work zone.

**Basis of Payment:** Traffic control and protection standards 701011, 701101, 701316, 701321, and 701501 shall be paid for at the contract lump sum price.

Closure of Old Ottawa Road shall be paid as part of the Roadwork Contract.

The temporary concrete barrier used for lane closures and traffic protection during the removal of the guard rail shall be paid for as part of the Denmark Road Improvements contract. The Contractor shall coordinate with the roadway contract on the placement of the barrier for use during the sewer construction along Denmark Road. The barrier will need to be shifted in the field for various stages of the sewer contract’s traffic control and construction. Manipulation of the barrier during sewer construction shall be the responsibility of the sewer contract and shall be included in the cost of the pay item TRAFFIC CONTROL AND PROTECTION (SPECIAL).

All traffic control and protection, in addition to those standards listed above, as shown on the plans and described in these specifications will be paid for at the contract lump sum price for TRAFFIC CONTROL AND PROTECTION (SPECIAL), which work shall include furnishing, installing, maintaining, replacing, relocating and removing all traffic control devices used for the purpose of regulating, warning, directing, closing, and detouring traffic on the local streets impacted by the construction of the project.

**CONSTRUCTION LAYOUT**

**Description:** The Contractor shall furnish and place construction layout stakes for this project.

**General:** The Contractor shall provide field forces, equipment, and material to set all additional stakes for this project, which are needed to establish offset stakes, reference points, and any other horizontal or vertical controls, including supplemental bench marks, necessary to secure a correct layout for work. The Contractor will not be required to determine property lines between private properties.

The survey control points or bench marks will be set by the Owner per Article 105.09 of the SSRBC. Points set will be identified in the field to the Contractor. The Contractor shall exercise care in the preservation of all stakes and bench marks and shall have them reset when any are damages, lost, displaced, removed, or otherwise obliterated. The Owner may deduct compensation from the Contractor for any reset of bench marks or survey control.
The Contractor shall establish from the given bench marks all the points necessary to construct the individual project elements. The Contractor shall be responsible for having the finished work conform to the lines, grades, elevations and dimensions called for in the Plans.

The Owner or Owner’s Representative may make random checks of the Contractor’s staking to determine if the work is in conformance with the Plans. It is not the responsibility of the Owner or Owner’s Representative to check the correctness of the Contractor’s stakes. Any apparent errors will be immediately called to the Contractor’s attention. The Contractor shall be required to make the necessary correction before the stakes are used for construction purposes. Any inspection or checking of the Contractor’s layout by the Owner or Owner’s Representative and the acceptance of all or any part of it shall not relieve the Contractor of his/her responsibility to secure the proper dimensions, grades, and elevations.

For structure staking, the Contractor shall use diligent care and appropriate accuracy. Points shall be positioned to allow reuse throughout the construction process. Prior to beginning of construction activities, all structure centerlines and pier lines are to be established by the Contractor. The Contractor shall provide a detailed structure layout drawing showing span dimensions, staking lines and offset distances.

Where the Contractor, in setting construction stakes, discovers discrepancies, the Owner or Owner’s Representative will check to determine their nature and make whatever revisions are necessary in the Plans. Any additional restaking required by the Owner or Owner’s Representative shall be the responsibility of the Contractor. The additional restaking done by the Contractor shall be paid for according to Article 109.04 of the SSRBC.

The Contractor shall provide the Owner or Owner’s Representative a copy of any field notes, cut/fill sheets, and layout diagrams produced during the course of the project.

Where the plan quantities for excavation are to be used as the final pay quantities, the Owner or Owner’s Representative may make sufficient checks to determine if the work has been completed in conformance with the Plans.

All work shall be according to normally accepted self-checking surveying practices. Field notes shall be kept in standard survey field notebooks and those books shall become the property of the Owner at the completion of the project. All notes shall be neat, orderly, and in accepted form.

**Basis of Payment:** This work shall be paid for at the contract lump sum price for CONSTRUCTION LAYOUT.

**TEMPORARY FENCE**

**Description:** This work shall consist of constructing temporary fencing in accordance with Section 201 of the SSRBC at the locations identified on the plans.
Northwest Sanitary Sewer Service Area Reconstruction  
Vermilion County  
City of Danville  

**General:** Contractor shall install the temporary fencing around the existing wetland ahead of construction.

**Basis of Payment:** This work shall be paid for at the contract unit price per foot for TEMPORARY FENCE.

**POROUS GRANULAR EMBANKMENT**

**Description:** This work shall consist of placing porous granular embankment in accordance with Section 207 of the SSRBC at the locations identified on the plans.

**General:** This work shall consist of the expansion of the causeway along Denmark Road. PGE shall be placed accurately and the finished profile shall be graded/confirmed. The contractor shall proceed with filter fabric and riprap as soon as practical after the placement of the PGE to prevent movement and contamination from wave action.

PGE tonnage is calculated using 2.05 tons per cubic yard.

**Basis of Payment:** This work shall be paid for at the contract unit price per ton for POROUS GRANULAR EMBANKMENT.

**STONE RIPRAP, CLASS A4**

**Description:** This work shall consist of providing and installing riprap along the Denmark Road causeway in accordance with Section 281 of the SSRBC as identified on the plans.

**General:** This work consists of armoring the expanded embankment along Denmark Road. Riprap placement will be in the water for the majority of the installation. The use of a gradeall or GPS guided equipment for final placement and confirmation of proper placement are recommended. Riprap shall be placed from downslope to upslope. Care is to be taken not to damage the filter fabric.

Riprap tonnage is calculated using 1.5 tons per cubic yard.

**Basis of Payment:** This work shall be paid for at the contract unit price per ton for STONE RIPRAP, CLASS A4.

**FILTER FABRIC**

**Description:** This work shall consist of providing and installing filter fabric of the type identified in accordance with Section 282 of the SSRBC at the locations identified on the plans.

**General:** This work shall consist of placing filter fabric on the prepared surface of the causeway embankment in preparation for the placement of riprap. The filter fabric shall extend beyond the limits of the proposed riprap as noted on the plans. The contractor shall anchor the fabric with sandbags temporarily to keep it from shifting prior to the placement of riprap. The extra fabric in
the water shall remain uncovered. The extra fabric at the top of the slope shall be laid along the top of the slope and covered with fill to create an anchor.

**Basis of Payment:** This work shall be paid for at the contract unit price per square yard for **FILTER FABRIC.**

**AGGREGATE SURFACE COURSE, TYPE A, 8”**

**Description:** This work shall consist of constructing aggregate surface course of the type identified on a subgrade in accordance with Section 402 of the SSRBC at the locations identified on the plans.

**General:** Contractor shall match existing pavement elevations at the transitions.

**Basis of Payment:** This work shall be paid for at the contract unit price per square yard for **AGGREGATE SURFACE COURSE, TYPE A, 8”.**

**PORTLAND CEMENT CONCRETE DRIVEWAY PAVEMENT, 5 INCH**

**Description:** This work shall consist of constructing Portland cement concrete driveway pavement on a prepared subgrade in accordance with Section 423 of the SSRBC at the locations identified on the plans.

**General:** Contractor shall match existing pavement elevations at the transitions.

**Basis of Payment:** This work shall be paid for at the contract unit price per square yard for **PORTLAND CEMENT CONCRETE DRIVEWAY PAVEMENT, 5 INCH.**

**PORTLAND CEMENT CONCRETE DRIVEWAY PAVEMENT, 8 INCH**

**Description:** This work shall consist of constructing Portland cement concrete driveway pavement on a prepared subgrade in accordance with Section 423 of the SSRBC at the locations identified on the plans.

**General:** Contractor shall match existing pavement elevations at the transitions.

**Basis of Payment:** This work shall be paid for at the contract unit price per square yard for **PORTLAND CEMENT CONCRETE DRIVEWAY PAVEMENT, 8 INCH.**

**COFFERDAM (TYPE 2) (LOCATION 1) / (LOCATION 2)**

**Description:** This work shall be in accordance with IDOT Standard Specifications for Road and Bridge Construction 2016, Article 502.06, except as modified below.
Construction: Contractor shall monitor the existing bridge during driving of sheet piling. If settlement of the existing bridge is observed, the Contractor shall stop work and contact the Engineer.

As an alternative, the Contractor may utilize a Coffercell instead of a Cofferdam at no additional cost to the owner. The Contractor shall submit drawings and design calculations showing the proposed Coffercell. These drawings and calculations shall be sealed by an Illinois licensed Structural Engineer.

Basis of Payment: This work shall be paid for at the contract unit price per each for COFFERDAM (TYPE 2) (LOCATION 1) / (LOCATION 2).

FURNISHING STEEL PILES HP 10X42

Description: This work shall consist of furnishing steel piles of the size specified for the project.

General: N/A

Basis of Payment: This work shall be paid for at the contract unit price per foot for FURNISHING STEEL PILES HP 10X42.

TEST PILE HP 10X42

Description: This work shall consist of driving a test pile in accordance with Section 512 of the SSRBC at locations identified in the plans.

General: Test piles shall be provided and driven in accordance with Section 512.

Basis of Payment: This work shall be paid for at the contract unit price per each for TEST PILE HP 10X42.

REMOVE AND RELOCATE WATER MAIN 12”

Description: This work shall consist of first locating, then if necessary, relocating a segment of water main and removing the existing water main in accordance with the specifications outlined in Appendix A, Aqua Illinois Standard Specifications for the Construction of Water Main. Aqua Illinois will provide the pipe material, fittings, tracer wire, polywrap and accessories and will isolate the water main for the removal and relocation of the main. Aqua required the following of the contractor:

- Aqua will need to notify users of the shutdown min. 48 hours prior to the work being done
- Aqua will operate the valves
- The main will need to be lowered and will need 18” vertical separation

The water main to be located is an existing 12-in diameter main along the gravity sanitary sewer between Stations 199+14 and Station 206+00.
General: The main shall be located both horizontally and vertically prior to the start of the sewer construction. Relocation of the 12” water main shall include all coordination with the water company, isolation of the main, excavation, backfill, installation and testing associated with placing the main back into service.

The cost of relocating the water main shall also include pressure testing and bacteriological sampling of the main once the new section is installed.

AQUA owns the existing water main and should be the primary point of contact for the proposed relocation.

All backfill shall be FA-6.

Basis of Payment: This work shall be paid for at the contract unit price per foot for REMOVE AND RELOCATE WATER MAIN 12” which shall include all locating of the existing main, the labor, backfill, restraints and all other items necessary to relocate the main.

CONTROLLED LOW STRENGTH MATERIAL, SPECIAL

Description: This work shall consist of backfilling utility trenches in pavement sections where noted in the plans in accordance with Section 593 of the SSRBC.

General: The contractor shall use Mix 2 for the controlled low strength material.

Basis of Payment: This work is paid for in other pay items. No additional compensation will be made for CONTROLLED LOW STRENGTH MATERIAL.

MANHOLES, TYPE A, 4’ DIAMETER, TYPE 1 FRAME, CLOSED LID, 5’ DIAMETER, TYPE 1 FRAME, CLOSED LID AND 6’ DIAMETER, TYPE 1 FRAME, CLOSED LID

Description: This work shall consist of removing existing manholes where applicable and installing 4’, 5’ or 6’ diameter concrete manholes, frames and lids shall in accordance with Section 602 of the SSRBC at the locations identified in the plans.

Construction: All manholes shall be cast with a concrete mix that has been fortified with ConShield or Engineer approved equal. Coating of the concrete surface after casting shall not be considered equivalent to integrally mixing the additive into the concrete. The manufacture of the manholes shall provide documentation that the additive has been utilized according to the specifications of the additive manufacturer.

The frame and lid shall be Neenah R-1713, East Jordan 1051, or approved equal with concealed pick holes and gasketed lid. The word “SANITARY” must be present in the center of the lid. The frame shall be set on a double ring of butyl mastic rope.

Pipe connections to manholes shall be compression or boot style meeting ASTM C 923. Compression connections shall be non-shrink grouted on the inside and outside of the manhole.
after pipe installation. Boot connectors shall contain only stainless steel hardware and shall be non-shrink grouted on the inside of the manhole after pipe installation. Non-shrink grout shall be flush with the walls, bench, and invert of the manhole and shall meet the requirements of Section 1024 of the IDOT Standard Specifications.

A minimum of 2” and a maximum of 8” of the manhole height shall consist of concrete adjustment rings. Each adjusting ring shall be set on a ring of butyl mastic rope.

Seals between manhole sections shall be made with butyl mastic rope placed on the flat, outside edge of each precast manhole section, preformed flexible gaskets meeting ASTM C 990, or rubber gaskets conforming to ASTM C 443. All exterior manhole joints shall be wrapped with external sealing bands meeting ASTM C 877 Type 2, installed according to the manufacturer’s requirements.

All manholes shall have external chimney seals. Chimney seals shall be made of a rubber meeting ASTM C-923 in a minimum thickness of 3/16 of an inch. The seal shall have stainless steel bands and hardware designed to secure it to the bottom flange of the casting and the upper portion of the manhole cone section. Type C manholes shall have a lip on the flat lid section for securing a chimney seal or the contractor shall furnish a special chimney seal to meet requirements of the Engineer.

All new manholes will be subject to vacuum testing. No cementitious materials may be applied to manhole joints or adjusting rings prior to the manhole passing the vacuum test. Pipe connections to the structure may be grouted in advance of vacuum testing. Upon a passing test, internal joints and lift holes shall be neatly filled with a non-shrink grout material. Adjusting rings should not be grouted.

**Measurement:** This work shall include the specified type and size including frames, lids, steps, adjustment rings, joint sealing, chimney seals, connections to sewers, and testing.

**Basis of Payment:** This work shall be paid for at the contract unit price per each for MANHOLES, TYPE A, 4’ DIAMETER, TYPE 1 FRAME, CLOSED LID, MANHOLES, TYPE A, 5’ DIAMETER, TYPE 1 FRAME, CLOSED LID, MANHOLES, TYPE A, 6’ DIAMETER, TYPE 1 FRAME, CLOSED LID.

**PEDESTRIAN TRUSS SUPERSTRUCTURE**

**Description:** This work shall consist of the design, fabrication, storage, delivery and erection of a welded steel, pedestrian truss superstructure. Also included in this work shall be the furnishing and installation of a deck, all bearings, anchors and/or retainers, railings, fencing and miscellaneous items as indicated on the plans.

**Materials:**

Truss. Structural steel shall conform to the requirements of Section 1006 of the Standard Specifications, ASTM A847 for cold formed welded square and rectangular tubing, AASHTO M270 Grade 50W (M270M 345W) for atmospheric corrosion resistant structural steel, as applicable, unless otherwise shown on the plans or approved by the Engineer. All structural steel
field connections shall be bolted with high strength bolts. High strength bolts for unpainted weathering steel shall conform to ASTM A325 (A325M) (Type 3). For painted structures, the high strength bolts shall be mechanically galvanized according to the requirements of Article 1006.08(a) of the Standard Specifications.

**Deck:** The deck type shall be Ipe hardwood decking. All decking shall be full thickness planks.

Wood decking shall be naturally durable hardwood Ipe (Tabebuia Spp Lapacho Group). All planks shall be partially air dried to a moisture content of 20% or higher, and shall be supplied S4S (surfaced four sides), E4E (eased four edges), with the edges eased to a radius of 1/8”. Measured at 25% moisture content, the width and thickness shall not vary from specified dimensions by more than ± 0.125” and ±0.0625”, respectively. All planks shall be supplied with the end sealed with “Anchorseal” Mobil CER-M or an equal aqueous wax log sealer.

All planks shall be graded as FEQ (First Export Quality) grading rules, defined as follows:
- Lumber shall be graded both faces and both edges.
- Lumber shall be straight grained, maximum slope of grain to be 1:10.

**FEQ (first one face and better)**

Grading Face, Back Face and Edges
- Include - Mixed Appearance Characteristics
- Include - Mixed Physical Characteristics that can be removed using normal installation methods, tools, or sanding
- Include - Sound Defects
- Exclude - Milling Defects

Back Face and Edges:
- Include – Unsound Defects
- Include – Milling Defects

**Appearance Characteristics**
1. Color variation
2. Mixed grain
3. Drying checks
4. Reverse/roey grain
5. Birdseye
6. Pin knots
7. Maculas
8. Water stain
9. Discoloration
10. Sticker marks
11. Molder knife marks

**Milling Defects:**
1. Skip
2. Torn grain
3. Chipped grain
4. Non-compliant profiling

Physical Characteristics

1. Bow
2. Crook
3. Cup
4. Twist
5. Raised grain

Sound Defects:
1. Pin holes
2. Sound knots

Unsound Defects:
1. Large borer holes
2. Splits
3. Unsound knots
4. Shake
5. Sapwood

All planks shall meet or exceed the following mechanical properties (based on the 2” standard) as defined by the U.S. Forest Products Laboratory publications and testing data:

- MC% = AD
- Bending Strength = 22,475 psi
- Modulus of Elasticity = 3,145,000 psi
- Max. Crush Strength = 13,140 psi
- Janka side hardness is 3595lbs. at 12% moisture content
- Average air-dry density is 56.7 to 59.3 pcf.
- Basic specific gravity is 0.85 - 0.97.

All planks shall be naturally fire resistant without the use of any fire resistant preservatives to meet NFPA Class A and UBC Class I.

Planks shall be supplied that meet or exceed the Static Coefficient of Friction for both Neolite and leather shoes in accordance with ASTM Test Method C1028-89.

- Neolite = 0.69 lbs wet
- Leather = 0.79 lbs wet

For transverse wood decking, wheel loads shall be assumed to act on one plank only. The wheel loads shown in Section 3.1.3 shall be distributed on the plank along a length equal to the tire print width (W). The plank shall be designed for shear and bending in accordance with the support conditions and spacing. For design, the following unfactored allowable values shall be used:

- Allowable Bending = 3,700 psi
- Allowable Shear = 320 psi
- Modulus of Elasticity = 3,000,000 psi
Railing. The railing shall consist of a smooth rub rail, a toe plate and misc. elements, all located on the inside face of the truss.

Bearings. The bearing shall be designed and furnished as detailed in the plans, in the absence of details, the bearings details shall be as specified by the bridge manufacturer.

When specified for use, elastomeric bearings shall be according to Article 1083 of the Standard Specifications. Teflon surfaces shall be per Article 1083.02(b) of the Standard Specification and shall be bonded to the bearing plate.

Suppliers. The Illinois Department of Transportation maintains a pre-qualified list of proprietary structural systems allowed for pedestrian truss superstructures. This list can be found on the Departments web site under Prequalified Structural Systems. The Contractor’s options are limited to those systems pre-qualified by the Department. These systems have been reviewed for structural feasibility and adequacy only. Presence on this list shall in no case relieve the Contractor of the site specific design or QC/QA requirements stated herein.

The manufacturer shall provide evidence of current certification by AISC according to Article 106.08(b) of the Standard Specifications.

Design: The superstructure shall conform to the clear span, clear width, and railing configuration shown on the contract plans. The design shall be according to the LRFD Guide Specifications for the Design of Pedestrian Bridges. The design loads shall be as specified by the Guide Specification except as follows:

<table>
<thead>
<tr>
<th>Design Wind Loads ($P_z$) for Pedestrian Trusses in Illinois</th>
<th></th>
<th>Applied to:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>psf (kPa)</td>
<td></td>
</tr>
<tr>
<td>Circular Members</td>
<td>35 (1.68)</td>
<td>Projected vertical area of member</td>
</tr>
<tr>
<td>Flat Members</td>
<td>55 (2.63)</td>
<td>Projected vertical area of member</td>
</tr>
<tr>
<td>Signs</td>
<td>35 (1.68)</td>
<td>Projected vertical area of sign</td>
</tr>
<tr>
<td>Chain Link Fencing</td>
<td>10 (0.48)</td>
<td>Full projected area of fencing as if solid</td>
</tr>
</tbody>
</table>

The railings shall be designed per the appropriate Bridge Design Specifications for bicycle railings as shown on the plans. Smooth rub rails shall be attached to the bicycle railing and located at a bicycle handlebar height of 3.5 ft. (1.1 m) above the top of the deck.

Prior to beginning construction or fabrication, the Contractor shall submit design calculations and six sets of shop drawings for each pedestrian bridge to the Engineer for review and approval. In addition, for bridges with any span over 150 ft. (46 m), or over a State or Federal Route, or within the States Right-of-Way, a copy of the shop drawings will be reviewed and approved for structural adequacy, by the Bureau of Bridges and Structures prior to final approval of shop drawings. The shop drawings shall include all support reactions for each load type. The following certification shall be placed on the first sheet of the bridge shop plans adjacent to the seal and signature of the Structural Engineer:
Northwest Sanitary Sewer Service Area Reconstruction  
Vermilion County  
City of Danville

“I certify that to the best of my knowledge, information and belief, this bridge design is structurally adequate for the design loading shown on the plans and complies with the requirements of the Contract and the current ‘Guide Specifications for Design of Pedestrian Bridges’.”

The substructure is designed per the appropriate Bridge Design Specifications and based on the assumed truss loads, as shown on the plans. If the manufacturer’s design exceeds those loads and/or the substructure needs to be adjusted to accommodate the truss superstructure chosen, then the Contractor shall submit the redesign to the Engineer for approval prior to ordering any material or starting construction. All design calculations, shop drawings and redesigned substructure drawings shall be sealed by a Structural Engineer licensed in the State of Illinois.

**Construction:** Truss erection procedures shall be according to the manufacturer’s instructions. The deck shall be placed according to the applicable Sections of the Standard Specifications.

When weathering steel is used, all structural steel shall be prepared according to Article 506.07.

When painting is specified, all structural steel shall be cleaned and painted according to Section 506. The paint system and color of the finish coat shall be as specified in the plans.

**Deck:** At time of installation, planks are to be placed tight together with no gaps.

Every plank must be attached with at least one fastener at each end. All fasteners to be zinc plated. Self-tapping screws or hex-head bolts, with a steel plank hold down, are to be used at the ends of planks. Self-tapping screws or carriage bolts are to be used as interior connection fasteners when required. Power actuated fasteners will not be allowed.

Planks are to be drilled prior to installation of bolts and/or screws.

In addition to at least one fastener at each end of every plank (typical for all installations), planks for bridges with widths of 72” to 143” shall be attached with a minimum of two fasteners at a location approximately near the center of the bridge width. Bridges wider than 143” are to have two fasteners located at a minimum of two interior stringer locations, approximately at the third points of the bridge width.

**Method of Measurement:** The pedestrian truss superstructure will be measured in square feet (square meters) of completed and accepted structure measured horizontally from back to back of abutments and within the clear path width as defined on the plans.

**Basis of Payment:** This item will be paid for at the contract unit price per square foot for PEDESTRIAN TRUSS SUPERSTRUCTURE.

**CELLULAR CONCRETE**

**Description:** This work shall consist of filling in existing pipes that are to be abandoned and filled at the locations indicated on the Plans and herein.
General: Contractor shall fill the existing pipes sections to be abandoned with cellular concrete. The cellular concrete shall be per Section 1029 Cellular Concrete of the SSRBC.

The cellular concrete shall be Class IV.

Prior to filling the annular space, the upstream and downstream ends of the pipe section shall have caps, plugs or bulkheads constructed to contain the cellular concrete. If non-shrink grout is used, the grout shall extend into the forcemain a minimum of 6 inches and flare outside the pipe, engaging the outside of the pipe. If bulkheads are used, the bulkhead shall be constructed with Class SI concrete. The bulkheads shall extend inward a minimum depth of 18 inches from the ends of the pipe. A method of venting through the bulkheads or grouting ports at the crown shall be utilized to allow air to escape when pumping material and to allow verification that the annular space has been filled.

The cellular concrete shall be placed according to the approved installation procedures provided by the manufacturer. There shall be no standing water in the pipe to be filled. If necessary, dewatering shall be continuous during the time the lightweight cellular concrete fill is constructed. Cellular concrete shall not be placed during or when periods of precipitation are expected unless ground water is diverted away from the abandoned pipe.

The pumping operation shall completely fill the entire pipe length. The air temperature at time of placement and for 24 hours thereafter shall be a minimum of 35 °F. The temperature of the cellular concrete at point of discharge shall be a minimum of 45 °F and a maximum of 95 °F.

Upon completion of the pumping operation, all remaining unfilled vent holes in bulkheads including those at both the upstream and downstream ends shall be filled with a non-shrink grout. Only enough water to make a stiff but workable non-shrink grout shall be used. The air temperature at time of placement and for 24 hours thereafter shall be a minimum of 35 °F.

No mechanical vibration of the cellular concrete shall be permitted.

The cellular concrete shall have a minimum 28 day compressive strength of 80 psi. The Contractor shall sample the cellular concrete a minimum of once each day for compression strength during production. Mold the cellular concrete according to ASTM C 495. For each test, four 3 in. x 6 in. specimens shall be molded for the cellular concrete. The specimens shall be stored in a temperature range of 60 to 80 °F for the first 24-72 hours, and the Contractor shall provide a field curing box. After this time, the Contractor shall transport the specimens to an approved the laboratory for curing and testing. The cellular concrete shall be tested for compressive strength according to ASTM C 495, except that samples shall not be tested. A compressive strength test is defined as the average of four cylinder breaks. For each sample, tests shall be conducted at 7 and 28 days, except when the mix includes fly ash, in which case, the tests may be conducted at 14 and 56 days, respectively.
The Contractor shall sample and test the as-cast density of the cellular concrete. The first batch placed each day and every 2 hours thereafter shall be sampled and tested as described for “experimental density of the concrete after pumping” according to ASTM C 796, except the hose length shall be that used for jobsite placement. The as-cast density shall be the average of at least two tests. If the average as-cast density is outside the specified tolerance from Table 1, the Contractor shall reject the batch or make an adjustment to the mix before placement. Adjustments to the mix shall be accomplished by either increasing or decreasing the foam only.

<table>
<thead>
<tr>
<th>Class</th>
<th>Maximum Lift Height</th>
<th>Maximum As-Cast Density</th>
<th>Minimum Compressive Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ft (m)</td>
<td>lb/cu ft (kg/cu m)</td>
<td>Psi (kPa) Days (Note 1)</td>
</tr>
<tr>
<td>I</td>
<td>4 (1.2)</td>
<td>30 ± 2 (481 ± 32)</td>
<td>30 (205) 7 (Note 1)</td>
</tr>
<tr>
<td>II</td>
<td>4 (1.2)</td>
<td>36 ± 2 (577 ± 32)</td>
<td>60 (415) 80 (Note 1)</td>
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<tr>
<td>III</td>
<td>2.5 (0.76)</td>
<td>42 ± 2 (673 ± 32)</td>
<td>90 (620) 120 (Note 1)</td>
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<tr>
<td>IV</td>
<td>2.5 (0.76)</td>
<td>50 ± 2 (801 ± 32)</td>
<td>115 (795) 150 (Note 1)</td>
</tr>
</tbody>
</table>

Notes:
(1) When fly ash is used, the required 7-day and 28-day strengths may be reached at 14 and 56 days, respectively.

Results of all field and laboratory tests performed shall be made available to the Owner as soon as possible to determine the acceptability of the Work. Results will then be the sole property of the Owner.

If the Owner or Owner’s Representative finds any results to be unsatisfactory, the Owner shall choose method(s) that will be used to correct any unaccepted work. The Contractor will not be eligible for additional payment.

Submittals: Prior to construction, the Contractor shall submit the following items:
- The cellular concrete mix design.
- The name of the subcontractor providing and installing the cellular concrete. The Contractor shall present an organization chart including names, telephone numbers, current certifications and/ or titles, and roles and responsibilities of all those involved in the manufacturing and installation of the cellular concrete.
• Manufacturer's specifications (including installation procedures), catalog cuts, and other product data needed to demonstrate compliance with specified requirements. These shall include reports and test results from laboratories.
• The subcontractor installing the cellular concrete shall be certified in writing by the Manufacturer of the cellular concrete. The certified applicator shall be regularly engaged in the placement of cellular concrete of a similar nature including the completion of mass fills having a minimum of 13,000 cubic yards in the past five years.
• Qualifications and experience for third party testing company for compressive strength tests shall be submitted by the Contractor and approved by the Owner before start of field work.
• Results of all tests performed shall be submitted to the Owner.
• A description of the proposed installation procedure. The procedure shall address the following:
  (1) Proposed construction sequence and schedule.
  (2) Location of the equipment and batching areas.
  (3) Type of equipment and tools to be used.

Basis of Payment: This item of work will be paid for in the Special Provision 24” SANITARY SEWER ABANDON AND FILL

CLEANING EXISTING SANITARY SEWERS

Description: This work shall consist of cleaning a section of gravity sewer to be used for a casing under Denmark Road.

General: The contractor shall jet the sewer under Denmark road once it has been disconnected. All jetted material shall be vacuumed up by a Vactor truck and disposed of in a legal manner.

Basis of Payment: This work shall be paid for at the contract unit price per foot for CLEANING EXISTING SANITARY SEWERS.

RECONSTRUCT WET WELL – ROSE HILL COVE/CHATEAU ESTATES PUMP STATION

Description: This item of work shall consist of modifying the existing sanitary wet well per the demolition sheets in the plans.

General: Contractor shall make the indicated removals and demolition items associated with the demolition of the existing wet wells. The work shall include the removal of portions of the wet wells, removal of pumps, pipes, and accessories and disposal of the items in a lawful manner.

Basis of Payment: This item of work will be paid for at the contract unit price per each for RECONSTRUCT WET WELL – ROSE HILL COVE/CHATEAU ESTATES PUMP STATION.
SANITARY SEWER REMOVAL, 10”

Description: This item of work shall consist of removing 10” sanitary sewer at the locations identified on the plans.

General: The contractor shall remove the existing sewer where indicated and dispose of it in a lawful manner.

Basis of Payment: This item will be paid for at the contract unit price per foot for SANITARY SEWER REMOVAL, 10”.

VALVE VAULTS TO BE ABANDONED

Description: This item of work shall consist of the abandonment of existing air release valve vaults.

General: This work shall take place only after the existing Northwest lift station has been decommissioned and the forcemain is not in use. Isolation valves shall be closed and the existing valves removed and disposed of. The top of the vault shall be removed and the vault filled with FA-6 to a point 1 ft below grade. The contractor shall fill the remaining hole with topsoil to match existing grade. There are additional valves to be removed along the

Basis of Payment: This work will be paid for at the contract unit price per each for VALVE VAULTS TO BE ABANDONED.

EXPOSE AND PROTECT EXISTING UTILITIES

Description: This item of work shall consist of exposing existing water mains along Denmark road to determine actual elevations and whether the utility needs to be relocated.

General: Where indicated on the plans, the contractor shall coordinate with Aqua Illinois to mark the location of their water mains. The contractor shall then hydroexcavate to locate the vertical location of the water main and determine if it needs to be relocated for the installation of the proposed gravity sewer. The main shall be protected during the installation of the proposed gravity sewer with support provided to the exposed portion of the main.

Basis of Payment: This item will be paid for at the contract unit price per foot. For EXPOSE AND PROTECT EXISTING UTILITIES.

CLEARING AND GRUBBING

Description: This item of work shall consist of clearing the vegetation off of the causeway on the south side of Denmark Road ahead of the installation of the gravity sewer.
General: This item of work is limited to Stations 200+00 to 218+00 and 300+00 to 302+00 on the sewer plans. The contractor shall remove and dispose of woody brush and small trees including the root balls.

Basis of Payment: This item will be paid for at the contract lump sum price for CLEARING AND GRUBBING.

**REMOVE AND REINSTALL PIPE CULVERTS**

Description: This item of work shall consist of removing pipe culverts that are in conflict with the installation of the sewer and reinstalling them at the same grade.

General: Contractor shall locate the culverts that are in conflict and carefully dig on either side of the culverts and along the top without damaging it. The culvert shall be removed and set to the side while the forcemain is installed. The ground from the forcemain up to the culvert invert shall be compacted. The culvert shall be reinstalled at the flowline of the ditch and backfilled carefully. If a culvert is damaged, the contractor shall replace it in kind at no additional cost to the owner.

Basis of Payment: This item will be paid for at the contract unit price per foot for REMOVE AND REINSTALL PIPE CULVERTS.

**CUT AND CAP EXISTING 4” FORCEMAIN**

Description: This item of work shall consist of cutting and capping existing forcemains.

General: The forcemain shall be cut square and plug the forcemain either with a ductile iron mechanical joint cap, or by using non-shrink grout. If non-shrink grout is used, the grout shall extend into the forcemain a minimum of 6 inches and flare outside the forcemain, engaging the outside of the pipe.

Basis of Payment: This work shall be paid for at the contract unit price per each for CUT AND CAP EXISTING 4” FORCE MAIN.

**GRANULAR BACKFILL FOR STRUCTURES**

Description: This item of work shall consist of the material and procedures for backfilling structures as noted on the plans.

General: Structures shall be backfilled with CA-6 aggregate. Structures shall be backfilled in 6-inch lifts with each lift compacted to 97% maximum dry density in accordance with ASTM D-698.

Basis of Payment: This work shall be paid for at the contract unit price per cubic yard for GRANULAR BACKFILL FOR STRUCTURES.
VALVE BOX

Description: This item of work shall consist of supplying and installing a valve box for the purpose of accessing a locator wire.

General: The valve box is a standard cast iron valve box used for water valves. The box shall have a cast iron lid that say SEWER on it. The valve box shall be installed parallel to the forcemain. A hole shall be drilled in the side of valve box and the tracer wire run up through the box. The valve box shall be set on a concrete block before being backfilled. The contractor shall ensure the box is set vertically and does not shift as it’s being backfilled. The box shall be installed flush with the surrounding finished grade.

Basis of Payment: This work shall be paid for at the contract unit price per each for VALVE BOX.

CHAIN LINK FENCE, 4’ ATTACHED TO STRUCTURE

Description: This work shall consist of placing 4’ chain link fabric, posts, supports, foundations, tension wire, and associated hardware at locations shown on the plans. The chain link fabric, posts, fence framework, tension wires, ties and fittings shall have a black polyvinyl chloride (PVC) coating. All non-aluminum material shall be galvanized prior to vinyl coating. See Section 1006.27 of the SSRBC for chain link fence components. Hot-dip galvanize fence framework after fabrication.

General: Placement of CHAIN LINK FENCE 4’ ATTACHED TO STRUCTURE shall be according to Section 664 of the SSRBC. Fence post shall be installed plumb within a tolerance of +/- 1 1/2”. Use shim plates as required to achieve plumb. The required quantity and thickness of shim plates will be determined in the field.

Basis of Payment: This work shall be paid for at the contract unit price per foot for CHAIN LINK FENCE, 4’ ATTACHED TO STRUCTURE. Payment for this work shall include all fence materials, incidental materials, labor, and equipment required to complete installation of the fence.

SELECT GRANULAR BACKFILL

Description: This item of work consists of providing select granular backfill in lieu of native backfill where indicated on the plans.

Materials: Material shall meet IDOT gradations FA-1, FA-2, FA-5, FA-6, FA-10 or FA-21 and/or may be reclaimed asphalt millings from the City of Danville at Winter Park, 1155 E. Voorhees, and 800 South Street. The Contractor may propose other gradations but are subject to the approval of the Engineer.

General: Where indicated on the plans, select granular backfill will be used for trench backfill.
Basis of Payment: This work will be paid for at the contract unit price per cubic yard for SELECT GRANULAR BACKFILL.

CONCRETE BOLLARDS

Description: This work shall consist of providing and installing concrete filled steel bollard at the locations identified in the plans.

General: The bollards shall consist of a 6” diameter carbon steel pipe factory painted yellow and installed in a concrete base and filled with concrete. The concrete at the top of the bollard shall be rounded to shed moisture. The bollard shall be 8 ft in length with 4 ft of exposure.

The contractor shall excavate a 1’-6” diameter hole 4’-6” deep for each bollard. The bollard shall be backfilled with Class SI concrete troweled flush with the surrounding grade. The contractor shall protect the paint during installation.

Basis of Payment: This work will be paid for at the contract price per each for CONCRETE BOLLARDS.

SANITARY SEWER REMOVAL 24”

Description: This work shall consist of removing sections of the existing 24” diameter sanitary sewer.

General: The existing 24” sanitary sewer will be in conflict with the new gravity sewer and will need to be removed as the new sewer is installed. The Contractor shall remove and dispose of the existing gravity sewer in a lawful manner. Open end sections of the 24” sewer remaining in place shall be grouted shut prior to backfill.

Basis of Payment: This work shall be paid for at the contract unit price per foot for SANITARY SEWER REMOVAL 24”.

PORTLAND CEMENT CONCRETE DRIVEWAY REMOVAL AND REPLACEMENT

Description: This work shall consist of removing and constructing Portland cement concrete driveway pavement on a prepared subgrade in accordance with Section 423 of the SSRBC at the locations identified on the plans.

General: The existing driveway shall be removed to an existing control joint or saw cut. All removed pavement shall be disposed of in a lawful manner. Contractor shall match existing pavement elevations at the transitions and install a control joint at the transition.

Basis of Payment: This work shall be paid for at the contract unit price per square yard for PORTLAND CEMENT CONCRETE DRIVEWAY REMOVAL AND REPLACEMENT.
CONNECTING TO EXISTING MANHOLE BY CORE DRILLING

**Description:** This work shall consist of excavating around an existing manhole and core drilling a new opening, installing a new pipe connection and making the seal water tight.

**General:** The connection to the existing manhole shall be watertight by the use of a link style sealing system (See special provision LINK SEAL). The new cored hole shall be square to the manhole to ensure a good seal between the pipe and the manhole wall. The contractor shall confirm the required hole dimension based on product data and manufacturer’s installation instructions.

**Basis of Payment:** This work shall be paid for at the contract unit price per each for CONNECTING TO EXISTING MANHOLE BY CORE DRILLING.

WETWELL AND VALVE VAULT STRUCTURES – ROSE HILL COVE/CHATEAU ESTATES/DENMARK HILL LIFT STATION

**Description:** This work shall consist of constructing and installing wet wells and valve vaults at the locations indicated on the plans and specified in the following section.

**General:** The wet well and valve vault shall be constructed per the drawings. The new wet wells shall be constructed in conformance with ASTM C-478. The valve vaults shall conform to ASTM C-913. The vaults shall be designed for earth loads and HS-20 live load for vehicular traffic.

All openings and embedments in the wet well and valve vault shall be verified prior to casting.

The wet well exterior surfaces shall be sealed by a two part urethane asphalt applied to provide a dry film thickness of 20 mils.

The valve vault exterior surfaces shall be sealed by a two-part urethane asphalt applied to provide a dry file thickness of 20 mils.

Each valve vault floor shall be grouted to provide positive drainage to the sump and drain pipe.

**Basis of Payment:** This work shall be paid for at the contract unit price per each for WET WELL AND VALVE VAULT STRUCTURES – ROSE HILL COVE/CHATEAU ESTATES/DENMARK HILL LIFT STATION of the lift stations identified on plans.

HOT MIX ASPHALT DRIVEWAY REMOVAL AND REPLACEMENT

**Description:** This work shall consist of removing and constructing hot mix asphalt driveway pavement on a prepared subgrade in accordance with Section 408 of the SSRBC at the locations identified on the plans.
General: The existing driveway shall be removed to an existing control joint or saw cut. All removed pavement shall be disposed of in a lawful manner. Contractor shall match existing pavement elevations at the transitions and match existing thickness.

Basis of Payment: This work shall be paid for at the contract unit price per square yard for HOT MIX ASPHALT DRIVEWAY REMOVAL AND REPLACEMENT.

REINFORCED CONCRETE STEPS

Description: This work shall consist of forming and casting reinforced concrete steps as described here and depicted in the plans.

General: The steps shall be formed per the plans. Reinforcing bar placement, spacing and tolerances shall be per Section 508 of the SSRBC. Concrete shall be Class SI.

Basis of Payment: This work shall be paid for at the contract unit price per each for REINFORCED CONCRETE STEPS.

AIR RELEASE VALVE VAULT

Description: This work shall consist of providing and installing a precast concrete valve vault. This work is in conjunction with the pay item AIR RELEASE VALVE.

General: The vault shall be an open bottom precast manhole with a flat slabtop lid conforming to ASTM C 473 and per the plans. The vault shall have a Neenah R-5900-H, East Jordan Iron Works 2810 casting or approved equivalent. The precast slab top lid shall have a 4” diameter schedule 40 galvanized steel vent pipe with a bird screen. Two precast concrete blocks shall be included with the vault per the plans for the vault to rest on.

The forcemain shall be backfilled with CA-7 aggregate to the limits identified on the plans. Precast concrete blocks shall be installed parallel to the forcemain that the vault will sit on.

Contractor shall coordinate on the height of the air release valve assembly selected and adjust the forcemain and vault height to accommodate as needed.

Basis of Payment: This work will be paid for at the contract unit price per each for AIR RELEASE VALVE VAULT.

REMOVE AND ABANDON VALVE BOX

Description: This work shall consist of removing an existing valve box.

General: The existing valve box shall be removed and disposed of in a lawful manner.

Basis of Payment: This work shall be paid for at the contract unit price per foot for REMOVE AND ABANDON VALVE BOX.
AGGREGATE DRIVEWAY REMOVAL AND REPLACEMENT

**Description:** This work shall consist of removing driveway pavement in accordance with Section 440 of the SSRBC at the locations identified on the plans.

**General:** The aggregate shall be removed and disposed of in a legal manner. Contractor shall replace the driveway aggregate with CA-6 matching existing thicknesses. New aggregate shall be placed according to Section 412 of the SSRBC meeting the Type A requirements.

**Basis of Payment:** This work shall be paid for at the contract unit price per square yard for AGGREGATE DRIVEWAY REMOVAL AND REPLACEMENT.

AIR RELEASE VALVE

**Description:** This work shall consist of installing a combination air release valve including the forcemain tap, isolation valving and accessories over the proposed forcemain. This work is in conjunction with the pay item AIR RELEASE VALVE VAULT.

**General:** The air release valve shall be a complete package including all connections, valves, piping, excavation and backfill.

The air release valve shall be connected to the forcemain per the plans using a stainless steel service repair saddle with a 2” threaded tap, 2” stainless steel ball valve, 2” stainless steel pipe nipples and a 2 1/2” pressure gauge with a 3/8” threaded connection and 3/8” isolation valve. The connection between the air release valve and the 2” piping shall be a 2” cam-lock connection.

Combination air valves shall be conical shaped 316L stainless steel bodied with a threaded connection at the inlet and threaded or flanged connection at the outlet made of 316L stainless steel or polymer materials. Valve internals shall be 316L stainless steel and polymer materials. Valve float stem shall be spring loaded to allow float to move inside the valve during pumping cycle without breaking seal in the top. The valve shall allow large volume of air to escape during pump start up and allow large volume of air intake to relieve vacuum when pump cycle ends. Valve shall also incorporate rolling seal mechanism to allow air to escape during pumping cycle. Valve shall have standard five year written warranty from the manufacturer. Combination air valves shall be ARI Model 2” D-023SS as shown on plan and profile or approved equal.

The contractor shall confirm final height of the valve assembly and adjust the vault and forcemain elevation to accommodate the valve.

**Basis of Payment:** This work will be paid for at the contract unit price per each for AIR RELEASE VALVE.

BONDED PREFORMED JOINT SEALER, 4-INCH
DESCRIPTION: This work shall consist of preparing the joint faces and furnishing and installing a bonded preformed joint seal with the necessary bonding epoxy for bridge joints.

MATERIALS: The material quality of bonded preformed joint seal shall be according to the physical requirements of Table 1 of AASHTO M 220. The adhesive used to bond the joint sealer shall be supplied but the manufacturer of the bonded preformed joint seal.

Installation – The inside surfaces of the joint opening shall be roughened by sand blasting. The depth of roughening of the joint shall equal the depth of the bonded portion of the preformed joint material. After roughening, the joint shall be cleaned with compressed air. The bonded preformed joint seal shall be wiped with a primer that promotes adhesion when recommended by the joint manufacturer. The epoxy adhesive shall be applied to both the inner walls of the joint and the exterior surfaces of the joint seal. Immediately after blow down, the primer and adhesive shall be applied in amounts recommended by the joint manufacturer.

The joint seal with epoxy shall be inserted into the joint and held tightly against both faces of the joint until a sufficient bond has formed to resist expansion forces. The seal shall be placed so the top of the seal is approximately 1/8” recessed.

BASIS OF PAYMENT: This work shall be paid for at the contract unit price per foot for BONDED PREFORMED JOINT SEALER, 4-INCH.

STABILIZED CONSTRUCTION ENTRANCE

DESCRIPTION: This work shall consist of installing a stabilized construction entrance for access to the forcemain project for Chateau lift station forcemain and the Denmark Hill lift station.

GENERAL: The stabilized entrance shall be installed at the location indicated on the plans and per the detail in the SWPPP. This shall be maintained during construction.

BASIS OF PAYMENT: This work shall be paid for at the contract unit price per square yard for STABILIZED CONSTRUCTION ENTRANCE.

PIPE UNDERDRAINS FOR STRUCTURES, 4-INCH

DESCRIPTION: This work consists of installing a 4-inch underdrain where indicated on the plans.

GENERAL: The underdrain shall be installed at the locations indicated on the plans. The pipe shall be single wall corrugated perforated drain tile. The material shall be high density polyethylene. The pipe shall meet the requirements of ASTM F667.

BASIS OF PAYMENT: This work shall be paid for at the contract unit price per foot for PIPE UNDERDRAINS FOR STRUCTURES, 4-INCH.

8”/10” FORCEMAIN ABANDON

DESCRIPTION: This work shall consist of abandoning sanitary forcemains.
General: The filling of the existing forcemains shall be limited to those areas where the forcemain is cut into. Any locations where normal construction opens the forcemain, the open area shall be grouted closed with non-shrink grout or Class X concrete. Sections of forcemain removed shall be disposed of in a lawful manner. All remaining forcemain if undisturbed shall remain in place.

Basis of Payment: This work will be incidental to the installation of the proposed new utilities and with no additional compensation.

8”/10” SANITARY SEWER ABANDON

Description: This work shall consist of abandoning the existing 8”/10” gravity sewer where indicated on the plans.

General: The abandoned existing gravity sewers where indicated on the plans shall be plugged with non-shrink grout or Class X concrete.

Basis of Payment: This work will be paid for at the contract unit price per foot for 8”/10” SANITARY SEWER ABANDON of the size identified in the plans.

SANITARY FORCEMAIN

Description: This item of work shall consist of furnishing all labor, materials, equipment and incidentals required for installation of sanitary forcemain of the size and type indicated either by horizontal directional drilling or by open cut. The option of open cut versus directional drilling is up to the Contractor for the 4-in diameter Chateau Estates forcemain and the 4-in diameter Rose Hill Cove forcemain. The Denmark Road forcemain installation method is a combination of open cut and directional drilling. There is no open cut option where directional drilling is identified on the Denmark Road forcemain.

The Contractor shall furnish all labor, materials, equipment and incidentals required to install carrier pipe by the technique of horizontal directional drilling, at the locations shown on the Drawings and as specified herein. Horizontal directional drilling requirements are listed later in this special provision.


Submittals:

Prior to the start of work, the Contractor shall submit a detailed plan of boring and receiving pits, including excavation, together with an outline of the methods to be used and a time for schedule
of boring operations. The plan shall be submitted to the Engineer for review, and no work shall be done until Engineer’s review is completed and written concurrence has been granted. The Contractor shall also submit the name of the boring subcontractor for approval when applicable.

The boring Contractor must demonstrate expertise in trenchless methods by providing a list of ten utility references for whom similar work has been performed in the last two years. The references should include a name and telephone number where contact can be made to verify the Contractor’s capability. The Contractor must provide documentation showing successful completion of the projects used for reference. Conventional trenching experience will not be considered applicable.

Prior to approval for directional boring, the Contractor must submit the names of supervisory field personnel and historical information of directional boring experience. In addition, the Contractor must submit for approval name, plate, data for the drilling equipment, mobile spoils removal unit, and MSDS (Material Safety Data Sheet) information for the drilling slurry compounds.

Pipe material technical data information.

**Material:**

**Pipe:**
- Piping for sanitary forcemain to be installed by open excavation shall be PVC SDR 26 with push on joints meeting ASTM D2241 or an approved equivalent.
- The pipe material to be used for installation by directional bore for the Chateau Estates and Rose Hill forcemains shall be Yelomine IPS pressure pipe, SDR 21 (4”) with restrained joints meeting ASTM D-2241, or an approved equivalent.
- The pipe material to be used for the installation by directional bore for the Denmark Hill forcemain shall be Yelomine IPS pressure pipe, SDR 26 (10”) with restrained joints meeting ASTM D-2241, or an approved equivalent.

**Fittings:**
- All pressure main fittings shall be mechanical joint ductile iron for below ground service, unless otherwise indicated on the Plans.
- All fittings shall conform to ANSI A21.53 (AWWA C153), where possible. Minimum pressure rating shall be 350 psi. If shown or specified fittings are unavailable in the above standards, the manufacturer’s standard may be used upon approval of the ENGINEER.
- All rubber gaskets shall conform to ANSI A21.11 (AWWA C111).
- All fittings shall have cement mortar lining and seal coat per ANSI A21.40 (AWWA C104).
- Mechanical joints shall utilize locking glands in lieu of standard glands. The locking gland shall meet the applicable requirements of ANSI/AWWA C110/A21.53. The glands shall have a working pressure equal to or greater than the fitting they are bolted to. Locking glands shall be Mega Lug Series 1100, Romac RomaGrip or equal.
Tracer wire:

- The Contractor shall furnish and install, along the entire route of the force main, #12 AWG Copperhead Soloshot EHS-CCS 45 Mil or approved equal copper clad locator wire.
- For forcemain installed in open excavation, the wire shall be installed just above the crown of the pipe.
- For forcemain installation by directional bore, three wires shall be added to each directionally drilled section in the event one is damaged during the pull back. Wires shall be continuous for each run.
- At the tie in locations to the existing force mains, run the wire up through the valve box. Install the tracer wire in a 3/4 in. diameter PVC pipe installed along the outside of the receiving manhole. Any necessary splicing shall be made using a direct bury splice kit such as 3M Part No. DBY 09053, or equivalent.
- The tracer wire shall be tested for continuity prior to final acceptance by the OWNER.

Installation:

Forcemain installed in open excavation:

- Piping installation shall comply with the plan details, the “Standard Specifications for Water and Sewer Installation in Illinois, and requirements herein. Installation shall commence at the downstream end of the line or system and proceed in the upstream direction. Upstream Connections: The timing of the connections to the existing upstream sewers shall be coordinated with the Owner.
- Bedding, haunching and initial backfill material shall be CA-7.
- Install piping with a minimum bedding thickness of 4 inches, maintaining line and grade of the sewer. Bury depth or ultimate cover shall be a minimum of 4 feet. Install and compact initial backfill to a minimum height of 12 inches above the top of the sewer.
- Verify minimum vertical clearances at all utility crossings.
- Thrust blocking shall be provided and installed at all bends.
- Select Granular Fill
  - Shall be utilized for backfill at the following locations when an open excavation is the method of construction:
    - Rose Hill Cove
      - When the open excavation occurs within a paved (bituminous, concrete, or oil and chip) or gravel surface or listed locations below.
        - Valve vault to border of gravel lot
        - Any location where the forcemain crosses the pump station access road
      - Sta. 18+90 to Sta. 21+10 (under oil and chip pavement)
    - Chateau Estates
      - Within right-of-way of Old Ottawa Road from Sta. 116+72.77 to Sta. 128+90.03 Existing Manhole #3531
    - Denmark Hill
      - Where identified on plans.
Material shall meet IDOT gradations FA-1, FA-2, FA-5, FA-6, FA-10 or FA-21 and/or may be reclaimed asphalt millings from the City of Danville at Winter Park, 1155 E. Voorhees, and 800 South Street. The Contractor may propose other gradations but are subject to the approval of the Engineer.

Forcemain installed by horizontal directional drilling:
- Forcemain piping shall be installed where identified on the plans.
- Boring pits, spoils, and all equipment necessary for directional boring shall be within City right-of-way and/or easements.
- The vertical and horizontal deflections shall meet the pipe manufacturer’s minimum required radii.
- The directionally drilled forcemain shall maintain minimal clearance from all other utilities.

Directional Drilling Operation:

A. The Contractor shall provide all material, equipment, and facilities required for directional drilling the opening beneath the crossing as shown on the drawings. Proper alignment and elevation of the opening shall be consistently maintained throughout the directional drilling operation. The method used to make the directional drilling shall conform to the requirements of all applicable permits.

B. Boring pits shall be shored with sheeting or such other materials as required. Sheet ing (if used) shall be driven to a sufficient depth below the invert of the carrier pipe to resist any pressure developed by the soil outside the boring pit. Sheet ing when used shall terminate not less than 6-feet 6-inches above existing grade.

C. Where wet type boring techniques are allowed, bentonite or other stabilizing gels shall be used to prevent caving of the unsupported bore hole.

D. Because directional boring performed while existing buried electrical cable is energized, the following safety requirements must be met:
   1. All drilling equipment must have a permanent, inherent alarm system capable of detecting an electrical current. The ground system shall be equipped with an audible alarm to warn the operator when the drill head nears electrified cable.
   2. All crews shall be provided with grounded safety mats, heavy gauge ground cables with connectors, and hot boots and gloves.
   3. All supervisory personnel must be adequately trained and have direct supervisory experience in directional boring.

Installing Pipe by Horizontal Directional Drilling:

A. The pipe installed within the boring shall be in full conformity with these Specifications and
as shown on the Drawings. The pipe shall be installed to the lines and grades required after having been satisfactorily placed by the Contractor and approved by the Engineer.

B. The type and size of the pilot string cutting head shall be at the Contractor’s discretion. The type and outside diameter of the drill to be used in the pilot string shall also be at the Contractor’s discretion.

C. The tunneling system shall be remotely steerable and permit electronic monitoring of tunnel depth and locations. Accurate placement of pipe at up to the depth as shown on the plans, within a 12-inch window is desired.

D. Tunneling must be performed by a fluid-cutting process (high pressure-low volume) utilizing a liquid clay, i.e. bentonite. The clay lining will maintain tunnel stability and provide lubrication in order to reduce frictional drag while the pipe is being installed. In addition, the clay fluid must be totally inert and contain no environmental risk. The Contractor must also have a mobile vacuum spoils recovery vehicle on site to remove the drilling spoils from the access pits. The spoils must then be transported from the job site and be properly disposed of. Under no circumstance will the drilling spoils be permitted to be disposed of into any sanitary, storm, or other public or private drainage systems.

E. Upon completion of the pilot hole phase of the operation, a complete set of as-built records shall be submitted in duplicate to the Engineer. These records shall include copies of the site plan and profile drawing with depths to be provided at 10 ft intervals, as well as directional survey reports as recorded during the drilling operation.

F. Upon approval of the pilot hole location by the Engineer, the hole opening or enlarging phase of the installation shall begin. The borehole diameter shall be increased to accommodate the pullback operation of the required carrier pipe size. The type of hole opener or back reamer to be utilized in this phase shall be determined by the types of subsurface soil conditions that have been encountered during the pilot hole drilling operation. The reamer type shall be at the Contractor’s discretion with the final hole opening diameter being a minimum of 40 percent larger than the outside diameter of the product pipe to be installed in the borehole.

G. The open borehole may be stabilized by means of bentonite drilling slurry being pumped through the inside diameter of the drill and through openings in the reamer. The slurry will also serve as an agent to carry the loose cuttings to the surface through the annulus of the borehole. These cuttings and bentonite slurry are to be contained at the exit or entry side of the directional bore in pits or holding tanks. The slurry may be recycled at this time for reuse in the hole opening operation, or it shall be hauled by the Contractor to an approved dump site and properly disposed of.

H. The pipe shall be installed together according to manufacturer’s specifications, and supported by pipe rollers or comparable equipment, in preparation of pull back through the enlarged borehole. The product pipe will be elevated to the approximate angle of exit and supported by means of a sideboom with roller arm, or similar equipment, to allow for a free
stress situation as the pipe is pulled into the exit hole towards the drill rig. The product pullback phase of the directional operation shall be carried out in a continuous manner until the pipe reaches the original entry side of the bore.

I. A complete list of all drilling fluid additives and mixtures to be used in the directional operation will be submitted to the Engineer, along with their respective Material Safety Data Sheets. All drilling fluids and loose cuttings shall be contained in pits or holding tanks for recycling or disposal, no fluids shall be allowed to enter any unapproved areas or natural waterways. Upon completion of the directional drill project, these materials shall be disposed of by the Contractor at an approved dump site.

Completion of Directional Drilling:

A. The forcemain shall be pressure tested at a pressure of 100 psi for a period of two hours with a maximum of not more than 2 PSI drop in pressure.

B. In the event of failure to install the directional drilled pipelines, the Contractor shall retain possession of any Contractor supplied pipe and remove it from the site. The bore holes shall be completely filled with grout to prevent future problems. If the pipe cannot be removed from the bore it shall be cut off 5 feet below ground and the pipe and annular space shall be grouted.

Surface Removal and Restoration:

Where the forcemain is installed through open excavation, the disturbed surface shall be restored to match existing in kind conditions or as shown in the Plans.

The surface restoration shall be per the special provisions herein and the SSRBC. Surface restoration includes:

- Landscaping
  - Topsoil Furnish and Place
  - Seeding, Class 1A
  - Nitrogen Fertilizer Nutrient
  - Phosphorous Fertilizer Nutrient
  - Potassium Fertilizer Nutrient
  - Mulch, Method 2

- Pavement
  - Driveway Pavement Removal and Replacement
  - Aggregate Driveway Removal and Replacement
  - Pavement Removal and Replacement
  - Oil and Chip Pavement Removal and Replacement
  - Gutter Removal and Replacement
  - Curb and Gutters Removal and Replacement

- Above grade structures
  - Wood fences
  - Fleximat
Wooden fence: Surface removal and restoration includes removing an existing wooden fence to allow for construction and reinstalling it once construction is complete. The Contractor shall carefully remove the sections of fencing that are in the path of open excavation construction and stockpile them where they won’t be damaged. Once construction is complete and finish grade has been reestablished, the fencing shall be reinstalled. Damaged pieces of the fence shall be replaced by the Contractor at no additional cost.

Fleximat: Surface removal and restoration includes removing sections of Fleximat from the ditch along Old Ottawa Road and stockpiling them at the edge of the right of way when in conflict with open excavation construction. The City has Fleximat segmental concrete mats in the north ditchline along Old Ottawa Road. The Fleximats are located along the forcemain alignment. The Contractor shall remove the mats ahead of the installation of the sewer and stockpile them out of the way along the edge of the right of way when in conflict with open excavation construction of the forcemain. Damaged pieces of the Fleximat shall be replaced by the Contractor at no additional cost. The Fleximat will be reinstalled under the Roadway Contract.

Testing:

Force mains shall be pressure tested at a pressure of 100 PSI for a period of two hours with a maximum of not more than 2 PSI drop in pressure. Tracer wire on all forcemains shall be tested by the Contractor for continuity.

All testing shall conform to the current requirements of the Standard Specifications for Water and Sewer Construction in Illinois. The Contractor shall be responsible for performing the following activities relative to field testing:

- Notifying the Owner of project progress, and determining which testing regimens will be required;
- Coordination with the Owner’s personnel for the timing and extent of testing to be performed for a given reach or section of the improvements;
- Performing the specific tests required by the Owner;
- Performing any required corrective measures and retesting necessary when initial testing results are unsatisfactory; and,
- Complying any additional corrective requirements as necessary for the Owner’s ultimate acceptance of the Work.

Basis of Payment: This work will be paid for at the contract price per foot for 4” DIAMETER SANITARY FORCEMAIN, 10” DIAMETER YELOMINE IPS SDR26 SANITARY FORCEMAIN DIRECTIONALLY DRILLED, and 10” DIAMETER SDR26 WITH PUSH ON JOINTS SANITARY FORCEMAIN FORCE MAIN and depending on the installation method shall include cost for earth excavation, bedding, haunching, initial backfill, thrust blocks, select granular backfill, native backfill, surface removal and restoration and horizontal directional drilling.
8”/10”/18” DIAMETER GRAVITY SANITARY SEWER (0-8 FT/8-14 FT/14-20 FT DEEP)

Description: This work shall consist of installing gravity sewer of the size and depth identified on the plans and in this document.

General: Flexible pipe for gravity sewer systems shall be SDR 26 polyvinyl chloride pipe (PVC) and shall conform to ASTM D3034 "Standard Specification for Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings". The pipe shall be made of PVC having a cell classification as defined in ASTM D1784 for 12454 or 12364 cell classification. The pipe shall be furnished in 14' laying lengths. The pipe shall be made and jointed with integral bell and spigot rubber gasketed joints. Each integral bell joint shall consist of a formed bell complete with a single rubber gasket. Gaskets shall conform to ASTM F477 and meet the requirements of ASTM D3212.

Where watermain quality pipe is called out on the plans, flexible gravity sewers shall be polyvinyl chloride pipe (PVC) and shall conform to AWWA C-900 with push on gasketed joints meeting ASTM D3139 and gaskets conforming to ASTM F477. Pipe shall be pressure class 165 with DR ratio of 25.

Rigid pipe for gravity sewer applications shall be ductile iron pipe (DIP) conforming to AWWA C-151, and be cement lined and seal coated in accordance with AWWA C104. The joints of pipe shall be mechanical joint type with rubber gaskets conforming to AWWA C111. Pipe shall be Pressure Class 350.

All fittings shall conform to ANSI A21.53 (AWWA C153), where possible. Minimum pressure rating shall be 350 psi. If shown or specified fittings are unavailable in the above standards, the manufacturer’s standard may be used upon approval of the ENGINEER. All rubber gaskets shall conform to ANSI A21.11 (AWWA C111). All fittings shall have cement mortar lining and seal coat per ANSI A21.40 (AWWA C104).

Mechanical joints shall utilize locking glands in lieu of standard glands. The locking gland shall meet the applicable requirements of ANSI/AWWA C110/A21.53. The glands shall have a working pressure equal to or greater than the fitting they are bolted to. Locking glands shall be Mega Lug Series 1100, Romac RomaGrip or equal.

Piping installation shall comply with the plan details, the Standard Specifications for Water and Sewer Main Construction in Illinois, Current Edition, and requirements herein. Installation shall commence at the downstream end of the line or system, and proceed in the upstream direction.

Manhole installation shall follow the order of sewer construction. Upstream Connections: The timing of the connections to the existing upstream sewers shall be coordinated with the Owner.

Bedding, haunching and initial backfill material shall be CA-7.
Install piping with a minimum bedding thickness of 6 inches, maintaining line and grade of the sewer. Bury depth or ultimate cover shall be a minimum of 4 feet unless specifically noted on the plans. Install and compact initial backfill to a minimum height of 12 inches above the top of the sewer.

Verify minimum vertical clearances at all utility crossings. Excavation, pipe, bedding, haunching, and initial backfill shall be considered part of this pay item. Backfill using native material shall also be considered part of this pay item.

Testing: The Contractor shall be responsible for furnishing all equipment, labor, materials and bypass pumping necessary for testing of sewers. Testing shall consist of the following:

1. Reach Integrity Testing: Reach integrity testing shall include air testing of sewers. Air testing shall conform to Section 31-1.13 C of the Standard Specifications for Water and Sewer Construction in Illinois.
2. Mandrel Testing: Mandrel tests of flexible sewers shall be performed to verify pipe deflection is within tolerances. Mandrel testing shall conform to Section 31-1.13 D of the Standard Specifications for Water and Sewer Construction in Illinois.
3. Post Mandrel Inspection: CCTV inspection required for all gravity sewers. Contractor shall provide post televising files to the City upon completion.

Basis of Payment: This work will be paid for at the contract unit price per foot 8”/10”/18” DIAMETER GRAVITY SANITARY SEWER (0-8 FT/8-14 FT/14-20 FT DEEP).

24” SANITARY SEWER ABANDON AND FILL

Description: This work shall consist of abandoning the existing 24” gravity sewer where indicated on the plans.

General: The abandoned existing 24” diameter gravity sewers where indicated on the plans shall be filled with cellular concrete and capped/plugged with non-shrink grout or Class X concrete.

Existing manholes abandoned shall have their barrels removed to 6 inches below the proposed utilities, the sewers plugged with and the rest of the barrel filled with cellular concrete. Removal of the existing manhole sections shall be per Section 605 of the SSRBC with the exception that the existing manhole removed shall be replaced with the same backfill required for the proposed sewer.

Basis of Payment: This work will be paid for at the contract unit price per foot for 24” SANITARY SEWER ABANDON AND FILL.

CASING SPACERS

Description: This work shall be in conjunction with cased bores identified on the plans.
General: Casing spacers shall be constructed of a non-corrosive material such as stainless steel, polyethylene or PVC. The use of wood blocks and steel straps is not allowed. Spacers shall support the carrier pipe and shall center the pipe within the steel casing.

Attach casing spacers to the carrier pipe in accordance with the plans and the manufacturer’s directions. Carrier pipes shall be supported at nominal 6 ft intervals, or a minimum of 3 spacers per nominal pipe segment length. Additional spacers are required at casing pipe ends. The spacers shall be installed on the pipe before it is installed in the casing.

Basis of Payment: This work will be paid for at the contract lump sum price for CASING SPACERS.

CAST IN PLACE BUILDING FOUNDATION

Description: This work shall consist of forming and casting a reinforced concrete foundation to support the precast building at the Denmark Road lift station site.

General: The work associated with the cast in place building foundation shall include all excavation, forming, reinforcement, and concrete. Foundations shall be formed and reinforced per the plans and as noted in this special provision. Foundations include the 6-inch concrete building slab and the concrete retaining wall shown on plans. Reinforcing steel shall be per Section 508 of the SSRBC. Concrete shall be per Section 503 of the SSRBC. Concrete shall be Class X.

Basis of Payment: This work shall be paid for at the contract lump sum price for CAST IN PLACE BUILDING FOUNDATION.

CONTROL BUILDING

Description: This work shall consist of supplying and installing the electrical control building associated with the Denmark Lift Station as identified in the plans and in the specifications.

General: The work associated with the Denmark lift station electrical control building is covered in the attached specification numbered 13341 and labeled Fabricated Pre-Engineered Precast Concrete Building and on the plans. This work shall be complete including site preparation, fabrication, shipping, setting of the building, and final installation. The building shall be installed on a cast in place concrete foundation outlined in the special provision CAST IN PLACE BUILDING FOUNDATION.

Basis of Payment: This work will be paid for at the contract lump sum price for CONTROL BUILDING.

CONTROLS AND INSTRUMENTATION – ROSE HILL/CHATEAU/DENMARK HILL PUMP STATION
Northwest Sanitary Sewer Service Area Reconstruction  
Vermilion County  
City of Danville  

**Description:** This work shall consist of supplying and installing a PLC based controller and level monitoring for each of the proposed lift stations.

**General:** This work is specified in Section 16900.

**Basis of Payment:** This work will be paid for at the contract unit price per each for CONTROLS AND INSTRUMENTATION – ROSE HILL/CHATEAU/DENMARK HILL PUMP STATION respectively.

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**COORDINATION WITH CONTRACTOR**

**Description:** This work shall consist of coordinating with the concurrent construction contract that is awarded separately for the reconstruction of Denmark Road, Old Ottawa Road and the addition of a sidewalk.

**General:** The work associated with this task includes the coordination required to schedule portions of the project with a second contractor in charge of the road and sidewalk improvements being constructed after the sewer infrastructure is in place. The task includes meeting with the second contractor and the City to ensure a smooth transition from one contract to the other.

**Basis of Payment:** This work will be paid for at the contract lump sum price for COORDINATION WITH CONTRACTOR.

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**DECOMMISSION PUMP CHAMBER**

**Description:** This work shall consist of decommissioning the existing Chateau Estates “Can” style pump station.

**General:** The work associated with decommissioning the pump chamber at the Chateau Estates lift station shall commence once the contractor has bypass pumping in place for the reconstruction of the station. Contractor shall remove all pipes, ladders, vents and pumps from the wet well and pump chamber. Pipes between the two chambers shall be cut flush with the wall and filled with non-shrink grout. The electrical panels and all remaining equipment shall be removed from the pump chamber. Specified holes shall be cut through the floor of the pump chamber to promote draining. The top two feet of the pump chamber shall be removed. The pump chamber will be filled with sand to the top of the structure. The chamfers in the wet well shall be removed.

**Basis of Payment:** This work will be paid for at the contract lump sum price for DECOMMISSION PUMP CHAMBER.

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**DECOMMISSION DENMARK HILL PUMP STATION**

**Description:** This work shall consist of decommissioning the existing Denmark Hill pump station. The existing Denmark Hill lift station only shall be decommissioned once flow is diverted to the new Denmark Hill lift station in accordance with this special provision.
General: The work associated with decommissioning the old Denmark Road lift station shall commence once the new Denmark lift station is operational and flows have been diverted to it.

The contractor shall remove the existing controls, SCADA, antenna and antenna pole and salvage them for reuse.

The existing Denmark Road lift station does not have a valve vault. All existing piping and valves are in the wet well. The existing wet well is 3 ft. diameter and 10 ft. deep.

Remove all pipes, pumps, valves, vents, and ladders from the wet well. Pipes shall be cut flush with the inside wall of the lift station. A 6” diameter hole shall be drilled or cut into the invert of the wet well. The contractor shall remove the top of the wet well to a point 2 ft. below grade. The wet well shall be backfilled with FA-6 fine aggregate to 2 ft. below grade and topsoil for the remaining backfill.

Basis of Payment: This work shall be paid for at the contract lump sum price for DECOMMISSION DENMARK HILL PUMP STATION –

DRIVING PERMANENT SHEET PILING

Description: This work shall consist of driving permanent sheet piling supplied by the City at the Denmark Road lift station site.

General: The permanent sheet piling at the proposed Denmark Road lift station are to be supplied by the City of Danville. The contractor is responsible for hauling the sheet piles to the site and driving them to the depth identified on the plans. The contractor is also responsible for purchasing the missing sheets identified on the plans. The cost of the extra sheets is to be included in this pay item.

Basis of Payment: This work will be paid for at the contract lump sum price for DRIVING PERMANENT SHEET PILING.

ELECTRICAL – ROSE HILL COVE LIFT STATION

Description: This work shall consist of supplying and installing all electrical components and electrical work associated with the Rose Hill Cove Lift Station as identified in the plans and in the specifications.

General: The electrical work associated with the Rose Hill Cove lift station is covered in the attached specifications numbered 16010 through 16621 and on the plans. All electrical work is to be considered under the referenced section unless otherwise broken out in the bid schedule including supplying equipment, installation, and startup and testing.

Basis of Payment: This work will be paid for at the contract lump sum price for ELECTRICAL – ROSE HILL COVE LIFT STATION.
ELECTRICAL – CHATEAU ESTATES LIFT STATION

Description: This work shall consist of supplying and installing all electrical components and electrical work associated with the Chateau Estates Lift Station as identified in the plans and in the specifications.

General: The electrical work associated with the Chateau Estates lift station is covered in the attached specifications numbered 16010 through 16621 and on the plans. All electrical work is to be considered under the referenced section unless otherwise broken out in the bid schedule including supplying equipment, installation, and startup and testing. In addition, the cast in place concrete foundation for the proposed generator shall be included in the cost.

Basis of Payment: This work will be paid for at the contract lump sum price for ELECTRICAL – CHATEAU ESTATES LIFT STATION.

ELECTRICAL – DENMARK HILL LIFT STATION

Description: This work shall consist of supplying and installing all electrical components and electrical work associated with the Denmark Hill lift station as identified in the plans and in the specifications.

General: The electrical work associated with the Denmark Hill lift station is covered in the attached specifications numbered 16010 through 16621 and on the plans. All electrical work is to be considered under the referenced section unless otherwise broken out in the bid schedule including supplying equipment, installation, and startup and testing. In addition, the cast in place concrete foundation for the proposed generator shall be included in the cost.

Basis of Payment: This work will be paid for at the contract lump sum price for ELECTRICAL – DENMARK HILL LIFT STATION.

FIBERGLASS MARKER POST

Description: This work shall consist of providing and installing an indicator post that marks the tracer wire boxes and/or the location of the proposed sanitary forcemain.

General: The tracer wire posts shall be constructed of fiber reinforced polymer, green in color, and shall state “Caution Sewer Pipeline” on both sides. The post shall be 3.9” wide and 66” long.

Basis of Payment: This work will be paid for at the contract unit price per each for FIBERGLASS MARKER POST.

LIFT STATION BYPASS PUMPING
Description: This work shall consist of providing bypass pumping to the Rose Hill Cove Lift Station and the Chateau Estates Lift Station during construction.

General: During the reconstruction efforts at the two lift stations, flows entering the station will need to be bypassed to allow work in the respective wet well. The contractor shall be responsible for providing pumps that operate 24 hours per day with alarming in case of failure. The contractor is responsible for all piping, hoses, pumps, fuel and maintenance for the duration of the construction. During construction on the Rose Hill station, the flows to the station will be limited to the houses north of the station. Flows of less than 40 gallons per minute peak are anticipated. Flows to the Chateau Estates lift station will be 150 gallons per minute peak.

Basis of Payment: This work shall be paid for at the contract unit price per each for LIFT STATION BYPASS PUMPING.

LINEAR EXPANSION JOINT

Description: This work shall consist of providing and installing a linear expansion joint in the gravity sewer line at the location of a bridge expansion joint to accommodate linear expansion and contraction of the bridge deck that the sewer is hung from.

General: At the locations identified on the plans, linear expansion joints shall be installed in the gravity sewer to accommodate movement in the gravity sewer. The expansion joint shall allow movement in one direction and shall have mechanical joint connections. The mechanical joints shall utilize locking glands in lieu of standard glands. The expansion joint shall have the same pressure rating as the adjacent piping. The expansion joint shall provide a minimum of 4 inches of linear expansion.

Basis of Payment: This work will be paid for at the contract unit price per each for LINEAR EXPANSION JOINT.

LINK SEALS

Description: This work shall consist of providing and installing a link style seal to form a watertight seal between a pipe and a concrete structure.

General: This work shall be completed in conjunction with the pay item CONNECTING TO EXISTING MANHOLES BY CORE DRILLING. The contractor shall coordinate the sizing cored hole with the link seal supplier. The seal shall be installed around the pipe, pushed into place and compressed forming a water tight seal with the manhole.

Basis of Payment: This work will be paid for at the contract unit price per each for LINK SEALS.

NEOPRENE BOOT
Description: This work shall consist of providing and installing rubber boots to form a watertight seal between and carrier pipe and a casing pipe. This work shall be completed in conjunction with a cased bore.

General: As part of installing a carrier pipe in a casing pipe, this item of work consists of installing a neoprene boot to form a watertight seal between the two. The boot shall be a minimum of 1/8” thick. It shall be attached using stainless steel band clamps fabricated of 304 stainless steel. The seal size shall be matched to the casing pipe and carrier pipe diameters to ensure a good fit. The seal shall be installed so that earth backfill will not tear or break the seal.

Basis of Payment: This work will be paid for at the contract price per each for NEOPRENE BOOT.

SCADA

Description: This work shall consist of modifying the existing SCADA panels and radio communication equipment from the three existing lift stations and modifying it for use in the new lift stations.

General: This work is specified in Section 16950 SCADA. This pay item shall be paid for in thirds as each station is integrated and brought online.

Basis of Payment: This work will be paid for at the contract lump sum price for SCADA.

SEWAGE PUMPING STATION – ROSE HILL COVE PUMP STATION/CHATEAU ESTATES PUMP STATION/DENMARK HILL PUMP STATION

Description: This work shall consist of providing and installing major lift station components specified for the Rose Hill pump station, Chateau pump station, and Denmark Hill pump station.

General: This work is specified in Section 11302.

Basis of Payment: This work will be paid for at the contract unit price per each for SEWAGE PUMPING STATION – ROSE HILL COVE PUMP STATION/CHATEAU ESTATES PUMP STATION/DENMARK HILL PUMP STATION of the pump station identified on the plans.

STUMP GRINDING

Description: This work shall consist of grinding stumps along Denmark Road on the causeway and in front of the GAO Grotto as well as along Old Ottawa Road.

General: Stumps located on the south side of the causeway up to and including the GAO Grotto shall be ground. The stumps shall be ground in accordance with Section 201.4 of the SSRBC.
Felled trees associated with the stumps shall be ground as part of the stump grinding and shall be included in the unit cost.

Contractor shall assume the stumps to be ground extend to waist height above ground.

**Basis of Payment:** This work will be paid for at the contract unit price per each for STUMP GRINDING.

**STUMP REMOVAL**

**Description:** This work shall consist of removing stumps along Denmark Road and Old Ottawa Road.

**General:** Stumps located along Denmark Road west and north of GAO Grotto along with Old Ottawa Road shall be removed.

Stumps shall be removed in accordance with Section 201.4 of the SSRBC.

Felled trees associated with the stumps shall be removed as part of the stump removal and shall be included in the unit cost.

**Basis of Payment:** This work will be paid for at the contract unit price per each for STUMP REMOVAL.

**TEMPORARY SOIL RETENTION AND SEWER INSTALLATION SYSTEM**

**Description:** This work shall consist of providing a temporary soil retention system at the locations identified on the plans for installing the gravity sewer utilizing conventional open cut.

**General:** This item of work covers the gravity sewer installation from Manhole 14 to Manhole 3505C. The existing utility constraints along with the depth of the sewer will require the use of a temporary soil retention system which is covered under this special provision.

The contractor shall familiarize himself with the proposed locations requiring temporary soil retention systems. The retention systems shall conform to Section 522.07 of the SSRBC and as modified herein. The work shall consist of designing, installing and maintaining the soil retention system for the duration required to construct the infrastructure within the excavated area. The retention systems shall provide protection to the excavation as well as to the adjacent utilities and pavement. The horizontal limits of the retention system shall be assumed at the excavation limits (hashed area) outlined on the plan view of the gravity sewer plan and profile sheets. The depth of the excavation requiring the retention system shall be assumed to be from existing grade to the invert of the proposed sewer.

The soil retention system should assume a granular soil profile to be retained. This work will also consist of temporary rerouting or support of existing force main serving the existing northwest pump station during sewer installation where needed throughout the project.
The item TEMPORARY SOIL RETENTION SYSTEM shall be paid for per lump sum. The cost shall include the retention system on both sides of the excavation, and removal of the temporary soil retention system once construction of the infrastructure is complete.

**Basis of Payment:** This work shall be paid for at the contract unit price per lump sum for TEMPORARY SOIL RETENTION AND SEWER INSTALLATION SYSTEM.
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<td>Bridge Deck Thin Polymer Overlay</td>
<td>May 7, 1997</td>
<td>Feb 6, 2013</td>
</tr>
<tr>
<td>GBSP51</td>
<td>Pipe Underdrain for Structures</td>
<td>May 17, 2000</td>
<td>Jan 22, 2010</td>
</tr>
<tr>
<td>GBSP53</td>
<td>Structural Repair of Concrete</td>
<td>Mar 15, 2006</td>
<td>Aug 9, 2019</td>
</tr>
<tr>
<td>GBSP55</td>
<td>Erection of Curved Steel Structures</td>
<td>Jun 1, 2007</td>
<td></td>
</tr>
<tr>
<td>GBSP56</td>
<td>Setting Piles in Rock</td>
<td>Nov 14, 1996</td>
<td>Apr 1, 2016</td>
</tr>
<tr>
<td>GBSP59</td>
<td>Diamond Grinding and Surface Testing Bridge Sections</td>
<td>Dec 6, 2004</td>
<td>Mar 29, 2017</td>
</tr>
<tr>
<td>GBSP60</td>
<td>Containment and Disposal of Non-Lead Paint Cleaning Residues</td>
<td>Nov 25, 2004</td>
<td>Apr 22, 2016</td>
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<tr>
<td>GBSP61</td>
<td>Slipform Parapet</td>
<td>Jun 1, 2007</td>
<td>March 1, 2019</td>
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<tr>
<td>GBSP72</td>
<td>Bridge Deck Fly Ash or GGBF Slag Concrete Overlay</td>
<td>Jan 18, 2011</td>
<td>March 1, 2019</td>
</tr>
<tr>
<td>GBSP75</td>
<td>Bond Breaker for Prestressed Concrete Bulb-T Beams</td>
<td>Apr 19, 2012</td>
<td></td>
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<tr>
<td>GBSP79</td>
<td>Bridge Deck Grooving (Longitudinal)</td>
<td>Dec 29, 2014</td>
<td>Mar 29, 2017</td>
</tr>
<tr>
<td>GBSP81</td>
<td>Membrane Waterproofing for Buried Structures</td>
<td>Oct 4, 2016</td>
<td>March 1, 2019</td>
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<tr>
<td>GBSP82</td>
<td>Metallizing of Structural Steel</td>
<td>Oct 4, 2016</td>
<td>Oct 20, 2017</td>
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<tr>
<td>GBSP83</td>
<td>Hot Dip Galvanizing For Structural Steel</td>
<td>Oct 4, 2016</td>
<td>Oct 20, 2017</td>
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<td>GBSP85</td>
<td>Micropiles</td>
<td>Apr 19, 1996</td>
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<tr>
<td>GBSP87</td>
<td>Lightweight Cellular Concrete Fill</td>
<td>Nov 11, 2001</td>
<td>Apr 1, 2016</td>
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<td>GBSP88</td>
<td>Corrugated Structural Plate Structures</td>
<td>Apr 22, 2016</td>
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</tr>
<tr>
<td>GBSP89</td>
<td>Preformed Pavement Joint Seal</td>
<td>Oct 4, 2016</td>
<td>March 1, 2019</td>
</tr>
<tr>
<td>GBSP90</td>
<td>Three Sided Precast Concrete Structure (Special)</td>
<td>Dec 21, 2016</td>
<td>April 13, 2018</td>
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<tr>
<td>GBSP91</td>
<td>Crosshole Sonic Logging Testing of Drilled Shafts</td>
<td>Apr 20, 2016</td>
<td>Aug 9, 2019</td>
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<tr>
<td>GBSP92</td>
<td>Thermal Integrity Profile Testing of Drilled Shafts</td>
<td>Apr 20, 2016</td>
<td></td>
</tr>
<tr>
<td>File Name</td>
<td>Title</td>
<td>Effective</td>
<td>Revised</td>
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<td>--------------------------------------------------------------</td>
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<td>--------------------</td>
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<tr>
<td>GBSP93</td>
<td>Preformed Bridge Joint Seal</td>
<td>Dec 21, 2016</td>
<td>March 1, 2019</td>
</tr>
<tr>
<td>GBSP94</td>
<td>Warranty for Cleaning and Painting Steel Structures</td>
<td>Mar 3, 2000</td>
<td>Nov 24, 2004</td>
</tr>
<tr>
<td>GBSP95</td>
<td>Bituminous Coated Aggregate Slopewall</td>
<td>April 13, 2018</td>
<td></td>
</tr>
<tr>
<td>GBSP96</td>
<td>Erection of Bridge Girders Over or Adjacent to Railroads</td>
<td>Aug 9, 2019</td>
<td></td>
</tr>
</tbody>
</table>

**LIST ADDITIONAL SPECIAL PROVISIONS BELOW**

The following Guide Bridge Special Provisions have been incorporated into the 2016 Standard Specifications:

<table>
<thead>
<tr>
<th>File Name</th>
<th>Title</th>
<th>Std Spec Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>GBSP32</td>
<td>Temporary Sheet Piling</td>
<td>522</td>
</tr>
<tr>
<td>GBSP38</td>
<td>Mechanically Stabilized Earth Retaining Walls</td>
<td>522</td>
</tr>
<tr>
<td>GBSP42</td>
<td>Drilled Soldier Pile Retaining Wall</td>
<td>522</td>
</tr>
<tr>
<td>GBSP43</td>
<td>Driven Soldier Pile Retaining Wall</td>
<td>522</td>
</tr>
<tr>
<td>GBSP44</td>
<td>Temporary Soil Retention System</td>
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<tr>
<td>GBSP46</td>
<td>Geotextile Retaining Walls</td>
<td>522</td>
</tr>
<tr>
<td>GBSP57</td>
<td>Temporary Mechanically Stabilized Earth Retaining Walls</td>
<td>522</td>
</tr>
<tr>
<td>GBSP62</td>
<td>Concrete Deck Beams</td>
<td>504</td>
</tr>
<tr>
<td>GBSP64</td>
<td>Segmental Concrete Block Wall</td>
<td>522</td>
</tr>
<tr>
<td>GBSP65</td>
<td>Precast Modular Retaining Wall</td>
<td>522</td>
</tr>
<tr>
<td>GBSP73</td>
<td>Cofferdams</td>
<td>2017 Supp</td>
</tr>
<tr>
<td>GBSP74</td>
<td>Permanent Steel Sheet Piling (LRFD)</td>
<td>522</td>
</tr>
<tr>
<td>GBSP76</td>
<td>Granular Backfill for Structures</td>
<td>2017 Supp</td>
</tr>
<tr>
<td>GBSP80</td>
<td>Fabric Reinforced Elastomeric</td>
<td>1028</td>
</tr>
<tr>
<td>GBSP84</td>
<td>Precast, Prestressed Concrete Beams</td>
<td>2017 Supp</td>
</tr>
</tbody>
</table>

The following Guide Bridge Special Provisions have been discontinued or have been superseded:

<table>
<thead>
<tr>
<th>File Name</th>
<th>Title</th>
<th>Disposition:</th>
</tr>
</thead>
<tbody>
<tr>
<td>GBSP70</td>
<td>Braced Excavitation</td>
<td>Use TSRS per Sec 522</td>
</tr>
<tr>
<td>GBSP 95</td>
<td>Bridge Deck Concrete Sealer</td>
<td>Use July 1, 2012 version for Repair projects only</td>
</tr>
</tbody>
</table>
BONDED PREFORMED JOINT SEAL

Effective:  July 12, 1994
Revised:  August 9, 2019

Description.  This work shall consist of preparing the joint opening faces and furnishing and installing a bonded preformed joint seal with the necessary bonding epoxy into bridge joints.

Materials.  The material quality of bonded preformed joint seal shall be according to the physical requirements of Table 1 of ASTM D2628 with the following exceptions: compression set shall not be over 40 percent when tested according to Method B (Modified) of ASTM D 395 after 70 hours at 212 ºF (100 ºC).  The Compression-Deflection requirement will not apply to the bonded preformed joint seal.

The adhesive used to bond the joint sealer shall be supplied by the manufacturer of the bonded preformed joint seal and shall meet the following requirements:

- The adhesive shall be epoxy base, dual component, which resists salt, diluted acids, alkanes, solvents, greases, oils, moisture, sunlight and weathering.  Temperatures up to 200 ºF (93 ºC) shall not reduce bond strength.  At 68 ºF (20 ºC), the bond strength shall be a minimum of 1000 psi (6.9 MPa) within 24 hours.
  
  - Pot Life; min.  40 minutes @ 68 ºF (20 ºC)
  - Tensile Strength; min.  4000 psi (28 MPa)
  - Solids Hardness; max.  5 mohs
  - Flash Point; min.  200 ºF (93 ºC)
  - Axial Compression; min.  8760 psi (60 MPa)
  - Complete Cure; max.  7 days @ 68 ºF (20 ºC)
  - Concrete Bond Strength; min.  4000 psi (28 MPa)
  - Steel Bond Strength; min.  4000 psi (28 MPa)

Any primers or cleaning solutions used on the faces of the joint or on the profile of the sides of the bonded preformed joint seal shall be supplied by the manufacturer of the bonded preformed joint seal.  Any additional installation materials and adhesive for splicing joint sections, shall be as supplied by the manufacturer of the bonded preformed joint seal.

Construction Requirements

Installation.  The inside surfaces of the joint opening shall be roughened by sand blasting to bare white metal on a metal walled joint or to clean elastomeric polymer concrete on an elastomeric polymer concrete walled joint.  The depth of roughening of the joint shall equal the depth of the bonded portion of the preformed joint material.  After roughening, the joint shall be cleaned with compressed air.  The compressed air shall be according to the cleanliness requirements of ASTM D 4285.  The bonded preformed joint seal shall be wiped with a primer that promotes adhesion when recommended by the joint manufacturer.  The epoxy adhesive shall then be applied, both to the inner walls of the joint, and to the exterior surfaces of the joint seal.  Immediately after blow down, the primer and adhesive shall be applied in the amounts
recommended by the joint manufacturer. Maximum application lengths of joints for a pound (kilogram) of epoxy shall be supplied by the joint seal manufacturer.

The joint seal with epoxy shall be inserted into the joint and held tightly against both sides of the joint until sufficient bond strength has been developed to resist the expected expansion forces. The seal shall be placed so the top of the seal is approximately 1/8 in. (3 mm) recessed.

Bonded preformed joint seals shall not be installed when temperatures below 50 °F (10 °C) are predicted within a 48 hour period.

**Method of Measurement.** The bonded preformed joint seal will be measured in place, in feet (meters) along the centerline of the joint.

**Basis of Payment.** This work will be paid for at the contract unit price per foot (meter) for BONDED PREFORMED JOINT SEAL, of the size specified.
PIPE UNDERDRAINS FOR STRUCTURES
Effective: May 17, 2000
Revised: January 22, 2010

Description. This work shall consist of furnishing and installing a pipe underdrain system as shown on the plans, as specified herein, and as directed by the Engineer.

Materials. Materials shall meet the requirements as set forth below:

The perforated pipe underdrain shall be according to Article 601.02 of the Standard Specifications. Outlet pipes or pipes connecting to a separate storm sewer system shall not be perforated.

The drainage aggregate shall be a combination of one or more of the following gradations, FA1, FA2, CA5, CA7, CA8, CA11, or CA13 thru 16, according to Sections 1003 and 1004 of the Standard Specifications.

The fabric surrounding the drainage aggregate shall be Geotechnical Fabric for French Drains according to Article 1080.05 of the Standard Specifications.

Construction Requirements. All work shall be according to the applicable requirements of Section 601 of the Standard Specifications except as modified below.

The pipe underdrains shall consist of a perforated pipe drain situated at the bottom of an area of drainage aggregate wrapped completely in geotechnical fabric and shall be installed to the lines and gradients as shown on the plans.

Method of Measurement. Pipe Underdrains for Structures shall be measured for payment in feet (meters), in place. Measurement shall be along the centerline of the pipe underdrains. All connectors, outlet pipes, elbows, and all other miscellaneous items shall be included in the measurement. Concrete headwalls shall be included in the cost of Pipe Underdrains for Structures, but shall not be included in the measurement for payment.

Basis of Payment. This work will be paid for at the contract unit price per foot (meter) for PIPE UNDERDRAINS FOR STRUCTURES of the diameter specified. Furnishing and installation of the drainage aggregate, geotechnical fabric, forming holes in structural elements and any excavation required, will not be paid for separately, but shall be included in the cost of the pipe underdrains for structures.
DRILLED SHAFTS
Effective: October 5, 2015
Revised: October 4, 2016

Revise Section 516 of the Standard Specifications to read:

“SECTION 516. DRILLED SHAFTS

516.01 Description. This work shall consist of constructing drilled shaft foundations.

516.02 Materials. Materials shall be according to the following.

<table>
<thead>
<tr>
<th>Item</th>
<th>Article/Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Portland Cement Concrete (Note 1)</td>
<td>1020</td>
</tr>
<tr>
<td>(b) Reinforcement Bars</td>
<td>1006.10</td>
</tr>
<tr>
<td>(c) Grout (Note 2)</td>
<td>1024.01</td>
</tr>
<tr>
<td>(d) Permanent Steel Casing</td>
<td>1006.05(d)</td>
</tr>
<tr>
<td>(e) Slurry (Note 3)</td>
<td></td>
</tr>
</tbody>
</table>

Note 1. When the soil contains sulfate contaminants, ASTM C 1580 testing will be performed to assess the severity of sulfate exposure to the concrete. If the sulfate contaminate is >0.10 to < 0.20 percent by mass, a Type II (MH) cement shall be used. If the sulfate contaminant is >0.20 to < 2.0 percent by mass, a Type V cement shall be used. If the sulfate contaminant is ≥ 2.0 percent by mass, refer to ACI 201.2R for guidance.

Note 2. The sand-cement grout mix shall be according to Section 1020 and shall be two to five parts sand and one part Type I or II cement. The maximum water cement ratio shall be sufficient to provide a flowable mixture with a typical slump of 10 in. (250 mm).

Note 3. Slurry shall be bentonite, emulsified polymer, or dry polymer, and shall be approved by the Engineer.

516.03 Equipment. Equipment shall be according to the following.

<table>
<thead>
<tr>
<th>Item</th>
<th>Article/Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Concrete Equipment</td>
<td>1020.03</td>
</tr>
<tr>
<td>(b) Drilling Equipment (Note 1)</td>
<td></td>
</tr>
<tr>
<td>(c) Hand Vibrator</td>
<td>1103.17(a)</td>
</tr>
<tr>
<td>(d) Underwater Concrete Placement Equipment</td>
<td>1103.18</td>
</tr>
</tbody>
</table>
Note 1. The drilling equipment shall have adequate capacity, including power, torque and down thrust, to create a shaft excavation of the maximum diameter specified to a depth of 20 percent beyond the depths shown on the plans.

516.04 Submittals. The following information shall be submitted on form BBS 133.

(a) Qualifications. At the time of the preconstruction conference, the Contractor shall provide the following documentation.

(1) References. A list containing at least three projects completed within the three years prior to this project’s bid date which the Contractor performing this work has installed drilled shafts of similar diameter, length, and site conditions to those shown in the plans. The list of projects shall contain names and phone numbers of owner’s representatives who can verify the Contractor’s participation on those projects.

(2) Experience. Name and experience record of the drilled shaft supervisor, responsible for all facets of the shaft installation, and the drill operator(s) who will be assigned to this project. The supervisor and operator(s) shall each have a minimum of three years experience in the construction of drilled shafts.

(b) Installation Procedure. A detailed installation procedure shall be submitted to the Engineer for acceptance at least 28 days prior to drilled shaft construction and shall address each of the following items unless otherwise directed by the Engineer in writing.

(1) Equipment List. List of proposed equipment to be used including cranes, drill rigs, augers, belling tools, casing, vibratory hammers, core barrels, bailing buckets, final cleaning equipment, slurry equipment, tremies, or concrete pumps, etc.

(2) General Sequence. Details of the overall construction operation sequence, equipment access, and the sequence of individual shaft construction within each substructure bent or footing group. The submittal shall address the Contractor’s proposed time delay and/or the minimum concrete strength necessary before initiating a shaft excavation adjacent to a recently installed drilled shaft.

(3) Shaft Excavation. A site specific step by step description of how the Contractor anticipates the shaft excavation to be advanced based on their evaluation of the subsurface data and conditions expected to be encountered. This sequence shall note the method of casing advancement, anticipated casing lengths, tip elevations and diameters, the excavation tools used and drilled diameters created. The Contractor shall indicate whether wet or dry drilling conditions are expected and if groundwater will be sealed from the excavation.
(4) Slurry. When the use of slurry is proposed, details on the types of additives to be used and their manufacturers shall be provided. In addition, details covering the measurement and control of the hardness of the mixing water, agitation, circulation, de-sanding, sampling, testing, and chemical properties of the slurry shall be submitted.

(5) Shaft Cleaning. Method(s) and sequence proposed for the shaft cleaning operation.

(6) Reinforcement Cage and Permanent Casing. Details of reinforcement placement including rolling spacers to be used and method to maintain proper elevation and location of the reinforcement cage within the shaft excavation during concrete placement. The method(s) of adjusting the reinforcement cage length and permanent casing if rock is encountered at an elevation other than as shown on the plans. As an option, the Contractor may perform soil borings and rock cores at the drilled shaft locations to determine the required reinforcement cage and permanent casing lengths.

(7) Concrete Placement. Details of concrete placement including proposed operational procedures for free fall, tremie or pumping methods. The sequence and method of casing removal shall also be stated along with the top of pour elevation, and method of forming through water above streambed.

(8) Mix Design. The proposed concrete mix design(s).

(9) Disposal Plan. Containment and disposal plan for slurry and displaced water. Containment and disposal plan for contaminated concrete pushed out of the top of the shaft by uncontaminated concrete during concrete placement.

(10) Access and Site Protection Plan. Details of access to the drilled shafts and safety measures proposed. This shall include a list of casing, scaffolding, work platforms, temporary walkways, railings, and other items needed to provide safe access to the drilled shafts. Provisions to protect open excavations during non-working hours shall be included.

The Engineer will evaluate the drilled shaft installation procedure and notify the Contractor of acceptance, need for additional information, or concerns with the installation's effect on the existing or proposed structure(s).
CONSTRUCTION REQUIREMENTS

516.05 General. Excavation for drilled shaft(s) shall not proceed until written authorization is received from the Engineer. The Contractor shall be responsible for verification of the dimensions and alignment of each shaft excavation as directed by the Engineer.

Unless otherwise approved in the Contractor’s installation procedure, no shaft excavation, casing installation, or casing removal with a vibratory hammer shall be made within four shaft diameters center to center of a shaft with concrete that has a compressive strength less than 1500 psi (10,300 kPa). The site-specific soil strengths and installation methods selected will determine the actual required minimum spacing, if any, to address vibration and blow out concerns.

Lost tools shall not remain in the shaft excavation without the approval of the Engineer.

Blasting shall not be used as a method of shaft excavation.

516.06 Shaft Excavation Protection Methods. The construction of drilled shafts may involve the use of one or more of the following methods to support the excavation during the various phases of shaft excavation, cleaning, and concrete placement dependent on the site conditions encountered. Surface water shall not flow uncontrolled into the shaft excavation, however water may be placed into the shaft excavation in order to meet head pressure requirements according to Articles 516.06(c) and 516.13.

The following are general descriptions indicating the conditions when these methods may be used.

(a) Dry Method. The dry construction method shall only be used at sites where the groundwater and soil conditions are suitable to permit the drilling and dewatering of the excavation without causing subsidence of adjacent ground, boiling of the base soils, squeezing, or caving of the shaft side walls. The dry method shall consist of drilling the shaft excavation, removing accumulated water, cleaning the shaft base, and placing the reinforcement cage and concrete in a predominately dry excavation.

(b) Slurry Method. The slurry construction method may be used at sites where dewatering the excavation would cause collapse of the shaft sidewalls or when the volume and head of water flowing into the shaft is likely to contaminate the concrete during placement resulting in a shaft defect. This method uses slurry, or in rare cases water, to maintain stability of the shaft sidewall while advancing the shaft excavation. After the shaft excavation is completed, the slurry level in the shaft shall be kept at an elevation to
maintain stability of the shaft sidewall, maintain stability of the shaft base, and prevent additional groundwater from entering the shaft. The shaft base shall be cleaned, the reinforcement cage shall be set, and the concrete shall be discharged at the bottom of the shaft excavation, displacing the slurry upwards.

(c) Temporary Casing Method. Temporary casing shall be used when either the dry or slurry methods provide inadequate support to prevent sidewall caving or excessive deformation of the shaft excavation. Temporary casing may be used with slurry or be used to reduce the flow of water into the excavation to allow dewatering and concrete placement in a dry shaft excavation. Temporary casing shall not be allowed to remain permanently without the approval of the Engineer.

During removal of the temporary casing, the level of concrete in the casing shall be maintained at a level such that the head pressure inside the casing is a minimum of 1.25 times the head pressure outside the casing, but in no case is less than 5 ft (1.5 m) above the bottom of the casing. Casing removal shall be at a slow, uniform rate with the pull in line with the shaft axis. Excessive rotation of the casing shall be avoided to limit deformation of the reinforcement cage. In addition, the slump requirements during casing removal shall be according to Article 516.12.

When called for on the plans, the Contractor shall install a permanent casing as specified. Permanent casing may be used as a shaft excavation support method or may be installed after shaft excavation is completed using one of the above methods. After construction, if voids are present between the permanent casing and the drilled excavation, the voids shall be filled with grout. Permanent casing shall not remain in place beyond the limits shown on the plans without the specific approval of the Engineer.

When the shaft extends above the streambed through a body of water and permanent casing is not shown, the portion above the streambed shall be formed with removable casings, column forms, or other forming systems as approved by the Engineer. The forming system shall not scar or spall the finished concrete or leave in place any forms or casing within the removable form limits as shown on the plans unless approved as part of the installation procedure. The forming system shall not be removed until the concrete has attained a minimum compressive strength of 2500 psi (17,200 kPa) and cured for a minimum of 72 hours. For shafts extending through water, the concrete shall be protected from water action after placement for a minimum of seven days.

516.07 Slurry. When slurry is used, the Contractor shall provide a technical representative of the slurry additive manufacturer at the site prior to introduction of the slurry into the first shaft where slurry will be used, and during drilling and completion of a minimum of one shaft to adjust the slurry mix to the specific site conditions. During construction, the level of the slurry shall be maintained a minimum of 5 feet (1.5 m) above the height required to prevent
caving of the shaft excavation. In the event of a sudden or significant loss of slurry in the shaft excavation, the construction of that foundation shall be stopped and the shaft excavation backfilled or supported by temporary casing, until a method to stop slurry loss, or an alternate construction procedure, has been approved by the Engineer.

(a) General Properties. The material used to make the slurry shall not be detrimental to the concrete or surrounding ground. Mineral slurries shall have both a mineral grain size that remains in suspension and sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system. Polymer slurries shall have sufficient viscosity and gel characteristics to transport excavated material to suitable screening systems or settling tanks. The percentage and specific gravity of the material used to make the slurry shall be sufficient to maintain the stability of the excavation and to allow proper concrete placement.

If approved by the Engineer, the Contractor may use water and excavated soils as drilling slurry. In this case, the range of acceptable values for density, viscosity and pH, as shown in the following table for bentonite slurry shall be met.

When water is used as the slurry to construct rock sockets in limestone, dolomite, sandstone or other formations that are not erodible, the requirements for slurry testing shall not apply if the entire fluid column is replaced with fresh water after drilling. To do so, fresh water shall be introduced at the top of the shaft excavation and existing water used during drilling shall be pumped out of the shaft excavation from the bottom of the shaft excavation until the entire volume of fluid has been replaced.

(b) Preparation. Prior to introduction into the shaft excavation, the manufactured slurry admixture shall be pre-mixed thoroughly with clean, fresh water and for adequate time in accordance with the slurry admixture manufacturer’s recommendations. Slurry tanks of adequate capacity shall be used for slurry mixing, circulation, storage and treatment. No excavated slurry pits will be allowed in lieu of slurry tanks without approval from the Engineer. Adequate desanding equipment shall be provided to control slurry properties during the drilled shaft excavation in accordance with the values provided in Table 1.

(c) Quality Control. Quality control tests shall be performed on the slurry to determine density, viscosity, sand content and pH of freshly mixed slurry, recycled slurry and slurry in the shaft excavation. Tests of slurry samples from within two feet of the bottom and at mid-height of the shaft excavation shall be conducted in each shaft excavation during the excavation process to measure the consistency of the slurry. A minimum of four sets of tests shall be conducted during the first eight hours of slurry use on the project. When a series of four test results do not change more than 1% from the initial test, the testing frequency may be decreased to one set every four hours of slurry use. Reports of all tests, signed by an authorized representative of the Contractor, shall be furnished to the
Engineer upon completion of each drilled shaft. The physical properties of the slurry shall be as shown in Table 1.

The slurry shall be sampled and tested less than 1 hour before concrete placement. Any heavily contaminated slurry that has accumulated at the bottom of the shaft shall be removed. The contractor shall perform final shaft bottom cleaning after suspended solids have settled from the slurry. Concrete shall not be placed if the slurry does not have the required physical properties.

<table>
<thead>
<tr>
<th>Property</th>
<th>Bentonite</th>
<th>Emulsified Polymer</th>
<th>Dry Polymer</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density, lb/cu ft (kg/cu m) (at introduction)</td>
<td>65.2 ± 1.6</td>
<td>63 (1009.0) max.</td>
<td>63 (1009.0) max.</td>
<td>ASTM D 4380</td>
</tr>
<tr>
<td>Density, lb/cu ft (kg/cu m) (prior to concrete placement)</td>
<td>67.0 ± 3.5</td>
<td>63 (1009.0) max.</td>
<td>63 (1009.0) max.</td>
<td>ASTM D 4380</td>
</tr>
<tr>
<td>Viscosity(^2), sec/qt (sec/L)</td>
<td>46 ± 14 (48 ± 14)</td>
<td>38 ± 5 (40 ± 5)</td>
<td>65 ± 15 (69 ± 16)</td>
<td>ASTM D 6910</td>
</tr>
<tr>
<td>pH</td>
<td>9.0 ± 1.0</td>
<td>9.5 ± 1.5</td>
<td>9.0 ± 2.0</td>
<td>ASTM D 4972</td>
</tr>
<tr>
<td>Sand Content, percent by volume (at introduction)</td>
<td>4 max.</td>
<td>1 max.</td>
<td>1 max.</td>
<td>ASTM D 4381</td>
</tr>
<tr>
<td>Sand Content, percent by volume (prior to concrete placement)</td>
<td>10 max.</td>
<td>1 max.</td>
<td>1 max.</td>
<td>ASTM D 4381</td>
</tr>
<tr>
<td>Contact Time(^3), hours</td>
<td>4 max.</td>
<td>72 max.</td>
<td>72 max</td>
<td></td>
</tr>
</tbody>
</table>

Note 1. When the slurry consists of only water and excavated soils, the density shall not exceed 70 lb/cu ft (1121 kg/cu m).
Note 2. Higher viscosities may be required in loose or gravelly sand deposits.
Note 3. Contact time is the time without agitation and sidewall cleaning.
516.08 **Obstructions.** An obstruction is an unknown isolated object that causes the shaft excavation method to experience a significant decrease in the actual production rate and requires the Contractor to core, break up, push aside, or use other means to mitigate the obstruction. Subsurface conditions such as boulders, cobbles, or logs and buried infrastructure such as footings, piling, or abandoned utilities, when shown on the plans, shall not constitute an obstruction. When an obstruction is encountered, the Contractor shall notify the Engineer immediately and upon concurrence of the Engineer, the Contractor shall mitigate the obstruction with an approved method.

516.09 **Top of Rock.** The top of rock will be considered as the point where rock, defined as bedded deposits and conglomerate deposits exhibiting the physical characteristics and difficulty of rock removal as determined by the Engineer, is encountered which cannot be drilled with augers and/or underreaming tools configured to be effective in the soils indicated in the contract documents.

516.10 **Design Modifications.** If the top of rock elevation differs from that shown on the plans by more than 10 percent of the length of the drilled shaft above the rock, the Engineer shall be contacted to determine if any drilled shaft design changes may be required. In addition, if the type of soil or rock encountered is not similar to that shown in the subsurface exploration data, the Contractor may be required to extend the drilled shaft length(s) beyond those specified in the plans. In either case, the Engineer will determine if revisions are necessary and the extent of the modifications required.

516.11 **Excavation Cleaning and Inspection.** Materials removed or generated from the shaft excavations shall be disposed of according to Article 202.03.

   After excavation, each shaft shall be cleaned. For a drilled shaft terminating in soil, the depth of sediment or debris shall be a maximum of 1 1/2 in. (38 mm). For a drilled shaft terminating in rock, the depth of sediment or debris shall be a maximum of 1/2 in. (13 mm).

   A shaft excavation shall be overreamed when, in the opinion of the Engineer, the sidewall has softened, swelled, or has a buildup of slurry cake. Overreaming may also be required to correct a shaft excavation which has been drilled out of tolerance. Overreaming may be accomplished with a grooving tool, overreaming bucket, or other approved equipment. Overreaming thickness shall be a minimum of 1/2 in. (13 mm) and a maximum of 3 in. (75 mm).

516.12 **Reinforcement.** This work shall be according to Section 508 and the following.

   The shaft excavation shall be cleaned and inspected prior to placing the reinforcement cage. The reinforcement cage shall be completely assembled prior to drilling and be ready for adjustment in length as required by the conditions encountered. The reinforcement cage shall be lifted using multiple point sling straps or other approved methods to avoid reinforcement
cage distortion or stress. Cross frame stiffeners may be required for lifting or to keep the reinforcement cage in proper position during lifting and concrete placement.

The Contractor shall attach rolling spacers to keep the reinforcement cage centered within the shaft excavation during concrete placement and to ensure that at no point will the finished shaft have less than the minimum concrete cover(s) shown on the plans. The rolling spacers or other approved non-corrosive spacing devices shall be installed within 2 ft (0.6 m) of both the top and bottom of the drilled shaft and at intervals not exceeding 10 ft (3 m) throughout the length of the shaft to ensure proper reinforcement cage alignment and clearance for the entire shaft. The number of rolling spacers at each level shall be one for each 1.0 ft (300 mm) of shaft diameter, with a minimum of four rolling spacers at each level. For shafts with different shaft diameters throughout the length of the excavation, different sized rolling spacers shall be provided to ensure the reinforcement cage is properly positioned throughout the entire length of the shaft.

When a specific concrete cover between the base of the drilled shaft and the reinforcement cage is shown on the plans, the bottom of the reinforcement cage shall be supported so that the proper concrete cover is maintained.

If the conditions differ such that the length of the shaft is increased, additional longitudinal bars shall be either mechanically spliced or lap spliced to the lower end of the reinforcement cage and confined with either hoop ties or spirals. The Contractor shall have additional reinforcement available or fabricate the reinforcement cages with additional length as necessary to make the required adjustments in a timely manner as dictated by the encountered conditions. The additional reinforcement may be non-epoxy coated.

516.13 Concrete Placement. Concrete work shall be performed according to the following.

Throughout concrete placement the head pressure inside the drilled shaft shall be at least 1.1 times the head pressure outside the drilled shaft.

Concrete placement shall begin within 1 hour of shaft cleaning and inspection. The pour shall be made in a continuous manner from the bottom to the top elevation of the shaft as shown on the contract plan or as approved in the Contractor's installation procedure. Concrete placement shall continue after the shaft excavation is full and until 18 in. (450 mm) of good quality, uncontaminated concrete is expelled at the top of shaft. Vibration of the concrete will not be allowed when the concrete is displacing slurry or water. In dry excavations, the concrete in the top 10 ft (3 m) of the shaft shall be vibrated.

When using temporary casing or placing concrete under water or slurry, a minimum of seven days prior to concrete placement, a 4 cu yd (3 cu m) trial batch of the concrete mixture shall be
performed to evaluate slump retention. Temporary casing shall be withdrawn before the slump of the concrete drops below 6 in. (150 mm). For concrete placed using the slurry method of construction, the slump of all concrete placed shall be a minimum of 6 in. (150 mm) at the end of concrete placement.

Devices used to place concrete shall have no aluminum parts in contact with concrete.

When the top of the shaft is at the finished elevation and no further concrete placement above the finished elevation is specified, the top of the shaft shall be level and finished according to Article 503.15(a).

Concrete shall be placed by free fall, tremie, or concrete pump subject to the following conditions.

(a) Free Fall Placement. Concrete shall only be placed by free fall when the rate of water infiltration into the shaft excavation is less than 12 in. (300 mm) per hour and the depth of water in the shaft excavation is less than 3 in. (75 mm) at the time of concrete placement.

Concrete placed by free fall shall fall directly to the base without contacting the reinforcement cage, cross frame stiffeners, or shaft sidewall. Drop chutes may be used to direct concrete to the base during free fall placement.

Drop chutes used to direct placement of free fall concrete shall consist of a smooth tube. Concrete may be placed through either a hopper at the top of the tube or side openings as the drop chute is retrieved during concrete placement. The drop chute shall be supported so that free fall does not exceed 60 ft (18.3 m) for conventional concrete or 30 ft (9.1 m) for self-consolidating concrete. If placement cannot be satisfactorily accomplished by free fall in the opinion of the Engineer, either a tremie or pump shall be used to accomplish the pour.

(b) Tremie and Concrete Pump Placement. Concrete placement shall be according to Article 503.08, except the discharge end of the steel pipe shall remain embedded in the concrete a minimum of 10 ft (3.0 m) throughout concrete placement when displacing slurry or water.

516.14 Construction Tolerances. The following construction tolerances shall apply to all drilled shafts.

(a) Center of Shaft. The center of the drilled shaft shall be within 3 in. (75 mm) of the plan station and offset at the top of the shaft.
(b) Center of Reinforcement Cage. The center of the reinforcement cage shall be within 1 1/2 in. (40 mm) of plan station and offset at the top of the shaft.

(c) Vertical Plumbness of Shaft. The out of vertical plumbness of the shaft shall not exceed 1.5 percent.

(d) Vertical Plumbness of Reinforcement Cage. The out of vertical plumbness of the shaft reinforcement cage shall not exceed 0.83 percent.

(e) Top of Shaft. The top of the shaft shall be no more than 1 in. (25 mm) above and no more than 3 in. (75 mm) below the plan elevation.

(f) Top of Reinforcement Cage. The top of the reinforcement cage shall be no more than 1 in. (25 mm) above and no more than 3 in. (75 mm) below the plan elevation.

(g) Bottom of shaft. Excavation equipment and methods used to complete the shaft excavation shall have a nearly planar bottom. The cutting edges of excavation equipment used to create the bottom of shafts in rock shall be normal to the vertical axis of the shaft within a tolerance of 6.25 percent.

516.15 Method of Measurement. This work will be measured for payment in place and the volume computed in cubic yards (cubic meters). The volume will be computed using the plan diameter of the shaft multiplied by the measured length of the shaft. The length of shaft in soil will be computed as the difference in elevation between the top of the drilled shaft shown on the plans, or as installed as part of the Contractor’s installation procedure, and the bottom of the shaft or the top of rock (when present) whichever is higher. The length of shaft in rock will be computed as the difference in elevation between the measured top of rock and the bottom of the shaft.

When permanent casing is specified, it will be measured for payment in place, in feet (meters). Permanent casing installed at the Contractor's option will not be measured for payment.

Reinforcement furnished and installed will be measured for payment according to Article 508.07.

516.16 Basis of Payment. This work will be paid for at the contract unit price per cubic yard (cubic meter) for DRILLED SHAFT IN SOIL, and/or DRILLED SHAFT IN ROCK.

Permanent casing will be paid for at the contract unit price per foot (meter) for PERMANENT CASING.
Reinforcement furnished and installed will be paid for according to Article 508.08.
Obstruction mitigation will be paid for according to Article 109.04."
PORTLAND CEMENT CONCRETE (BDE)

Effective: November 1, 2017

Revise the Air Content % of Class PP Concrete in Table 1 Classes of Concrete and Mix Design Criteria in Article 1020.04 of the Standard Specifications to read:

<table>
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<th>Use</th>
<th>Air Content %</th>
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<tr>
<td>PP</td>
<td>Pavement Patching Bridge Deck Patching (10)</td>
<td>4.0 - 8.0&quot;</td>
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<td>PP-1</td>
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<td>PP-2</td>
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<td>PP-5</td>
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</table>

Revise Note (4) at the end of Table 1 Classes of Concrete and Mix Design Criteria in Article 1020.04 of the Standard Specifications to read:

“(4) For all classes of concrete, the maximum slump may be increased to 7 in (175 mm) when a high range water-reducing admixture is used. For Class SC, the maximum slump may be increased to 8 in. (200 mm). For Class PS, the maximum slump may be increased to 8 1/2 in. (215 mm) if the high range water-reducing admixture is the polycarboxylate type.”
## BDE SPECIAL PROVISIONS

**For the April 24, 2020 and June 12, 2020 Lettings**

The following special provisions indicated by a “check mark” are applicable to this contract and will be included by the Project Coordination and Implementation Section of the BD&E. An * indicates a new or revised special provision for the letting.

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### 2020 Supplemental Specifications and Recurring Special Provisions

#### File Name | Special Provision Title | New Location(s) | Effective | Revised
--- | --- | --- | --- | ---
80404 | Coarse Aggregate Quality for Micro-Surfacing and Cape Seals | Article 1004.01(b) | Jan. 1, 2019 |  
80392 | Lights on Barricades | Articles 701.16, 701.17(c)(2) & 603.07 | Jan. 1, 2018 |  
80336 | Longitudinal Joint and Crack Patching | Check Sheet #36 | April 1, 2014 | April 1, 2016  
80400 | Mast Arm Assembly and Pole | Article 1077.03(b) | Aug. 1, 2018 |  
80394 | Metal Flared End Section for Pipe Culverts | Articles 542.07(c) and 542.11 | Jan. 1, 2018 | April 1, 2018  
80390 | Payments to Subcontractors | Article 109.11 | Nov. 2, 2017 |  

The following special provisions have been deleted from use.

#### File Name | Special Provision Title | Effective | Revised
--- | --- | --- | ---
80328 | Progress Payments | Nov. 2, 2013 |  

The following special provisions require additional information from the designer. The additional information needs to be submitted as a separate document. The Project Coordination and Implementation section will then include the information in the applicable special provision.

- Bridge Demolition Debris
- Building Removal - Case I
- Building Removal – Case II
- Building Removal - Case III
- Building Removal-Case IV
- Completion Date
- Completion Date Plus Working Days
- DBE Participation
- Material Transfer Device
- Railroad Protective Liability Insurance
- Training Special Provisions
- Working Days
The Following Recurring Special Provisions Indicated By An “X” Are Applicable To This Contract And Are Included By Reference:

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The Following Local Roads And Streets Recurring Special Provisions Indicated By An “X” Are Applicable To This Contract And Are Included By Reference:

**Local Roads And Streets Recurring Special Provisions**

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<td>LRS 11</td>
<td>Employment Practices</td>
<td>199</td>
</tr>
<tr>
<td>LRS 12</td>
<td>Wages of Employees on Public Works</td>
<td>201</td>
</tr>
<tr>
<td>LRS 13</td>
<td>Selection of Labor</td>
<td>203</td>
</tr>
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</tr>
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<td>Protests on Local Lettings</td>
<td>208</td>
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<td>LRS 17</td>
<td>Substance Abuse Prevention Program</td>
<td>209</td>
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<tr>
<td>LRS 18</td>
<td>Multigrade Cold Mix Asphalt</td>
<td>210</td>
</tr>
</tbody>
</table>
1.1 GEOTECHNICAL DATA

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information. This Document and its attachments are not part of the Contract Documents.

B. Because subsurface conditions indicated by the soil borings are a sampling in relation to the entire construction area, and for other reasons, the Owner, the Architect, the Architect's consultants, and the firm reporting the subsurface conditions do not warranty the conditions below the depths of the borings or that the strata logged from the borings are necessarily typical of the entire site. Any party using the information described in the soil borings and geotechnical report shall accept full responsibility for its use.

C. Soil-boring data for Project, obtained by Midwest Engineering and Evaluation, dated February 28, 2020 and May 10, 2013 is available for viewing as appended to this Document.

END OF DOCUMENT 003132
May 10, 2013

Mr. Eric N. Childers
City of Danville
1155 E. Voorhees Street
Suite A
Danville, IL 61832

Re: Subsurface Exploration and Geotechnical Evaluation
  Proposed Gravity Sewer and Pump Station
  Denmark Road Causeway over Lake Vermilion
  Danville, Illinois
  MET Project No. 33034

Dear Mr. Childers:

In accordance with your request, we have completed subsurface exploration at three (3) locations along the Denmark Road Causeway over Lake Vermilion. A Vicinity Map, Figure 1, is attached. This letter report includes our findings, recommendations for design of the proposed pump station foundation and discussion of geotechnical aspects related to sanitary sewer installation.

The proposed project will include the construction of a new gravity sanitary sewer along the south side of the existing Denmark Road Causeway and a proposed pump (lift) station on an earth peninsula at the eastern end of the Causeway. It is understood that the City of Danville currently has 30-ft. long sections of sheet piling available that they would like to use as shoring to facilitate construction.

As requested, three (3) soil borings were advanced for the proposed structure, to depths ranging from 36.5 to 41.5 feet below surface grade, at the approximate locations indicated on the attached Boring Location Diagram, Figure 2. The soil borings were performed with a truck-mounted drill rig equipped with a rotary head. Conventional, continuous-flight, hollow-stem augers were used to advance the borings with representative samples obtained by employing split-barrel sampling techniques in general accordance with ASTM Procedure D-1586. Sampling intervals of 2.5 feet through a depth of 15 feet and 5 feet thereafter were used.

Samples of the soils encountered in the borings were placed in clean, glass sample jars and were returned to our laboratory for further analysis. All soil samples were visually classified by an MET soils engineer in general accordance with the Unified Soil Classification System (ASTM D-2488) terminology. The natural moisture content (MC) of all samples was determined by ASTM method D-2216 and is recorded on the Soil Boring Logs as a percentage of dry weight of soil. The undrained shear strength of the cohesive
soils was determined from unconfined compression tests on specimens obtained from the split-barrel sampler and the results are listed on the Soil Boring Logs beneath the column labeled "Qc". The cohesive specimens were also tested with a calibrated soil penetrometer, which provides an approximation of the unconfined compressive strength of the soils and is useful, along with other soil parameters, in evaluating the soil strength characteristics. The penetrometer results are listed on the Soil Boring Logs beneath the column labeled "Qp". The strength values of soil samples obtained by the split-spoon sampler must be considered recognizing that this sampling technique provides a representative, but somewhat disturbed sample. The dry density was determined on the cohesive soils where intact samples were available and the results are listed on the Soil Boring Logs beneath the column labeled "Dd".

All borings were taken through the Causeway embankment, but without knowing how the Causeway was constructed or having cross-sections available to examine, we are only able to estimate the depth of fill based on sample appearance, classification and density. The samples appear to indicate at least 7 feet of fill in each boring. However, the soils below this depth appear to more likely to be natural alluvial and glacial drift deposits. It should also be noted that drilling difficulty was noted at about the 7 foot depth where obstructions, possibly rip-rap stone, caused the auger to want to deflect from vertical.

In boring B-1, the presumed rip-rap was underlain by approximately 8 feet of stiff, brown silty clay with sand and gravel, which was classified as possible fill, but could also represent glacial till. Below a depth of about 15 feet, loose sandy clay outwash was encountered above hard, silty clay glacial till, which extended through a depth of 28 to 30 feet. This boring was terminated within a stratum of dense brown sand.

The profile encountered below the presumed rip-rap in boring B-2 was similar to B-1, except loose deposits of clayey sand, sandy clay and clay silt were present between the depths of 8 and 15 feet. In boring B-3, strata of loose to very loose sand, sandy clay and clay silt were encountered through a depth of about 38 feet followed by weathered shale.

Free water was noted on the sampling tools at depths ranging from 12.5 to 20 feet during the drilling operations. On completion, the water level was measured at depths of 7.2 and 6.6 feet in borings B-2 and B-3, respectively, which was similar to the lake surface elevation.

**Pump Station**

While details regarding the pump (lift) station design are not known, the location is understood to be in the vicinity of Boring B-1. Pump or lift stations are commonly slender, reinforced concrete, box-shaped structures with bases set well below surface grade. In boring B-1, primarily stiff to hard cohesive soils were encountered through a depth of between 27 and 30 feet. While bearing capacity is seldom a critical concern for such structures, there does appear to be a marginal bearing layer of soft sandy clay about 3 feet in thickness at a depth of about 15 feet. If the structure is projected to be founded near this
level, it is recommended that these marginal soils be undercut to the top of the underlying hard till and replaced with clean crushed stone, such as IDOT gradation CA-7.

**Sanitary Sewer**

Trench excavations through the Causeway are likely to encounter mixed cohesive fill materials through depths of about 5 to 7 feet. Immediately below these soils, an obstruction layer was encountered in the borings that is suspected to be rip-rap size stone used as a base layer for the overlying fill. Excavations extending below 7 feet are expected to expose loose sandy and silty soils with moderate to high porosity permitting seepage into the trench to quickly attain equilibrium with the Lake Vermilion water level. Thus, provisions should be made to provide trench boxes or shoring for worker and adjacent property protection.

Sheet piles are considered to be a feasible shoring system for pump station and sanitary sewer construction. Some driving resistance is anticipated through the shallow obstruction layer, which could be circumvented by installing a pilot trench to allow commencement of driving below this layer. Hard driving could also be experienced through the hard glacial till, although SPT values through these deposits were generally in the range of 10 to 20 blows/ft. It is understood that the sheet piles currently owned by the City are 30 feet in length. A typical rule-of-thumb for cantilevered sheet piling is to have the embedded length to be twice the height of retained soil, but 1:1 is often sufficient for temporary installations.

This geotechnical study has been conducted in a manner consistent with that level of care ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. The findings, recommendations, and opinions contained herein have been promulgated in accordance with generally accepted practice in the fields of foundation engineering, soils mechanics, and engineering geology.

MET appreciates the opportunity to be of service during this phase of the project. If there are any questions or comments you may have regarding the content of this report or if we may be of any further service, please contact us at your convenience.

Sincerely,

**Midwest Engineering and Testing, Inc.**

Daniel E. Tappendorf, P.E.                                      Robert W. Hahn, P.E.
President                                                                   Principal Engineer

Enclosures:  Vicinity Map  
             Boring Location Plan  
             Boring Logs (3)  
             General Notes (2)
Figure 2
Boring Location Diagram

Proposed Gravity Sewer and Pump Station
Denmark Road Causeway over Lake Vermilion
Danville, Illinois

SCALE: None
PROJECT NO.: 33034
DATE: April 19, 2013
DRAWN BY: JWO
<table>
<thead>
<tr>
<th>Feet</th>
<th>Sample No.</th>
<th>N</th>
<th>$Q_p$ (tsf)</th>
<th>$Q_u$ (tsf)</th>
<th>MC (%)</th>
<th>Dd (pcf)</th>
<th>Remarks</th>
</tr>
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<tbody>
<tr>
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<td>1-AU</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>13</td>
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<td></td>
</tr>
<tr>
<td>2</td>
<td>2-SS</td>
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<td>-</td>
<td>15</td>
<td>-</td>
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<td>4</td>
<td>1.3</td>
<td>-</td>
<td>15</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>4-SS</td>
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<td>1.8</td>
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<td>107</td>
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<td>1.6</td>
<td>16</td>
<td>106</td>
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<td>6</td>
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<td>0.6</td>
<td>20</td>
<td>116</td>
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</tr>
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<td>8-SS</td>
<td>15</td>
<td>4.5+</td>
<td>5.4</td>
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<td>124</td>
<td>Drilling: 20 ft.</td>
</tr>
<tr>
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<td>10-SS</td>
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<td>-</td>
<td>-</td>
<td>9</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>11-SS</td>
<td>37</td>
<td>-</td>
<td>-</td>
<td>11</td>
<td>-</td>
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</tr>
</tbody>
</table>

**VISUAL SOIL CLASSIFICATION**

Lines of Demarcation represent an approximate boundary between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.

---

**SOIL BORING LOG**

Project Name: Proposed Gravity Sewer and Pump Station
Location: Denmark Road Causeway over Lake Vermilion
Danville, Illinois

Boring: B-1
Project No.: 33034
Date of Boring: April 25, 2013
Field Representative: Zach Wilcoxen
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<th>$Q_u$  (tsf)</th>
<th>MC (%)</th>
<th>Dd (pcf)</th>
<th>Remarks</th>
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<tr>
<td>5</td>
<td>1-AU</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6</td>
<td>-</td>
<td></td>
</tr>
<tr>
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<td>2-SS</td>
<td>16</td>
<td>3.8</td>
<td>-</td>
<td>9</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>3-SS</td>
<td>9</td>
<td>1.5</td>
<td>-</td>
<td>16</td>
<td>-</td>
<td></td>
</tr>
<tr>
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<td>4-SS</td>
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<td>-</td>
<td>-</td>
<td>12</td>
<td>-</td>
<td>Completion: 7.2 ft.</td>
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</tr>
<tr>
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<td>6-SS</td>
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<td>0.8</td>
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<td>112</td>
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**VISUAL SOIL CLASSIFICATION**

**SOIL BORING LOG**

*Project Name:* Proposed Gravity Sewer and Pump Station  
*Location:* Denmark Road Causeway over Lake Vermilion  
*Date of Boring:* April 25, 2013  
*Field Representative:* Zach Wilcoxen

Lines of Demarcation represent an approximate boundary between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.
### VISUAL SOIL CLASSIFICATION

<table>
<thead>
<tr>
<th>Feet</th>
<th>Sample No.</th>
<th>N</th>
<th>$Q_p$ (tsf)</th>
<th>$Q_u$ (tsf)</th>
<th>MC (%)</th>
<th>Dd (pcf)</th>
<th>Remarks</th>
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<td>5</td>
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<td>2-SS</td>
<td>29</td>
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<td>8</td>
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<td>3-SS</td>
<td>11</td>
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<tr>
<td></td>
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<td>130</td>
<td>Drilling: 12.5 ft.</td>
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<td>8-SS</td>
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<td></td>
<td>10-SS</td>
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<td>0.4</td>
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<td>-</td>
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</tr>
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<td>85</td>
<td>1.8</td>
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**END OF BORING AT 41.5 FEET**

---

Lines of Demarcation represent an approximate boundary between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.
GENERAL NOTES

SAMPLE IDENTIFICATION

Visual soil classifications are made in general accordance with the Unified Soil Classification System on the basis of textural and particle size categorization, and various soil behavior characteristics. Visual classifications should be substantiated by appropriate laboratory testing when a more exact soil identification is required to satisfy specific project applications criteria.

PARTICLE SIZE ±

<table>
<thead>
<tr>
<th>Particle Type</th>
<th>Size Range</th>
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<tbody>
<tr>
<td>Boulders</td>
<td>8 inches</td>
</tr>
<tr>
<td>Cobble</td>
<td>3 to 8 inches</td>
</tr>
<tr>
<td>Gravel</td>
<td>5 mm to 3 inches</td>
</tr>
<tr>
<td>Coarse Sand</td>
<td>2 mm to 4 mm</td>
</tr>
<tr>
<td>Medium Sand</td>
<td>0.42 mm to 2 mm</td>
</tr>
<tr>
<td>Fine Sand</td>
<td>0.074 to 0.42 mm</td>
</tr>
<tr>
<td>Silt</td>
<td>0.005 mm to 0.074 mm</td>
</tr>
<tr>
<td>Clay</td>
<td>0.005 mm</td>
</tr>
</tbody>
</table>

DRILLING & SAMPLING SYMBOLS

- SS: Split-spoon, 2” O.D. by 1 3/8” I.D.
- ST: Shelby Tube, 2” O.D. or 3” O.D., as noted in test
- AU: Auger Sample
- DB: Diamond Bit
- CB: Carbide Bit
- HA: Hand Auger
- RB: Roller Bit
- WS: Wash Sample
- BS: Bag Sample

SOIL PROPERTY SYMBOLS

- N: Standard penetration count, indicating number of blows of a 140 lb. Hammer with a 30-inch drop, required to advance a split-spoon sampler one (1) foot.
- Qu: Unconfined compressive strength, tons per square foot (tsf).
- Op: Calibrated hand penetrometer resistance, tsf.
- MC: Moisture Content, %
- LL: Liquid Limit
- PL: Plastic Limit
- PI: Plasticity Index
- Dd: Dry density, pounds per cubic foot (pcf).
- PID: Photoionization Detector (Hnu meter) volatile vapor level, ppm

SOIL RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

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<th>Cohesive Soils</th>
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<td><strong>Classifier</strong></td>
<td><strong>N-Value Range</strong></td>
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<tr>
<td>very loose</td>
<td>0 – 3</td>
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<tr>
<td>loose</td>
<td>3 – 7</td>
</tr>
<tr>
<td>medium dense</td>
<td>7 – 15</td>
</tr>
<tr>
<td>dense</td>
<td>15 – 38</td>
</tr>
<tr>
<td>very dense</td>
<td>38 +</td>
</tr>
<tr>
<td></td>
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</tbody>
</table>

GROUNDWATER

Approximate Groundwater level at time noted on soil boring log, measured in open bore hole unless otherwise noted. Groundwater levels often vary with time, and are affected by soil permeability characteristics, weather conditions, and lateral drainage conditions.
<table>
<thead>
<tr>
<th>MAJOR DIVISIONS</th>
<th>SYMBOL</th>
<th>TYPICAL DESCRIPTION</th>
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</thead>
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<tr>
<td>Gravel and Gravelly Soils</td>
<td>GW</td>
<td>Well-graded gravels and gravel-sand mixtures</td>
</tr>
<tr>
<td></td>
<td>GP</td>
<td>Poorly-graded gravels and gravel-sand mixtures</td>
</tr>
<tr>
<td></td>
<td>GM</td>
<td>Silty gravels and gravel-sand-silt mixtures</td>
</tr>
<tr>
<td></td>
<td>GC</td>
<td>Clayey gravels and gravel-sand-clay mixtures</td>
</tr>
<tr>
<td>Sand and Sandy Soils</td>
<td>SW</td>
<td>Well-graded sands and gravelly sands</td>
</tr>
<tr>
<td></td>
<td>SP</td>
<td>Poorly-graded sands and gravelly sands</td>
</tr>
<tr>
<td></td>
<td>SM</td>
<td>Silty sands and sand-silt mixtures</td>
</tr>
<tr>
<td></td>
<td>SC</td>
<td>Clayey sands and sand-clay mixtures</td>
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<tr>
<td></td>
<td>ML</td>
<td>Inorganic silts or clayey silts of slight plasticity</td>
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<td></td>
<td>CL</td>
<td>Inorganic clays of low to medium plasticity</td>
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<tr>
<td></td>
<td>OL</td>
<td>Organic silts and organic silty clays of low plasticity</td>
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<td></td>
<td>MH</td>
<td>Inorganic silts of high plasticity</td>
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<td></td>
<td>CH</td>
<td>Inorganic clays of medium to high plasticity</td>
</tr>
<tr>
<td></td>
<td>OH</td>
<td>Organic clays of medium to high plasticity</td>
</tr>
<tr>
<td>Highly Organic Soils</td>
<td>PT</td>
<td>Peat, humus and swamp soils with high organic contents</td>
</tr>
</tbody>
</table>

Note: Dual symbols are used to indicate borderline classifications.
February 28, 2020

Mr. Sam Cole
City of Danville Public Works
1155 E Voorhees Suite B
Danville, IL 61832

Re: Subsurface Investigation and Evaluation
Proposed Denmark Road
Sanitary Sewer Improvements
Danville, Illinois
MET Project No. 93131

Dear Mr. Cole:

In accordance with your request, Midwest Engineering and Testing, Inc. (MET) has completed soil borings to aid in the design and planning for the proposed sanitary sewer improvements project in Danville, Illinois. The geotechnical report, which includes our findings, is being submitted via e-mail in .pdf format. Hard copies can be provided, if so desired.

MET appreciates the opportunity to be of service during this phase of the project. If there are any questions or comments you may have regarding the content of this report or if we may be of any further service, please contact us at your convenience.

Sincerely,

Midwest Engineering and Testing, Inc.

Nicholas D Wendling, P.E.
Geotechnical Department Manager

Daniel E. Tappendorf, P.E.
President
Subsurface Investigation and Evaluation

Proposed Denmark Road
Sanitary Sewer Improvements
Danville, Illinois

PREPARED FOR

City of Danville Public Works
1155 E Voorhees Suite B
Danville, IL 61832

February 28, 2020

MET File No. 93131
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<table>
<thead>
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<th>Section</th>
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<td>Groundwater Observations</td>
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<td>DISCUSSION AND EVALUATION</td>
<td>4</td>
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<td>GENERAL COMMENTS</td>
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**Appendix**
- Figure 1 – Vicinity Map
- Figure 2 – Boring Location Diagram
- Soil Boring Logs (9)
- General Notes (2)
INTRODUCTION

General

This report presents the results of subsurface investigation performed to aid in the design and planning of the proposed Denmark Road sanitary sewer improvements project in Danville, Illinois. A Vicinity Map, Figure 1, is included in the Appendix. The purpose of this exploration and analysis was to determine the in-situ soil profile and evaluate the excavation conditions in the vicinity of the proposed sanitary sewer. Included herein are the results of the subsurface exploration, field and laboratory soil test data, and our analysis and recommendations related to the planned sewer improvements.

Scope

The scope of services included a reconnaissance of the site, subsurface exploration, field and laboratory testing of the soil samples collected and engineering analysis and evaluation of the data.

Authorization

Authorization to perform this subsurface exploration and analysis was given in the form of a Purchase Order (PO No. 2020-00000168, dated October 23, 2019), which was issued in response to MET Proposal No. 9265, dated October 21, 2019. The Proposal outlined the scope of services to be provided and conditions for performance of the work.

PROJECT & SITE DESCRIPTION

The proposed project involves installing a new sanitary sewer along Denmark Road in Danville, Illinois. Based upon the plan and profile sheets provided, it is understood the new sewer will be installed to depths varying between about 5 ft. to 20 ft. below existing grade. Considering the proximity of the proposed sewer to Denmark Road, it is anticipated that some shoring will be required during construction. The main areas of concern are located between Station 222+80 to Station 237+95, where the proposed sewer will consist of 15-inch and 18-inch diameter gravity fed sewer pipe.

GEOLOGY OF THE AREA

The geology of the Danville, Illinois region has been greatly influenced by several major landforming factors. Bedrock and tectonic movements prior to the Pleistocene Period, continental glaciation during the Pleistocene Period, wind action, and man have all contributed to the geologic history of the area.
The subject site is located in east-central Vermilion County. In this area, the surficial geology typically consists of a thin layer of wind deposited and water worked loessial material overlying shallow deposits of glacial drift. The drift is comprised primarily of glacial till, a compact, heterogeneous mixture of sand and pebbles bound in a clay to silt matrix, but can also contain inclusions of granular outwash material. Pockets, lenses, seams and tubes of water-sorted gravels, sands, and silts are commonly found in these geologic formations. However, the site also lies within the confines of a man-made lake and it is reasonable to assume that alluvial floodplain deposits could overlie the glacial drift.

Underlying the surficial deposits at a depth of about 25 to 100 feet below surface grade is Pennsylvanian Age bedrock associated with the Carbondale Formation. Interbedded shale, sandstone, coal, and limestone are the predominant rock types comprising the formations in the vicinity.

FIELD EXPLORATION

Scope

In order to evaluate the characteristics of the subgrade soils, a field exploratory program was undertaken. Nine (9) soil borings were taken at the approximate locations shown on the Boring Location Diagram, Figure 2, included in the Appendix. The following sections provide a description of field drilling and testing procedures utilized.

Drilling and Sampling Procedures

The soil borings were performed with a truck-mounted drilling rig equipped with a rotary head. Conventional, continuous-flight, hollow-stem augers were used to advance the holes with representative samples obtained employing split-barrel sampling techniques in general accordance with ASTM D-1586. Continuous samples were obtained in borings B-1 through B-5 while a sampling interval of 2.5 ft. was typically used though a depth of 15ft. with 5 ft. intervals used thereafter in borings B-6 through B-9.

Field Tests and Measurements

Standard Penetration Tests: During the sampling procedure, Standard Penetration Tests (SPTs) were performed at regular intervals through the depth of the borings. The SPT value ("N" or blow counts) is defined as the number of blows required to advance a 2-inch O.D., split-barrel sampler a distance of one foot by a 140-pound hammer falling 30-inches. These values provide a useful preliminary indication of the consistency or relative density of most soil deposits and are included on the Soil Boring Logs.
**Water Level Measurements:** Groundwater level observations were made during the sampling process. Water levels information is noted on the Soil Boring Logs in the Remarks column.

**LABORATORY TESTING**

**General**

Representative samples of the soils encountered in the field were placed in clean, glass sample jars and transported to the MET laboratory. Additional significant characteristics of the subgrade materials were determined to provide data on which to classify and quantitatively assess the engineering properties of the samples obtained. The types of soils encountered were identified and logged on the Soil Boring Logs in the Appendix. The results of the field and laboratory tests are presented on the boring logs in the Appendix.

**Laboratory Tests and Measurements**

**Visual Classification:** A soils engineer visually classified all soil samples in accordance the Unified Soil Classification System (ASTM D-2487) terminology. An explanation of the symbols used in this system is included in the Appendix.

**Moisture Content Tests:** The natural moisture content of all samples was determined by test method ASTM D-2216 and is recorded on the Soil Boring Logs as a percentage of the dry weight of the soil.

**Unconfined Compression Tests:** The undrained shear strength of the cohesive soils was determined from unconfined compression tests performed on specimens obtained from the split-barrel samplers. The strength values of soil samples obtained by the SPT method must also be considered, recognizing that this sampling technique provides a representative, but somewhat disturbed sample. The results are listed on the Soil Boring Logs beneath the column labeled "Qu".

**Hand Penetrometer Tests:** Cohesive specimens extracted from the split-barrel sampler were tested with a calibrated soil penetrometer. This device provides an approximation of the unconfined compressive strength of the soils, and is useful, along with other soil parameters, in evaluating the soil strength characteristics. The results are listed on the Soil Boring Logs beneath the column labeled "Qp".

**Dry Density Determination:** The dry density was determined on the cohesive soils where intact samples were available. The results are listed on the Soil Boring Logs beneath the column labeled "Dd".
DESCRIPTION OF SUBSURFACE CONDITIONS

Subgrade Conditions

The types of subsurface materials encountered at the test boring locations are described on the Soil Boring Logs. The lines delineating the changes in strata on the logs represent an approximate boundary between the various soil classifications. These soil descriptions and delineations are representative for the specific test hole location. Variations in the soil profile and the engineering properties of the soil deposits may occur between boring locations. A summary of the major soil profile components is described in the following paragraphs. A more detailed description and supporting data for each test location can be found on the individual Soil Boring Logs in the Appendix.

The surface at the boring locations was typically comprised of a thin layer of vegetation and topsoil. The topsoil was typically underlain by clayey sand, sandy clay, and silty clay with sand, which extended through depths of 5 to 7 feet below grade. Below this level glacial drift soils were encountered, which extended through the boring termination depths. The drift was comprised of sandy outwash materials, which was often underlain by silty clay glacial till.

Groundwater Observations

Groundwater was encountered in borings B-1, B-4, B-7, and B-8 at depths ranging from 9 to 20 feet below surface grade. It must be recognized that groundwater levels fluctuate with time due to variations in seasonal precipitation, lateral drainage conditions, and soil permeability characteristics.

DISCUSSION AND EVALUATION

Based upon the soil borings and the proposed plan and profile, it is anticipated that a braced excavation will be required to install the proposed gravity sanitary sewer. The borings indicate that the majority of the soils to be retained will be clayey sand, to sandy clay soils, which will likely slough off during excavation. The borings indicate the sandy soils have a loose to medium dense in-situ relative density throughout the majority soil profile. The glacial till which was encountered in the borings possessed very stiff to hard consistency and could make installation of a driven retention system time consuming.

Where retention systems are allowed to move sufficiently to develop an active earth pressure condition, we recommend the use of an active earth pressure coefficient of 0.35 be utilized for design, while if internal bracing prevents sufficient movement, an active earth pressure coefficient of 0.5 should be utilized for design. Total unit weights of the in-situ loose to medium dense sands encountered in the borings would typically be on the order of 110 PCF, while the glacial silty clays have a total unit weight of about 135 PCF.
Groundwater was encountered in several of the borings performed at the site, however it is our opinion that groundwater levels will be largely affected by the amount of recent precipitation and the water level in the adjacent Lake Vermilion. Where groundwater was encountered, it was typically present immediately above relatively impermeable layers of glacial till, indicating groundwater is likely infiltrated precipitation, which moves downward through the relatively permeable sand layers, until it encounters the glacial till where it likely begins to move laterally towards the lake.

All excavations should be performed in accordance with the requirements detailed in the OSHA Excavation Regulations and Procedures, Section 1926 Subpart P. Based upon the soil boring data, Type A, Type B, and Type C soils were all encountered throughout the soil profile.

The maximum allowable slopes for these soil types are shown in the following table.

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Maximum Allowable Slopes for Excavations Less than 20 ft. deep Horizontal : Vertical (H:V)</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>( \frac{3}{4} : 1 )</td>
</tr>
<tr>
<td>B</td>
<td>1 : 1</td>
</tr>
<tr>
<td>C</td>
<td>1( \frac{1}{2} ) : 1</td>
</tr>
</tbody>
</table>

All excavations should be monitored by a Competent Person, as defined by the OSHA standard, and appropriate shoring or sloping techniques used to prevent cave-ins.

All structural backfill and fill should consist of inorganic materials, placed in lift thicknesses not exceeding 8 inches in a loose state and at a moisture content within 3 percentage points of laboratory optimum. Structural fill and backfill materials should be compacted to 95 percent of the maximum dry density as determined by ASTM D-698 (Standard Proctor) method of test, to reduce the potential for excessive settling.

Proper moisture control is essential to reduce the amount of compactive effort necessary to achieve the desired densities. This is especially true of cohesive soils, where scarification and aeration may be required to achieve near-optimum moisture levels prior to compaction. A sheepfoot roller is generally required for compaction of clayey soils, whereas a vibratory smooth drum roller is preferred for granular and silty material. Backfill placed in confined areas should consist of a clean granular material that is generally more readily compacted to required densities than cohesive backfill.

The evaluation of the subgrade and selection of fill materials for various applications should be done in consultation with the soils engineer. Similarly, the placement and compaction of fill for structural applications should be monitored and tested by a qualified representative of the soils engineer.
GENERAL COMMENTS

This geotechnical study has been conducted in a manner consistent with that level of care ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. The findings, recommendations, and opinions contained herein have been promulgated in accordance with generally accepted practice in the fields of foundation engineering, soils mechanics, and engineering geology.
APPENDIX
Figure 1 - Vicinity Map

Proposed Denmark Road
Sanitary Sewer Improvements
Dennville, Illinois

SCALE: Shown Above
PROJECT NO.: 93131
DATE: February 26, 2020
DRAWN BY: NDW
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<th>( Q_p ) (tsf)</th>
<th>( Q_u ) (tsf)</th>
<th>MC (%)</th>
<th>Dd (pcf)</th>
<th>REMARKS</th>
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Lines of Demarcation represent an approximate boundary between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.
## SOIL BORING LOG

**Project Name:** Proposed Denmark Road  
**Location:** Sanitary Sewer Improvements  
**Date:** March 28, 2019  
**Field Representative:** Nick Wendling  

### Visual Soil Classification

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**END OF BORING AT 20.0 FEET**

*Lines of Demarcation represent an approximate boundary between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.*
### VISUAL SOIL CLASSIFICATION

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**END OF BORING AT 20.0 FEET**

*Lines of Demarcation represent an approximate boundary between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.*
## VISUAL SOIL CLASSIFICATION

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### END OF BORING AT 20.0 FEET

Lines of Demarcation represent an approximate boundary between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.
# SOIL BORING LOG

**Project Name:** Proposed Denmark Road  
**Location:** Sanitary Sewer Improvements  
**Danville, Illinois**

**Boring:** B-5  
**Project No.:** 93031  
**Date of Boring:** March 28, 2019  
**Field Representative:** Nick Wendling

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**END OF BORING AT 18.0 FEET**

*Lines of Demarcation represent an approximate boundary between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.*
### Visual Soil Classification

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<td>16</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Brown clayey SAND (SC)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>Dry curing and upon completion of drilling</td>
</tr>
<tr>
<td>5</td>
<td>3-SS</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>17</td>
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<td></td>
</tr>
<tr>
<td>10</td>
<td>4-SS</td>
<td>2</td>
<td>-</td>
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<td>18</td>
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</tr>
<tr>
<td>10</td>
<td>5-SS</td>
<td>3</td>
<td>-</td>
<td>-</td>
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<td>-</td>
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</tr>
<tr>
<td>15</td>
<td>6-SS</td>
<td>11</td>
<td>-</td>
<td>-</td>
<td>10</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Brown medium to coarse SAND (SP)</td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
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<tr>
<td>Brown medium to coarse SAND (SP)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>with gravel</td>
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<tr>
<td>25</td>
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<td>14</td>
<td>-</td>
<td>-</td>
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<td>9-SS</td>
<td>17</td>
<td>-</td>
<td>-</td>
<td>8</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

**END OF BORING @ 26.5 FEET**

*Lines of Demarcation represent an approximate boundary between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.*
### VISUAL SOIL CLASSIFICATION

<table>
<thead>
<tr>
<th>Feet</th>
<th>Sample No.</th>
<th>N</th>
<th>Q_d (tsf)</th>
<th>Q_u (tsf)</th>
<th>MC (%)</th>
<th>Dd (pcf)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>1-SS</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>13</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>2-SS</td>
<td>4</td>
<td>-</td>
<td>-</td>
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<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3-SS</td>
<td>6</td>
<td>0.5</td>
<td>-</td>
<td>16</td>
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<td>-</td>
<td>9</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5-SS</td>
<td>7</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>-</td>
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<tr>
<td>15</td>
<td>6-SS</td>
<td>13</td>
<td>-</td>
<td>-</td>
<td>11</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7-SS</td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>13</td>
<td>-</td>
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<td>8-SS</td>
<td>24</td>
<td>-</td>
<td>-</td>
<td>16</td>
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<td>▼ Drilling: 20 ft.</td>
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<tr>
<td>25</td>
<td>9-SS</td>
<td>22</td>
<td>4.5+</td>
<td>-</td>
<td>12</td>
<td>-</td>
<td></td>
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</tbody>
</table>

**End of Boring @ 26.5 feet**

---

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<thead>
<tr>
<th>Feet</th>
<th>Sample No.</th>
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<th>N</th>
<th>Q_d (tsf)</th>
<th>Q_u (tsf)</th>
<th>MC (%)</th>
<th>Dd (pcf)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-SS</td>
<td>Brown clayey SAND (SP)</td>
<td>-</td>
<td>-</td>
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<td>11</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2-SS</td>
<td>Brown sandy CLAY (CL)</td>
<td>3</td>
<td>2.3</td>
<td>-</td>
<td>14</td>
<td>-</td>
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</tr>
<tr>
<td>5</td>
<td>3-SS</td>
<td>Brown fine to medium SAND (SP)</td>
<td>16</td>
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<td>-</td>
<td>10</td>
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<td></td>
</tr>
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<td>10</td>
<td>4-SS</td>
<td>Brown fine to medium SAND (SP)</td>
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<td>8</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>5-SS</td>
<td>Gray silty CLAY (CL) with sand and small gravel - Till</td>
<td>11</td>
<td>-</td>
<td>-</td>
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<td>-</td>
<td></td>
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<tr>
<td>20</td>
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<td>Gray silty CLAY (CL) with sand and small gravel - Till</td>
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<td>4.5+</td>
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<td>Drilling: 12.5 ft.</td>
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<td>4.0</td>
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<td>10</td>
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<td></td>
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<td>Gray silty CLAY (CL) with sand and small gravel - Till</td>
<td>20</td>
<td>3.8</td>
<td>2.6</td>
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<td>9-SS</td>
<td>Gray silty CLAY (CL) with sand and small gravel - Till</td>
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<td>2.0</td>
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<td>END OF BORING @ 26.5 FEET</td>
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</tr>
</tbody>
</table>

*Lines of Demarcation represent an approximate boundary between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.*
## Visual Soil Classification

<table>
<thead>
<tr>
<th>Feet</th>
<th>Sample No.</th>
<th>N</th>
<th>Q_d (tsf)</th>
<th>Q_u (tsf)</th>
<th>MC (%)</th>
<th>Dd (pcf)</th>
<th>Remarks</th>
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<tbody>
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<td>15</td>
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</tr>
<tr>
<td></td>
<td>Brown sandy CLAY (CL) - Fill</td>
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<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>2-SS</td>
<td>13</td>
<td>4.5</td>
<td></td>
<td>10</td>
<td></td>
<td>Dry clay and upon completion of drilling</td>
</tr>
<tr>
<td>5</td>
<td>3-SS</td>
<td>23</td>
<td>4.5+</td>
<td>5.1</td>
<td>4</td>
<td>125</td>
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<tr>
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<td>17</td>
<td>4.5+</td>
<td>5.4</td>
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<tr>
<td>15</td>
<td>Gray silty CLAY (CL) with sand and small gravel - Till</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>7-SS</td>
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<td>4.5+</td>
<td>2.6</td>
<td>9</td>
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<tr>
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<td>3.5</td>
<td>2.8</td>
<td>11</td>
<td>128</td>
<td></td>
</tr>
</tbody>
</table>

**End of Boring @ 26.5 Feet**

Lines of Demarcation represent an approximate boundary between soil types. Variations may occur between sampling intervals and between boring locations, and the transition may be gradual. Dashed lines are indicative of potentially erratic or unknown changes, such as fill-to-natural soil zone transitions.
GENERAL NOTES

SAMPLE IDENTIFICATION

Visual soil classifications are made in general accordance with the Unified Soil Classification System on the basis of textural and particle size categorization, and various soil behavior characteristics. Visual classifications should be substantiated by appropriate laboratory testing when a more exact soil identification is required to satisfy specific project applications criteria.

PARTICLE SIZE

| Boulders: 8 inches | Coarse Sand: 2 mm to 4 mm | Silt: 0.005 mm to 0.074 mm |
| Cobble: 3 to 8 inches | Medium Sand: 0.42 mm to 2 mm | Clay: - 0.005 mm |
| Gravel: 5 mm to 3 inches | Fine Sand: 0.074 to 0.42 mm |

DRILLING & SAMPLING SYMBOLS

SS: Split-spoon, 2” O.D. by 1 3/8” I.D.
ST: Shelby Tube, 2” O.D. or 3” O.D., as noted in test
AU: Auger Sample
DB: Diamond Bit
CB: Carbide Bit
RB: Roller Bit
WS: Wash Sample
BS: Bag Sample
HA: Hand Auger

SOIL PROPERTY SYMBOLS

N: Standard penetration count, indicating number of blows of a 140 lb. Hammer with a 30-inch drop, required to advance a split-spoon sampler one (1) foot.
Qu: Unconfined compressive strength, tons per square foot (tsf).
Qp: Calibrated hand penetrometer resistance, tsf.
MC: Moisture Content, %
LL: Liquid Limit
PL: Plastic Limit
PI: Plasticity Index
Dd: Dry density, pounds per cubic foot (pcf).
PID: Photoionization Detector (Hnu meter) volatile vapor level, ppm

SOIL RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

<table>
<thead>
<tr>
<th>NON-COHESIVE SOILS</th>
<th>COHESIVE SOILS</th>
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</thead>
<tbody>
<tr>
<td>Classifier</td>
<td>N-Value Range</td>
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<tr>
<td>very loose</td>
<td>0 – 3</td>
</tr>
<tr>
<td>loose</td>
<td>3 – 7</td>
</tr>
<tr>
<td>medium dense</td>
<td>7 – 15</td>
</tr>
<tr>
<td>dense</td>
<td>15 – 38</td>
</tr>
<tr>
<td>very dense</td>
<td>38 +</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

GROUNDWATER

Approximate Groundwater level at time noted on soil boring log, measured in open bore hole unless otherwise noted. Groundwater levels often vary with time, and are affected by soil permeability characteristics, weather conditions, and lateral drainage conditions.
# Unified Soil Classification

<table>
<thead>
<tr>
<th>Major Divisions</th>
<th>Symbol</th>
<th>Typical Description</th>
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</thead>
<tbody>
<tr>
<td><strong>Coarse Grained Soils</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gravel and Gravelly Soils</td>
<td>GW</td>
<td>Well-graded gravels and gravel-sand mixtures</td>
</tr>
<tr>
<td></td>
<td>GP</td>
<td>Poorly-graded gravels and gravel-sand mixtures</td>
</tr>
<tr>
<td></td>
<td>GM</td>
<td>Silty gravels and gravel-sand-silt mixtures</td>
</tr>
<tr>
<td></td>
<td>GC</td>
<td>Clayey gravels and gravel-sand-clay mixtures</td>
</tr>
<tr>
<td>Gravels with Fines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sand and Sandy Soils</td>
<td>SW</td>
<td>Well-graded sands and gravelly sands</td>
</tr>
<tr>
<td></td>
<td>SP</td>
<td>Poorly-graded sands and gravelly sands</td>
</tr>
<tr>
<td></td>
<td>SM</td>
<td>Silty sands and sand-silt mixtures</td>
</tr>
<tr>
<td></td>
<td>SC</td>
<td>Clayey sands and sand-clay mixtures</td>
</tr>
<tr>
<td><strong>Fine Grained Soils</strong></td>
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<td></td>
</tr>
<tr>
<td>Silts and Clays of Low Plasticity</td>
<td>ML</td>
<td>Inorganic silts or clayey silts of slight plasticity</td>
</tr>
<tr>
<td></td>
<td>CL</td>
<td>Inorganic clays of low to medium plasticity</td>
</tr>
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<td></td>
<td>OL</td>
<td>Organic silts and organic silty clays of low plasticity</td>
</tr>
<tr>
<td>Silts and Clays of High Plasticity</td>
<td>MH</td>
<td>Inorganic silts of high plasticity</td>
</tr>
<tr>
<td></td>
<td>CH</td>
<td>Inorganic clays of medium to high plasticity</td>
</tr>
<tr>
<td></td>
<td>OH</td>
<td>Organic clays of medium to high plasticity</td>
</tr>
<tr>
<td>Highly Organic Soils</td>
<td>PT</td>
<td>Peat, humus and swamp soils with high organic contents</td>
</tr>
</tbody>
</table>

*Note: Dual symbols are used to indicate borderline classifications.*
PART 1 - GENERAL

1.1 SUMMARY

A. Furnish all labor, materials, equipment and incidentals required and install three new sewage pump stations including submersible wastewater pumps, motors, and other auxiliary equipment and materials specified herein and as described below.

B. The Contractor shall be responsible for delivering and installing the complete pump station for a complete project that is operational.

C. This Section is intended to give a general description of what is required, but does not purport to cover all details which will vary in accordance with the requirements of the equipment as offered. It is, however, intended to cover the furnishing, the shop testing and delivery of all materials, equipment and appurtenances for the complete pumping units as herein specified, whether specifically mentioned in this Section or not.

D. The lift stations as shown are based on Grundfos and Yeomans pumping equipment and shall include as a minimum the following material and equipment:
   1. Aluminum hatches for the valve vaults and wet wells.
   2. Pumps and motors.
   3. Pump bases.
   4. Internal ductile iron discharge piping.
   5. Plug valves.
   6. Weighted swing arm check valves.
   7. Ductile iron fittings.
   8. Slide rail pump removal system.
   9. Stainless steel lifting chain or cable.
  10. Ultrasonic level transmitter.
  11. Backup float level controls.
  12. Integrated pump control panel and programmable logic controller.

E. The Contractor shall furnish all necessary and desirable accessory equipment and auxiliaries, whether specifically mentioned in this section or not, for a complete package.

1.2 REFERENCE STANDARDS

A. Underwriters Laboratories (UL)

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

1.3 SUBMITTALS

A. Submit copies of all materials required to establish compliance with this Section. Submittals shall include the following:
1. Certified shop and erection drawings showing all important details of construction, dimensions and anchor bolt locations.
2. Descriptive literature, bulletins, and/or catalogs of the equipment.
3. The total weight of the equipment including the weight of the single largest item.
4. Ductile iron pipe for internal piping.
5. A list of the manufacturer’s recommended spare parts with the manufacturer’s current price for each item. Include gaskets, packing, oil, seals, etc. List bearings by the bearing manufacturer’s numbers only.
6. All submittal data required.
7. Davit crane and winch.
8. Stainless steel trash basket and rail system.
9. Certified agreement to the conditions of the warranty.
10. Complete motor data.
11. All electrical components.

B. In the event that it is impossible to conform with certain details of this Section due to different manufacturing techniques, describe completely all nonconforming aspects.

C. Upon receipt of approval of submitted material, provide the number of prints specified in the General Conditions and one reproducible tracing of all drawings.

D. Operation and Maintenance Data

1. Copies of an operating and maintenance manual for pump station shall be furnished to the Owner. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions that are required to instruct operating and maintenance personnel unfamiliar with such equipment.

2. A factory representative, who has complete knowledge of proper operation and maintenance, shall be provided for 1 day (minimum 8 hours on site) to instruct representatives of the Owner on proper operation and maintenance. If there are difficulties in operation of the equipment due to the manufacturer's design or fabrication, additional service shall be provided at no additional cost to the Owner.

1.4 QUALITY ASSURANCE

A. All of the pumps and motors for a given station shall be by one manufacturer. All working parts shall be of standard dimension so that replacement parts and repairs can be obtained in the future. All parts shall be properly stamped for identification and location as shown on the Operation and Maintenance Manuals furnished. Nameplates giving the name of the manufacturer, the rated capacity, head, speed and all other pertinent data shall be attached to each pump and motor.

B. The service entrance and control panel manufacturer shall have an established record of successful performance for similar service.

C. All equipment furnished under this Section shall be new and unused, shall be the standard product of manufacturers having a successful record of manufacturing and servicing the equipment and systems specified herein for a minimum of 5 years.
1.5 SYSTEM DESCRIPTION

A. The new pump system shall consist of three new sanitary lift stations identified as the Chateau Estates Lift Station, the Rose Hill Cove Lift station and the Denmark Lift Station. The Chateau Estates and Rose Hill Cove Lift Stations will contain two pumps each. The Denmark Lift Station will contain space for three pumps but will start with two. Each station will be controlled by a PLC controller that will utilize an ultrasonic level transducer with backup floats.

B. Valve vault, electrical equipment, pump control equipment and SCADA equipment.

C. Pump control building for the Denmark Lift Station.

D. All the equipment specified herein is intended to be standard equipment for macerating and pumping all material in normal domestic wastewater.

1.6 DELIVERY, HANDLING AND STORAGE

A. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment.

B. Factory assembled parts and components shall not be dismantled for shipment.

C. Finished surfaces of all exposed pump openings shall be protected by wooden blanks, strongly built and securely bolted thereto.

D. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

E. After hydrostatic or other tests have been completed, all entrapped water shall be drained prior to shipment and proper care shall be taken to protect parts from the entrance of water during shipment, storage and handling.

F. Each box or package shall be properly marked to show its net weight in addition to its contents.

1.7 MAINTENANCE

A. A complete set of manufacturer's recommended spare parts shall be provided with each pump. Spare parts shall include at least one set of mechanical seals and one set of bearings for each pump supplied under this Section.

B. All spare parts shall be properly protected for long periods of storage and packed in containers which are clearly identified with indelible markings as to the contents.

1.8 WARRANTY

A. The manufacturer shall provide a transferable warranty guarantying its product to be free from defects in material and factory workmanship for a period of 2 years from date of startup. Repair or parts replacement required as a result of such defect will be made free of charge during this period upon return of the defective parts or equipment to the manufacturer or the nearest authorized service center.
B. Pay the cost of extending start of manufacturer warranty from the date of shipment to the completion of construction.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. The pumps and equipment covered by this Section are intended to be standard pumping equipment of proven ability as manufactured by reputable companies having long experience in the production of such pumps and equipment. The pumps and equipment furnished shall be designed and constructed in accordance with the best practice and methods.

B. All parts shall be designed and proportioned as to have liberal stiffness and to be specially adapted to for the work to be done. Ample room and facilities shall be provided for inspection, repair and adjustment.

C. Brass or stainless steel nameplates giving the name of the manufacturer, the rated capacity, head, speed, serial number, model number, horsepower, voltage, amperage, and all other pertinent information shall be attached to each pump.

2.2 SUBMERSIBLE PUMPS

A. Chateau Estates Lift Station: Furnish and install 2 submersible non-clog wastewater pump(s). Each pump shall be equipped with a 10 HP submersible electric motor, connected for operation on 460 volts, 3 phase, 60 hertz, 4 wire service, with 50 feet of submersible cable (SUBCAB) suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and also meet with P-MSHA Approval. The pumps and cables shall be rated for NEC Class I, Division 1, Group D hazardous location. The pump shall be supplied with a mating cast iron 3 inch discharge connection and be capable of delivering the following minimums: 158 GPM at 81FT. TDH at 60 Hz. and 100 GPM at 100 ft TDH at 60Hz. Shut off head shall be 119 feet (minimum). The Chateau Lift Station operating points are based on the pump curves of a Grundfos SLV.30.A30.100.EX.2.61R.C. The pumps shall be automatically and firmly connected to the discharge connection, guided by two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable. No portion of the pump shall bear directly on the sump floor. Each pump shall be fitted with 30 feet of lifting chain or stainless steel cable. The working load of the lifting system shall be 50% greater than the pump unit weight.

B. Rose Hill Cove Lift Station: Furnish and install 2 submersible non-clog wastewater pump(s). Each pump shall be equipped with a 5.5 HP submersible electric motor, connected for operation on 460 volts, 3 phase, 60 hertz, 4 wire service, with 40 feet of submersible cable (SUBCAB) suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and also meet with P-MSHA Approval. The pumps and cables shall be rated for NEC Class I, Division 1, Group D hazardous location. The pump shall be supplied with a mating cast iron 3 inch discharge connection and be capable of delivering the following minimums: 80 GPM at 50 FT. TDH at 60 Hz. and 40 GPM at 62 ft TDH at 60Hz. Shut off
head shall be 68 feet (minimum). The Rose Hill Lift Station operating points are based on the pump curves of a Grundfos SLV.30.A30..55.2.61J.1C. The pumps shall be automatically and firmly connected to the discharge connection, guided by two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable. No portion of the pump shall bear directly on the sump floor. Each pump shall be fitted with 25 feet of lifting chain or stainless steel cable. The working load of the lifting system shall be 50% greater than the pump unit weight.

C. Denmark Road Lift Station: Furnish and install 2 submersible non-clog wastewater pump(s). Each pump shall be equipped with a 50 HP submersible electric motor, connected for operation on 460 volts, 3 phase, 60 hertz, 4 wire service, with 40 feet of submersible cable (SUBCAB) suitable for submersible pump applications. The power cable shall be sized according to NEC and ICEA standards and also meet with P-MSHA Approval. The pumps and cables shall be rated for NEC Class I, Division 1, Group D hazardous location. The pump shall be supplied with a mating cast iron 6 inch discharge connection and be capable of delivering the following minimums: 850 GPM at 112 FT. TDH at 60 Hz. and 620 GPM at 123 ft TDH at 60Hz. Shut off head shall be 165 feet (minimum). The Denmark Road Lift Station operating points are based on the pump curves of a Yeomans Model 4123 Type 9100, Curve ID no. 3503A, Impeller ID Y-4575. The pumps shall be automatically and firmly connected to the discharge connection, guided by two guide bars extending from the top of the station to the discharge connection. There shall be no need for personnel to enter the wet-well. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket will not be acceptable. No portion of the pump shall bear directly on the sump floor. Each pump shall be fitted with 25 feet of lifting chain or stainless steel cable. The working load of the lifting system shall be 50% greater than the pump unit weight.

D. Pump Construction

1. Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. The lifting handle shall be of stainless steel. All exposed nuts or bolts shall be of stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied powder coat painting system to a thickness of 100 mils.

2. Sealing design shall incorporate **metal-to-metal contact** between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit. Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used. The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of dual cylindrical elastomer grommets, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter. The grommets shall be compressed by the cable entry unit, thus providing a strain relief function. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be sealed from each other, which shall isolate the stator housing from foreign
material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered equal.

3. The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of pins, bolts, screws or other fastening devices used to locate or hold the stator and that penetrate the stator housing are not acceptable. The motor shall be designed for continuous duty while handling pumped media of up to 104°F. The motor shall be capable of no less than 30 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of aluminum. Three thermal switches shall be embedded in the stator end coils, one per phase winding, to monitor the stator temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor control panel.

4. The junction chamber shall be sealed off from the stator housing and shall contain a terminal board for connection of power and pilot sensor cables using threaded compression type terminals. The use of wire nuts or crimp-type connectors is not acceptable. The motor and the pump shall be produced by the same manufacturer.

5. The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15. The motor shall have a voltage tolerance of +/- 10%. The motor shall be designed for continuous operation in up to a 40°C ambient and shall have a NEMA Class B maximum operating temperature rise of 80°C. A motor performance chart shall be provided upon request exhibiting curves for motor torque, current, power factor, input/output kW and efficiency. The chart shall also include data on motor starting and no-load characteristics.

6. Motor horsepower shall be sufficient so that the pump is non-overloading throughout its entire performance curve, from shut-off to run-out. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

7. The integral pump/motor shaft shall rotate on two bearings. The motor bearings shall be sealed and permanently grease lubricated with high temperature grease. The upper motor bearing shall be a two row angular contact ball bearing. The lower bearing shall be a two row angular contact ball bearing to handle the thrust and radial forces. The minimum L<sub>10</sub> bearing life shall be 50,000 hours at any usable portion of the pump curve.

8. Each pump shall be provided with a positively driven dual, tandem mechanical shaft seal system consisting of two seal sets, each having an independent spring. The lower primary seal, located between the pump and seal chamber, shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide ring. The upper secondary seal, located between the seal chamber and the seal inspection chamber shall be a leakage-free seal. The upper seal shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide seal ring. The rotating seal ring shall have small back-swept grooves laser inscribed upon its face to act as a pump as it rotates,
returning any fluid that should enter the dry motor chamber back into the lubricant chamber. All seal rings shall be individual solid sintered rings. Each seal interface shall be held in place by its own spring system. The seals shall not depend upon direction of rotation for sealing. Mounting of the lower seal on the impeller hub is not acceptable. Shaft seals without positively driven rotating members or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces are not acceptable. The seal springs shall be isolated from the pumped media to prevent materials from packing around them, limiting their performance.

9. Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and shall provide capacity for lubricant expansion. The seal lubricant chamber shall have one drain and one inspection plug that are accessible from the exterior of the motor unit. The seal system shall not rely upon the pumped media for lubrication.

10. The area about the exterior of the lower mechanical seal in the cast iron housing shall have cast in an integral concentric spiral groove. This groove shall protect the seals by causing abrasive particulate entering the seal cavity to be forced out away from the seal due to centrifugal action.

11. A separate seal leakage chamber shall be provided so that any leakage that may occur past the upper, secondary mechanical seal will be captured prior to entry into the motor stator housing. Such seal leakage shall not contaminate the motor lower bearing. The leakage chamber shall be equipped with a float type switch that will signal if the chamber should reach 50% capacity.

12. The pump and motor shaft shall be a single piece unit. The pump shaft is an extension of the motor shaft. Shafts using mechanical couplings shall not be acceptable. The shaft shall be stainless steel – ASTM A479 S43100-T. Shaft sleeves will not be acceptable.

13. The impeller shall be of (ASTM A-48, Class 35B gray iron or ASTM A-532 (Alloy III A) 25% chrome cast iron) dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog design. The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction. The screw-shaped leading edges of the gray iron impeller shall be hardened to Rc 45 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater. The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater. The impeller to volute clearance shall be readily adjustable by the means of a single trim screw. The impellers shall be locked to the shaft, held by an impeller bolt and shall be coated with alkyd resin primer. The impeller shall be capable of passing up to a 3 inch diameter sphere.

14. The pump volute shall be a single piece gray cast iron, ASTM A-48, Class 35B, non-concentric design with smooth passages of sufficient size to pass any solids that may enter the impeller. Minimum inlet and discharge size shall be as specified. The volute shall have a replaceable suction cover insert ring in which are cast spiral-shaped, sharp-edged groove(s). The spiral groove(s) shall provide trash release pathways and sharp edge(s) across which each impeller vane leading edge shall cross during rotation so to remain unobstructed. The insert ring shall be cast of (ASTM A-48, Class 35B gray iron
or ASTM A-532 (Alloy III A) 25% chrome cast iron) and provide effective sealing between the multi-vane semi-open impeller and the volute housing.

15. Each pump motor stator shall incorporate three thermal switches, one per stator phase winding and be connected in series, to monitor the temperature of the motor. Should the thermal switches open, the motor shall stop and activate an alarm. A float switch shall be installed in the seal leakage chamber and will activate if leakage into the chamber reaches 50% chamber capacity, signaling the need to schedule an inspection. The thermal switches and float switch shall be connected to a Mini CAS control and status monitoring unit. The Mini CAS unit shall be designed to be mounted in the pump control panel.

2.3 PUMP ACCESSORIES

A. Pump Base Threaded Connections

1. The pump bases shall be bolted to the invert of the wet well per the manufacturer’s recommendation. The length of embedment and size and spacing of the threaded connections shall be specified by the manufacturer.

B. Pump Guide Rails

1. The three lift stations shall use two 2-in diameter stainless steel pipes. Intermediate rail supports shall be furnished per the pump manufacturer’s recommendation. Rail supports shall also be stainless steel.

2.4 LIFT STATION ACCESSORIES

A. Access Frame and Cover

1. The Contractor shall furnish and install aluminum access frames and covers for the wet wells and valve vaults as shown on the Plans and specified herein. The units shall be rated at 300 lb/sq. ft complete with hinged and flush locking mechanism. The frame shall be securely cast in the concrete top slab as shown on the drawings. Each door shall have a safety handle to maintain the door in the open position. Doors shall be skid-proof design. The access frame and cover shall be provided with an outside padlock hasp. The access frame for the wet well shall include a cable support. The access frame and cover shall be supplied by the submersible pump supplier.

2. The wet well hatches shall be provided with safety netting that is installed in the frame below the aluminum hatch. The netting shall be constructed of highly visible synthetic fiber and shall meet OSHA requirements for fall protection. The netting shall be connected to the sides of the hatch opening and shall slide on guide rails to allow for the removal of the pumps. The net shall have a 150 lb/sq. ft rating.

3. The Rose Hill and Chateau wet well hatches shall have dual door hatches installed in a single frames for pump access. The Denmark Road wet well hatch shall have a three door hatch installed in a single frame for pump access. The valve vaults shall have single door hatches installed in individual frames.
4. Each wet well hatch shall have integral hooks for hanging pump conductor cables, control cables and level monitoring equipment. The hooks shall be constructed of the same material as the hatches.

B. Stainless Steel Wet Well Vent

1. The Rose Hill and Chateau wet wells shall each have a 3-in diameter stainless steel vent. The Denmark Road wet well shall have a 6-in diameter stainless steel vent. The vent shall not interfere with the removal and maintenance of pumps. It shall be constructed of Type 304 stainless steel. The vent shall be cast into the wet well lid and shall have a 180 degree turn-down. The vent shall be covered in a double layer of stainless steel mesh. The Denmark Road wet well vent shall be tapped into the side of the wet well and run horizontally to the restroom building and brought up along the edge of the building to be out of the way.

2.5 LIFT STATION LEVEL MEASUREMENT AND CONTROLS

A. Refer to Section 16900 – Pump Control Panel for lift station measurement and controls.

2.6 WET WELL AND VALVE VAULT PIPING AND VALVING

A. Piping

Ductile Iron Pipe barrels shall conform to ANSI 21.51. Flanged ends shall conform to ANSI A21.15. Pipe shall be thickness Class 53. Flanges shall conform to ANSI B16.1 Class 125. Pipe shall have a standard thickness cement mortar lining with asphaltic coating inside and out conforming to ANSI A21.4. Gaskets shall be constructed of molded SBR rubber and conform to ANSI A21.11. Nuts and bolts shall conform to ANSI B18.2.2 and B18.2.1 respectively. Bolts shall be constructed of low carbon steel conforming to ASTM A-307.

B. Fittings

All pressure main fittings shall be flanged ductile iron for above ground service, unless otherwise indicated on the Plans.

All fittings shall conform to ANSI A21.10 (AWWA C110), or ANSI A21.53 (AWWA C153), where possible. Minimum pressure rating shall be 350 psi. If shown or specified fittings are unavailable in the above standards, the manufacturer’s standard may be used upon approval of the ENGINEER. All rubber gaskets shall conform to ANSI A21.11 (AWWA C111). All fittings shall have cement mortar lining and seal coat per ANSI A21.40 (AWWA C104).

C. Plug Valves

Plug valves shall be flanged plug valves with lever operators. Plug valves shall be of the non-lubricating, eccentric type and shall be designed for a working pressure of 150 psi. Valves shall provide tight shut-off at rated pressure. The valve shall have a round port design. The valve body shall be cast iron ASTM A126 Class B with welded in overlay of 99 percent nickel allow content on all surfaces contacting the face of the plug.
The valve plug shall be ductile iron ASTM A-536, Grade 65-45-12 with Buna N resilient seating surface to mate with the body seat.

The plug valve shall be furnished with permanently lubricated sleeve type bearings conforming to AWWA C517. Bearings shall be of sintered oil impregnated type 316 stainless steel ASTM A-743 Grade CF-8M or bronze ASTM B-127.

Valve shaft seals shall be of the “U” cup type, in accordance with AWWA C517. Seals shall be self-adjusting and repackable without moving the bonnet from the valve.

D. Check Valves

Check valves shall be flanged swing check valves with a weighted lever arm.

Check valves shall conform to ANSI/AWWA C508.

The valve body shall be constructed of grey iron meeting ASTM A126 Grade B. The disc and disc arm shall be constructed of ductile iron conforming to ASTM A536. The valve seat shall be constructed of aluminum bronze conforming to ASTM B148. The mating surface shall be Buna-N.

The valve shaft and hardware shall be constructed of stainless steel with corrosion resistant bearings. Where the shaft is extended outside the valve body, it shall be sealed with a double O-ring and a grease fitting.

The valve seat and mating surface shall be field removable and replaceable without removing the valve from the pipeline.

PART 3 - EXECUTION

3.1 WET WELL AND VALVE VAULT

A. The wet well and valve vault shall be constructed per the drawings and as specified in the Special Provision WET WELL AND VALVE VAULT STRUCTURES. The Contractor shall coordinate shipment of the hatches to the precaster for installation in the structures.

3.2 PUMPS

A. Pump Test

The pump manufacturer shall perform the following inspections and tests on the pump before shipment from factory.

1. Impeller motor rating and electrical connections shall first be checked for compliance to the customer’s purchase order.

2. A motor and cable insulation test for moisture content or insulation defects.

3. Prior to submergence, the pump shall be run dry to establish correct rotation and mechanical integrity.
4. The pump shall be run for 30 minutes submerged, a minimum of 6 ft under water.

5. After operational test No. 4, the insulation test (No. 2) is to be performed again.

A written report stating the foregoing items have been done shall be supplied with the pump at the time of shipment.

B. The pumps shall be installed after the wet well lid has been cast and set into place to ensure the pump bases and guide rails are installed vertically.

C. Pumps shall be installed per the plans and the manufacturer’s recommendations.

3.3 PIPING AND VALVING

A. The Contractor shall submit a complete piping diagram with dimensions to confirm spacing prior to fabricating spools.

B. Wall penetrations shall be sealed with a non-shrink grout.

C. Check valve weights and lever arm position shall be adjusted prior to startup. The lever arm shall be moved to confirm the flapper is free to move.

D. The check valve and plug valve orientation shall be checked to ensure proper installation. The plug valve shall be opened and closed fully to ensure the valve is not blocked.

E. Piping shall be pressure tested from the check valve to the point of connection prior to connecting to the existing forcemains. The test shall be conducted through the bypass pump connection and shall be for a period of one hour at a pressure that is 150% of the shut-off head of the pumps. Piping between the check valve and the wet well shall be visually inspected during the startup of the pumps.

F. In the event the City does not construct the Chateau lift station the contractor shall locate and connect the new forcemain to the existing “can” style lift station discharge. The cost of locating and connecting the forcemain to the existing station shall be considered part of the cost of the 4” diameter forcemain.

3.4 START-UP

A. A service technician shall be made available on the jobsite to check installation and electrical wiring connections prior to start-up of the unit(s) is attempted by anyone.

B. The service technician shall complete the following:
   1. Megger stator and power cables.
   2. Check seal lubrication.
   3. Check for proper rotation.
   4. Check power supply voltage.
   5. Measure motor operating load and no load current.
   6. Check level control operation and sequence.
C. Initial startup training shall consist of a single 8 hour day onsite per lift station. Training of the Owner’s personnel shall take place after start up is substantially complete. A copy of the training program outline shall be submitted to the owner and their engineer as part of the equipment submittal package. A start-up report shall be filled out and submitted to the Owner and engineer by the trainer upon completion of the successful startup and training. A copy of the start-up report will be required by the manufacturer to validate the warranty.
Hanson Professional Services, Inc.  
1525 South Sixth Street  
Springfield, IL  62703  
Phone (217) 747-9254

Project Location:  
Client (End User):  
Client Site Location:  
Temperature (°F):  
Humidity:  
Time of Day:  
Weather (if outdoors):  
Motor Function/Designation/Location:  

Motor Nameplate Data  
1. Manufacturer’s Name:  
2. Motor Serial Number:  
3. Manufacturer’s type and frame designation:  
4. Horsepower:  
5. Time Rating (5, 15, 30, 60 minutes, or Continuous):  
6. Maximum ambient temperature for which motor is designed:  
7. NEMA Insulation Class Designation:  
8. NEMA Torque Design Class:  
9. RPM at rated load:  
10. Frequency:  
11. Number of Phases:  
12. Rated Full-Load Amperes:  
13. Voltage:  
14. Code letter for Locked-Rotor KVA:  
15. Service Factor:  
16. Efficiency (NEMA Nominal):  
17. Internal motor thermal protected (if required)? (Yes/No)
Motor Start-Up Certification and Testing Report (Continued)

Motor Start-Up & Commissioning Data

Insulation Resistance Test

Megohms measured to ground @ 500 VDC (60 Second continuous test)

Motor Lead T1 measured to Ground ______ Megohms
Motor Lead T2 measured to Ground ______ Megohms
Motor Lead T3 measured to Ground ______ Megohms
T1-T2-T3 (Tied) measured to Ground ______ Megohms

Voltage (at motor)

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<th>Full Load</th>
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<td>B-C</td>
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<td>C-A</td>
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Motor Current (field measured data)

No Load

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Full Load

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DATA CERTIFIED BY:

Firm: ____________________
Name: ____________________
Date: ____________________

END OF SECTION 11302
SECTION 1 – GENERAL

1.1 WORK INCLUDED

Contractor to furnish a precast concrete building to be field assembled by manufacturer on a cast-in-place foundation as indicated on contract plans and in accordance with manufacturer’s recommendations. Building shall be provided by manufacturer with all necessary openings as specified by contractor in conformance with manufacturer’s structural requirements.

1.2 REFERENCES

A. ACI-318-11: Building Code Requirements for Structural Concrete and Commentary
B. ASCE/SEI 7-10: Minimum Design Loads for Buildings and Other Structures
D. PCI Design Handbook, 7th Edition
E. Concrete Reinforcing Institute, Manual of Standard Practice
F. UL-752 (Test Method level 5) for bullet resistance certified by a military approved laboratory.

1.3 SYSTEM DESCRIPTION

DESIGN REQUIREMENTS

A. Building Dimensions:

   Exterior: 20’ x 20’ x 10’-0” (Not including floor)
   Interior: 19’-4” x 19’-4” x 9’ 0”

B. Design Loads:

   1. Seismic Design Category ‘C’, Risk Design Category II
   2. Roof Live Load (Snow) – 30 PSF
   3. Floor Live Load – 150 PSF (if precast floor is provided)
   4. Wind Loading* – 115 MPH

   *Design loads relate to precast components only, not accessories (i.e. doors,
C. Roof: Roof panel shall be flat. The roof shall extend 4” beyond the wall panel and have a turndown design which extends ½” minimum below the top edge of the wall panels to prevent water migration into the building along top of wall panels. Roof shall also have an integral architectural ribbed edge.

D. Roof Joint Keyway: Grout in keyways shall be a magnesium phosphate material or equal, prepared and placed per the manufacturer’s recommendations. Apply a polysulfide, elastomeric joint sealant to the top of the grouted keyway, installed per manufacture’s recommendations.

E. Contractor supplied cast-in-place slab must have a ½” step-down around the entire perimeter to prevent water migration into the building along the bottom of wall panels.

1.4 SUBMITTALS

A. Engineering calculations that are designed and sealed by a professional engineer, licensed to practice in the state where the project is located, shall be submitted for approval.

B. Manufacturers’ product literature shall be provided for any plumbing, electrical, and miscellaneous installed fixtures demonstrating compliance with these specifications.

1.5 QUALITY ASSURANCE

A. The precast concrete building producer shall be a plant-certified member of either the National Precast Concrete Association (NPCA), The Precast/Prestressed Concrete Institute (PCI), or equal.

B. The precast concrete building producer shall demonstrate product knowledge and must have a minimum of 5 years experience manufacturing and setting precast concrete.

C. The manufacturer must be a licensed producer of Easi-Set Buildings

D. No alternate building designs to the pre-engineered EASI-SPAN® building will be allowed unless pre-approved by the owner 10 days prior to the bid date.

SECTION 2 – PRODUCTS

2.1 MATERIALS

A. Concrete: Steel-reinforced, 5000 PSI minimum 28-day compressive strength, air-entrained (ASTM C260).

B. Reinforcing Steel: ASTM A615, grade 60 unless otherwise specified.

Welded Wire Fabric: ASTM 185, Grade 65
C. Post-tensioning Strand: Roof and floor (if required) sections shall be post-tensioned in the field after grout keyway is filled and has cured to the required PSI strength. Post-tensioning strand shall be 41K Polysarand CP50, ½” 270 KSI Seven-Wire strand, enclosed within a greased plastic sheath (ASTM A416). There will be a minimum of three transverse post-tensioning cables connecting roof and floor (if provided) sections together to provide a watertight joint. To ensure a watertight design, no alternate methods shall be substituted for the post-tensioning.

D. Caulking: All joints between panels shall be caulked on the exterior and interior surface of the joints. Caulking shall be DOW CORNING 790 silicone sealant or equal. Exterior caulk reveal to be 3/8” x 3/4” deep so that sides of joint are parallel for proper caulk adhesion. Back of the joint to be taped with bond breaking tape to ensure adhesion of caulk to parallel sides of joint and not the back.

E. Panel Connections: All panels shall be securely fastened together with 3/8” thick steel brackets. Steel is to be of structural quality, hot-rolled carbon complying with ASTM A36 and hot dipped galvanized after fabrication. All fasteners to be ½” diameter bolts complying with ASTM A325 for carbon steel bolts. Cast-in anchors used for panel connections to be Dayton-Superior F-63 coil inserts, or equal. All inserts for corner connections must be secured directly to form before casting panels. No floating-in of connection inserts shall be allowed. Wall panels shall be connected to cast-in-place floor slab using expansion anchors providing adequate embedment by manufacturer.

F. Brick Facade:
   
   a. The exterior facade of the restroom shall have a “thin brick” veneer brick applied. The veneer brick shall match the local “Danville Brick” with final color selection made by the Owner.
      i. Thin brick shall be Standard sized (¾” thick molded brick 2 ¼” tall by 7-5/8” wide.)
      ii. Conform to ASTM C-1088, Grade Exterior, Type TBS.


   c. Thin Brick Mortar: Multi-use, polymer fortified adhesive mortar for use on exterior thin brick. Mortar shall have an extra heavy rating per ASTM C627. The mortar shall meet the shear bond strength requirements of ANSI A118.4, 118.15, and 118.11. The mortar shall be designed to adhere to a water barrier prepared concrete substrate.

   d. Pointing Mortar: Product shall be a mortar designed for adhered stone, think brick and manufactured masonry veneers. The mortar shall be formulated from a blend of high strength Portland cement, graded aggregates and color fast pigments that provide a joint that is hard and durable.

   e. Anti-Graffiti Coating: The anti-graffiti shall be a silicone based product that penetrates brick and mortar pores and prevent water intrusion and paint...
adhesion. Product shall have a minimum 5 year warranty against paint adhesion.

2.2 ACCESSORIES

A. **Doors and Frames**: Shall comply with Steel Door Institute “Recommended Specifications for Standard Steel Doors and Frames” (SDI-100) and as herein specified. All door and frame galvanizing shall be in accordance with ASTM A924 and A653, A60 minimum coating thickness.

a. The building shall be equipped with a single 3’-0” x 6’-8” x 1-3/4” thick insulated, 18 gauge, metal doors with 16-gauge frame (to meet wall thickness). Door to have flush top cap. Doors and frames shall be factory bonderized and painted with one coat of rust inhibitive primer and one finish coat of enamel paint; color to be Owner specified otherwise.

b. Doors and frames shall meet SDI standard Level 2, 1¾” heavy duty.

B. **Door Hardware**:

1. **Pull Handle**: Shall meet requirements of ANSI A156.2. Shall be thru bolt attached and constructed of a minimum ¾” diameter stainless pull handle sized 8” center to center with a stainless backer plate, minimum 0.053” on both sides.

2. **Hinges**: Shall comply with ANSI A156.1 and be of the ball bearing, non-removable pin type (3 per door minimum). Hinges shall be 4 ½” x 4 ½” US26D (652) brushed chrome finish. Manufacturer shall provide a lifetime limited warranty.

3. **Deadbolt**: Commercial Grade Deadbolt conforming to ANSI 156.5 furnished with a 2 ¼” face plate and a 1” projecting deadbolt with hardened steel pins. Dead bolts shall be UL and ADA approved. Finish shall be US26D (626) brushed chrome finish. Manufacturer shall provide a lifetime limited warranty.

4. **Surface Bolt**: 8” Surface bolt UL listed. Finish US26D (626) brushed chrome finish. (2 per inactive leaf)

5. **Threshold**: Bumper Seal type threshold with a maximum 1” rise to prevent water intrusion. Thresholds shall be approved for UL 10B suitable for use with fire doors rated up to three hours.


7. **Drip Cap**: Aluminum drip cap with minimum projection of 2 ½” shall be furnished.

8. **Door Stop**: ANSI 156.16 approved wall mounted door stop with keeper constructed of a corrosion resistant cast brass material. Finish US26D (626) brushed chrome finish.

C. **Through Wall Heat Pump**:
1. Provide a single stage self-contained through the wall heat pump with integral electric heat.
2. Unit sizing and electrical requirements are located on the Denmark Road Pump Station Building Mechanical Plan.

2.3 FINISHES

A. Interior of Building: Smooth form finish on all interior panel surfaces unless exterior finish is produced using a form liner, then smooth hand-troweled.

B. Exterior of Building: The exterior of the building shall be a scratchcoat texture coordinated with the brick veneer supplier to provide a key to the brick adhesion system.

C. Brick veneer system shall be factory installed. Point mortar and anti-graffiti coating shall be repaired and/or touched up in the field.

SECTION 3 – EXECUTION

3.1 SITE PREPARATION

A. The precast concrete building will be placed on a cast in place concrete foundation per the plans. The building shall be secured using 3/8” thick steel angle brackets and anchor bolts per the plans. The slab is to be level within 1/8” in both directions and capable of supporting loads imposed by the structure. Floor slab must have a ½” step-down around the entire perimeter to prevent water migration into the building along the bottom of wall panels. A ring of butyl rope shall be placed around the perimeter of the foundation prior to setting the building in place.

3.2 SITE ACCESS

A. Contractor must provide a level, unobstructed area large enough for a crane and a tractor-trailer to park adjacent to the pad. Crane must be able to place outriggers within 5'-0” of edge of pad; truck and crane must be able to get side by side under their own power. Contractor shall coordinate with the local power company to provide protection for the overhead power lines adjacent to the site. Firm roadbed with turns that allow 65’ lowbed tractor-trailer must be provided directly to site.
PART 1 - GENERAL

1.1 WORK INCLUDES

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

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

C. Plans pertaining to this installation indicate general location of circuit breaker panels, load centers, conduits, wiring, lighting, outlets, and other details necessary for installation of system. Contractor shall field verify existing site conditions.

D. Electrical installation, as shown on Plans and as specified herein, is based upon available information, with regard to characteristics of building layout and associated equipment specified. In the event changes are necessary in order to accommodate mechanical equipment furnished, necessary revisions will be made with approval of Owner’s Representative.

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

F. The Contractor shall furnish and install all materials necessary for a complete and operational installation of the electrical equipment, as specified herein and as shown on the Plans. The complete installation and wiring shall be done in a neat, workmanlike manner. All electrical work shall comply with the requirements of NFPA 70 - National Electrical Code (NEC), most current issue in force, and all other applicable local codes, laws, ordinances, and requirements in force. Electrical equipment and materials shall be installed in conformance with the respective manufacturer’s directions and recommendations for the respective application. Any installations which void the UL listing, Intertek Testing Services verification/ETL listing, FM approval (or other third party listing), and/or the manufacturer’s warranty of a device will not be permitted.

G. The electrical work and equipment specified is based on equipment of the type and size as noted on the Plans and specified herein. Should the proposed pump motors (or any other proposed loads) exceed the ratings of the electrical equipment specified, the General Contractor shall be solely responsible for furnishing any and all modifications necessary in order to provide a fully functional system to the satisfaction of the Engineer at no change to the contract
The Contractor shall also be required to submit for review, sufficient information determined by the Engineer to be necessary to review such alternates or modifications.

1.2 CODE REQUIREMENTS, LAWS, AND ORDINANCES

A. In installation of this work, Contractor shall comply in every respect with requirements of NFPA 70- National Electrical Code, most current issue in force, and any state and local requirements, laws, and ordinances as may be applicable.

B. All electrical equipment and materials furnished and installed at the pump station shall conform to the applicable sections of the following:

1. ANSI – American National Standards Institute, Inc.
3. FM - Factory Mutual
4. IEEE – Institute of Electrical and Electronic Engineers.
5. Illinois Environmental Protection Agency Title 35: Environmental Protection, Subtitle C: Water Pollution, Chapter II: Environmental Protection Agency Part 370: Illinois Recommended Standards for Sewage Works
6. NECA 1 - Standard Practice of Good Workmanship in Electrical Construction.
13. UL – Underwriter’s Laboratories, Inc.
14. Rules and requirements of the serving electric utility company.
15. All other applicable local codes, regulations, ordinances, and requirements in force.

C. If, in opinion of the Contractor, there is anything in Plans or Specifications that will not strictly comply with above laws, ordinances, and rules, the matter shall be referred to the attention of the Owner’s Representative for a decision before proceeding with that part of the work. No changes on Plans or in Specifications shall be made without the full consent of Owner’s Representative.
D. Contractor shall obtain and pay for all licenses, permits, and inspections required by above laws, ordinances, and rules for entire electric wiring job called for in these Specifications and accompanying Plans.

PART 2 - PRODUCTS

2.1 Products shall be as specified in other sections and as detailed on the Plans.

PART 3 - EXECUTION

3.1 EQUIPMENT STORAGE

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

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

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

3.2 DRAWINGS

A. Drawings for electrical work are a part of electrical Plans to which will be added, during the period of construction, any other Detail Drawings as may be necessary in opinion of Owner’s Representative, to show proper installation of various appliances or equipment with relation to project.

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

C. The Contractor shall, during the progress of the job, record any and all changes or deviations from the original Drawings and, at the completion of the project, shall deliver to the Engineer a marked-up set of “as-built” Drawings.

3.3 SHOP AND ERECTION DRAWINGS

A. The Contractor shall prepare Shop Drawings for all parts of the electrical work. Before commencing any work or providing any material, the Contractor shall submit for approval of the Engineer all Drawings relating to the construction, arrangement or disposition of the
equipment entering into the Contract, and show the complete equipment with manufacturer’s Specifications of same.

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

C. Shop Drawings shall be fully descriptive of all the materials and equipment to be incorporated into this project. The Contractor shall carefully check all submitted Shop Drawings, making sure they are complete in all details and cover the specific items as hereinafter specified.

D. The preferred shop drawing submittal format shall be electronic (PDF) copies. Contractor may submit hard copies of shop drawings instead of electronic copies where applicable. Where hard copies are provided, the Contractor shall submit sufficient copies of shop drawings to meet the needs of his personnel, sub-contractor personnel, and equipment suppliers plus four (4) copies to be retained by the Project Engineer, (5 copies minimum).

E. No material or equipment shall be allowed at the site until Shop Drawings approved by the Engineer and/or Owner’s Representative are received by the Owner’s Representative at the site.

F. The following information shall be clearly marked on each Shop Drawing, catalog cut, pamphlet, specification sheet, etc. submitted:

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

G. The following electrical equipment and materials will require shop drawing submittals for this project.

1. Conduits and Ducts (all types used on the project)
2. Wire and Cables (all types used on the project)
3. Junction Boxes and Enclosures
4. Variable Frequency Drive Controllers
5. Enclosed Circuit Breakers
6. Ground Rods
7. Exothermic Weld Connections
8. Ground Wire
9. Transformers
10. Panelboards and Circuit Breakers
11. Automatic Transfer Switch
12. Surge Protective Devices
13. Engine Generator Set
3.4 CONTINUITY OF SERVICE

A. Should it be required that the Contractor perform work in the facility which is in operation at the time the Contractor’s work is to be performed, then the Contractor shall clear with the operating personnel of the facility and/or the Owner’s Representative any power outages or equipment downtime that may occur as a result of the performance of his work.

3.5 EQUIPMENT MOUNTING

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

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

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

3.6 GENERAL ELECTRICAL

A. The Contractor shall furnish and install all materials necessary for complete and operational installation of the vault equipment, as specified herein and as shown on the Plans. The complete installation and wiring shall be done in a neat, workmanlike manner. All electrical work shall comply with the requirements of the NFPA 70 – National Electrical Code (NEC) most current issue in force, and all other applicable local codes, laws, ordinances, and requirements in force. Electrical equipment and materials shall be installed in conformance with the respective manufacturer’s directions and recommendations for the respective application. Any installations which void the UL listing, Intertek Testing Services verification/ETL listing, FM approval (or other third party listing), and/or the manufacturer’s warranty of a device will not be permitted.

B. Per Illinois Environmental Protection Agency Title 35: Environmental Protection, Subtitle C: Water Pollution, Chapter II: Environmental Protection Agency Part 370: Illinois Recommended Standards for Sewage Works all electrical equipment installed in a sewage pump station wet well shall be suitable for Class I, Division 1, Group D hazardous location. In addition equipment located in a sewage wet well shall be suitable for use under corrosive conditions.

C. Per NFPA 820, Standard for Fire Protection in Wastewater Treatment and Collection Facilities, a wastewater pumping station wet well (with no ventilation or ventilated at less than twelve (12) air changes per hour) is classified as a Class I, Division 1, Group D hazardous location. All electrical installations associated with the pumping station wet well shall conform to the applicable sections of NEC 500, 501, and 504 in addition to the other applicable sections of NEC. Where electrical equipment is installed in a classified hazardous location it shall be UL-listed, Factory Mutual-approved, or ETL-listed suitable for use in the respective classified hazardous location.
D. Based on the above requirements all electrical installations associated with the pumping station wet well shall be suitable for Class I, Division 1, Group D hazardous location and conform to the applicable sections of NFPA 70 National Electrical Code (NEC) Articles 500, 501, and 504 in addition to the other applicable sections of NEC. Where electrical equipment is installed in a classified hazardous location it shall be UL-listed, Factory Mutual-approved, or Intertek Testing Services verified/ETL listed suitable for use in the respective classified hazardous location; (Class I, Division 1, Group D location for the pump station wet well).

E. Contractor shall keep a copy of the latest NEC in force on site at all times during construction for use as a reference.

F. Contractor shall keep a copy of the Plans, Special Provision Specifications including any addenda, and copies of any change orders on site at all times during construction.

G. Contractor shall coordinate work and any power outages with the Owner’s Representative. Any shutdown of existing systems shall be scheduled with and approved by the Owner’s Representative prior to shutdown. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures including, but not limited to, 29 CFR section 1910.147 The Control of Hazardous Energy (lockout/tagout).

H. Contractor shall comply with the applicable requirements of NFPA 70E – Standard for Electrical Safety in the Workplace.

I. Comply with NECA 1.

J. Measure indicated mounting heights to bottom of unit for suspended items and to top of unit for wall-mounting items.

K. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

L. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

M. Right of Way: Give priority to piping systems installed at a required slope.

N. All equipment and materials shall be installed and completed in a first-class workmanlike manner. The right is reserved to direct the removal and replacement of any item, which in the opinion of the Owner’s Representative and/or Architect/Engineer does not present an orderly and reasonably neat or workmanlike appearance, provided such items can be properly installed in an orderly way by usual methods in such work.

O. All electrical equipment installed by the Contractor shall be properly labeled, and all cables must be tagged.
P. All power and control cables shall be installed in conduit, wireways, pull boxes, junction boxes, or raceways. No exposed power or control wiring will be permitted.

Q. All changes to the electrical system shall be documented by the Contractor and provided to the Owner’s Representative.

R. **Locate Existing Underground Utilities and Cables.** The location, size, and type of material of existing underground and/or aboveground utilities indicated on the Plans are not represented as being accurate, sufficient, or complete. Neither the Owner nor the Engineer assumes any responsibility whatever in respect to the accuracy, completeness, or sufficiency of the information. There is no guarantee, either expressed or implied, that the locations, size, and type of material of existing underground utilities indicated are representative of those to be encountered in the construction. It shall be the Contractor’s responsibility to determine the actual location of all such facilities, including service connections to underground utilities. Prior to construction, the Contractor shall notify the utility companies of his operational plans, and shall obtain, from the respective utility companies, detailed information and assistance relative to the location of their facilities and the working schedule of the companies for removal or adjustment, where required. In the event an unexpected utility interference is encountered during construction, the Contractor shall immediately notify the utility company of jurisdiction. The Owner’s Representative shall also be immediately notified. Any damage to such mains and services shall be restored to service at once and paid for by the Contractor at no additional cost to the Contract. All utility cables and lines shall be located by the respective utility. **Contact JULIE (Joint Utility Location Information for Excavators) for utility information, phone: 1-800-892-0123.**

S. Should it be required that the Contractor perform work in the facility which is in operation at the time the Contractor’s work is to be performed, then the Contractor shall clear with the operating personnel of the facility and/or the Owner’s Representative any power outages or equipment downtime that may occur as a result of the performance of his work.

T. Electrical Contractor shall be responsible for furnishing and setting all anchor bolts required to install Contractor’s equipment.

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

V. Where electrical equipment is located on damp or wet walls or locations as directed, it shall be “stand-off” mounted 1/2-in. from wall in a manner so that rear of equipment is freely exposed to surrounding air. Method of mounting shall be approved by Owner’s Representative before equipment is mounted.

W. The CONTRACTOR shall, during the progress of the job, record any and all changes or deviations from the original Drawings and, at the completion of the project, shall deliver to the Project Engineer or the Resident Engineer/Resident Technician a marked-up set of “as-built” Drawings.

END OF SECTION 16010
PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The work included in this section is the conduits, raceways and fittings required for a complete and operational electrical system. The work included in this section shall also include the construction of electrical handholes with lids complete, in accordance with this Specification and as detailed on the Construction Plans.

1.2 RELATED SECTIONS

A. Section 16010 – Basic Electrical Requirements.
B. Section 16120 – Wire and Cable.
C. Section 16130 – Boxes
D. Section 16450 – Grounding.

1.3 REFERENCE TO STANDARDS

A. ANSI C80.1 – Rigid Steel Conduit, Zinc Coated.
B. ANSI C80.3 – Electrical Metallic Tubing, Zinc Coated.
C. ANSI C80.4 – Fittings Rigid Metal Conduit and EMT.
D. ANSI C80.5 – Rigid Aluminum Conduit.
H. NEMA TC-3 – Fittings Rigid PVC Conduit and Tubing.
I. NEMA TC-7 – Smooth-Wall Coilable Polyethylene Electrical Plastic Conduit.
J. NFPA 70, National Electrical Code (NEC) (most current issue in force).
K. UL Standard 1 – Flexible Metal Conduit.
L. UL Standard 6 – Rigid Metal Conduit.

M. UL Standard 360 – Liquid-Tight Flexible Steel Conduit.

N. UL Standard 514B – Conduit, Tubing and Cable Fittings.

O. UL Standard 651 – Schedule 40 and 80 Rigid PVC Conduit.


Q. UL Standard 797 – Electrical Metallic Tubing.

1.4 DELIVERY, STORAGE AND HANDLING

A. Threads of metal conduits shall be protected by plastic caps. Fittings shall be stored in boxes. All equipment shall be stored on pallets to prevent contact with earth and shall be covered with plastic sheeting to protect them from dirt and weather.

1.5 SUBMITTALS

A. The Contractor shall furnish shop drawings for approval before ordering equipment and/or materials. Shop drawings are required for each type of conduit or duct to be used on the project. Shop drawings shall be clear and legible. Copies that are illegible will be rejected. The preferred shop drawing submittal format shall be electronic (PDF) copies. Contractor may submit hard copies of shop drawings instead of electronic copies where applicable. In the event that the Contractor provides hard copies of shop drawings he shall submit sufficient quantities to meet the needs of his personnel, sub-contractor personnel, and equipment suppliers plus four (4) copies to be retained by the Project Engineer. Shop drawings shall include the following information:

1. In order to expedite the shop drawing review, inspection and/or testing of materials and equipment, the Contractor shall furnish complete statements to the Project Engineer as to the origin and manufacturer of all materials and equipment to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials and equipment.

2. Shop drawings shall include conduit and/or duct cut sheets with type, size, specifications, UL listing, manufacturer, and catalog or part number.

3. For plastic duct to be installed by boring method, provide manufacturer’s literature confirming the respective duct is suitable for directional boring with the respective Shop Drawing submittal.

4. Concrete mix design for concrete encased duct.

5. Provide cut sheets with part number and specification for manhole frame and lid.
1.6 QUALIFICATIONS

A. All material shall be purchased new from suppliers/manufacturers regularly engaged in the business of electrical conduit, ducts and fittings supply.

PART 2 - PRODUCTS

2.1 EQUIPMENT SPECIFICATION

A. Galvanized Rigid Steel Conduit: Rigid Steel Conduit and fittings shall be hot-dipped, galvanized, UL-listed, and produced in accordance with UL Standard 6 – Rigid Metal Conduit and ANSI C80.1 – Rigid Steel Conduit, Zinc Coated. Couplings, connectors, and fittings for rigid steel conduit shall be threaded, galvanized steel or galvanized, malleable iron, specifically designed and manufactured for the purpose. Fittings shall conform to ANSI C80.4 – Fittings Rigid Metal Conduit and EMT and UL 514B – Conduit, Tubing, and Cable Fittings. Set screw type fittings are not acceptable. Steel used to manufacture conduits shall be 100 percent domestic steel. Contractor shall provide certification that the respective steel conduits used on this project are manufactured from 100 percent domestic steel.

B. PVC-Coated, Galvanized, Rigid Steel Conduit: PVC-coated, galvanized, rigid steel conduit shall be manufactured by Robroy Industries, Inc., (Conduit Division, 1100 US Highway 271 South, Gilmer, Texas 75644, Phone 903-843-5591, Sales Department Fax: 903-843-2516) Plasti-Bond or approved equivalent. PVC coating shall be a minimum of 40 Mils permanently fused to hot dipped, galvanized, rigid steel conduit. An interior red polyurethane coating of 2 mils (.002 in.), shall be applied to the conduit and conduit couplings. Steel used to manufacture conduits shall be 100 percent domestic steel. Contractor shall provide certification that the respective steel conduits used on this project are manufactured from 100 percent domestic steel.

C. PVC Coated Rigid Aluminum Conduit: PVC coated rigid aluminum conduit and fittings shall be as manufactured by Robroy Industries, Inc., Conduit Division, 1100 US Highway 271 South, Gilmer, Texas 75644, Phone 903-843-5591, Sales Department Fax: 903-843-2516 or approved equivalent. The conduit, prior to coating, shall be new, unused material and shall conform to UL 6, Standard for Safety for Rigid Metal Conduit. An exterior gray PVC coating of a nominal 40 mils (.040 in.), shall be applied to the conduit and conduit couplings. The PVC coating shall conform to all applicable requirements of NEMA RN-1, Standard for PVC Coated Conduit. An interior red polyurethane coating of 2 mils (.002 in.), shall be applied to the conduit and conduit couplings. The polyurethane coating shall conform to all applicable requirements of NEMA RN-1, Standard for PVC Coated Conduit. Conduit having areas of thin or no coating shall be unacceptable. The PVC and polyurethane coatings applied to conduit shall have sufficient flexibility to permit field bending without cracking or flaking at temperatures above 30°F (-1°C). All male threads on conduit and all female threads on conduit couplings shall be protected by a coat of red polyurethane.

D. Schedule 40 PVC and Schedule 80 PVC Conduit: Conduit shall be Schedule 40 PVC, 90°C, UL rated or approved equal. Material shall comply with NEMA Specification TC-2 (Conduit), TC-3 (Fittings-UL-514), and UL-651 (Standard for rigid nonmetallic conduit). The conduit and
fittings shall carry a UL label (on each 10 foot length of conduit and stamped or molded on every fitting). Conduit and fittings shall be identified for type and manufacturer and shall be traceable to location of plant and date manufactured. The markings shall be legible and permanent. The conduit shall be made from polyvinyl chloride C-300 compound which includes inert modifiers to improve weatherability, heat distortion. Clean rework material, generated by the manufacturer’s own conduit production, may be used by the same manufacturer, provided the end products meet the requirements of this Specification. The conduit and fittings shall be homogeneous plastic material free from visible cracks, holes, or foreign inclusions. The conduit bore shall be smooth and free of blisters, nicks or other imperfections which could mar conductors or cables. Conduit, fittings and cement shall be produced by the same manufacturer to assure system integrity and shall be Carlton Plus 40, Plus 80 conduit, or approved equal.

E. Plastic Conduit for Directional Boring Installation: Conduits for directional boring shall be Schedule 40 PVC or Schedule 80 PVC conduit, UL-listed, rated for 90°C cable-conforming to NEMA Standard TC-2 and UL 651 and suitable for directional boring installation, Schedule 80 HDPE conduit, UL-listed, conforming to NEMA Standard TC-7 and UL 651B and suitable for directional boring installation, or Wall Type SDR 9 or SDR 11 HDPE conduit manufactured in accordance with ASTM D-3350 (Specification of Polyethylene Plastics Pipe and Fittings Materials) and ASTM F2160 (Standard Specification for Solid Wall, High-Density Polyethylene Conduit Based on Controlled Outside Diameter), and suitable for directional boring installation. Per NEC 300.5 (K), raceways installed using directional boring equipment shall be approved for the purpose. Provide manufacturer’s literature confirming the respective duct is suitable for directional boring with the respective Shop Drawing submittal. Conduits shall be suitable for underground applications encased in concrete or direct burial, and suitable for exposed applications aboveground.

F. Liquid-Tight, Flexible Metal Conduit (Non-Explosion Proof): Liquid-tight, flexible metal conduit shall consist of polyvinyl jacket over flexible, hot-dip, galvanized steel tubing. The flexible conduit shall be completely sealed from liquids, dust, dirt, and fumes and be resistant to oil, gasoline, grease, and abrasion. Jacket shall also be sunlight-resistant. Liquid-tight, flexible metal conduit shall be UL-listed, suitable for use as a grounding conductor, and comply with Article 350 of the NEC. Liquid-tight, flexible metal conduit and associated fittings shall be UL-listed to meet the requirements of NEC 350.6. Where liquid-tight, flexible metal conduit is installed in a Class I, Division 2 classified hazardous location it shall also be listed suitable for use in Class I, Division 2 classified hazardous locations. Liquid tight flexible metal conduit shall not be installed in a Class I, Division 1 classified hazardous location except for use with intrinsically safe wiring. Liquid-tight, flexible metal conduit shall be Anaconda Sealtite Type UA, as manufactured by Anamet Electrical Inc., 1000 Broadway Avenue East, Mattoon, Illinois 61938-0039, (Phone: 217-234-8844), Liquatite Type LA as manufactured by Electri-Flex Company, 222 W. Central Ave., Roselle, Illinois 60172, (Phone: 630-529-2920 or 1-800-323-6174), or approved equal. Do not install liquid-tight, flexible metal conduit that is not UL listed. Contractor shall confirm liquid-tight, flexible metal conduit bears the UL label prior to installation.

G. Square Duct/Wireway (Exterior Locations): Square duct shall be sized for the respective application and/or as detailed on the Plans. Wireways for exterior locations shall be NEMA 4X stainless steel with hinged cover as manufactured by Hoffman Enclosures Inc., or approved equal. All wireway lengths and accessories shall be Underwriter’s Laboratories listed and labeled in conformance with UL 870 Standards for Wireways, Auxiliary Gutters, and Associated Fittings and conform to NEMA 4, 4X enclosure rating.
H. Explosion-Proof Flexible Conduit: Explosion-proof flexible conduit shall be suitable for use in Class I, Division 1, Group D hazardous locations, and liquid-tight for wet locations. Conduit shall have an interior insulating liner to protect conductors from abrasion under vibrating conditions. Conduit shall provide a continuous electrical path. Explosion proof flexible conduit shall be Crouse-Hinds, O-Z/Gedney ECGJH, ECLK Series, Appleton EXGJH or EXLK Series Flexible Coupling, or equal.

I. Explosion Proof Conduit Seals: Explosion-proof conduit seals shall be suitable for use in Class I, Division 1, Group D hazardous location. Explosion proof conduit seals shall be Crouse-Hinds EYS or EZS Series, Appleton EYS, ESU, or EY Series, O-Z/Gedney EYA, EY, EZS Series explosion-proof sealing fitting, or equal.

J. Miscellaneous Fittings: Fittings shall be suitable for use with conduits and ducts supplied. All conduit bodies, fittings, and boxes installed in classified hazardous locations (Class I, Division 1 or 2, Group D) shall be UL-listed, FM listed, or ETL listed suitable for use in the respective classified hazardous location. Fittings shall be as manufactured by Appleton, Crouse-Hinds, Hubbell-Killark, O-Z/Gedney, or equal.

K. Provide NEMA 4 hubs for all conduit entries into boxes or enclosures rated NEMA 4 or NEMA 4X to maintain the NEMA 4, 4X rating of the respective enclosure. Provide NEMA 4X stainless steel hubs for NEMA 4X stainless steel enclosures.

L. Electrical Manholes: Electrical handholes shall be constructed in accordance with the details as shown on the Construction Plans.

M. Fire Stopping Material

1. Fire stopping materials shall consist of commercially manufactured products capable of passing ASTM E-814 (UL 1479) Standard Method of Fire Test for Through Penetration Fire Stops.

2. Fire stopping materials shall maintain the rating of the wall, partition or floor opening that penetration is made. Comply with NEC 300.21.

3. Fire stopping materials shall be U.L. classified.

4. Acceptable Products:
   a. 3M - Fire Barrier.
   b. Thomas & Betts - Flame Safe.
PART 3 - EXECUTION

3.1 INSPECTION

A. All conduits shall be inspected for proper fit and finish, for out-of-round and for proper thickness. All burrs and flashing shall be removed. Conduit and fittings shall be clean and free of obstructions.

3.2 LOCATE EXISTING UTILITIES

A. The location, size, and type of material of existing underground and/or aboveground utilities indicated on the Plans are not represented as being accurate, sufficient, or complete. Neither the Owner nor the Engineer assumes any responsibility whatever in respect to the accuracy, completeness, or sufficiency of the information. There is no guarantee, either expressed or implied, that the locations, size, and type of material of existing underground utilities indicated are representative of those to be encountered in the construction. It shall be the Contractor’s responsibility to determine the actual location of all such facilities, including service connections to underground utilities. Prior to construction, the Contractor shall notify the utility companies of his operational plans, and shall obtain from the respective utility companies detailed information and assistance relative to the location of their facilities and the working schedule of the companies for removal or adjustment, where required. In the event an unexpected utility interference is encountered during construction, the Contractor shall immediately notify the utility company of jurisdiction. The Owner’s Representative shall also be immediately notified. Any damage to such mains and services shall be restored to service at once and paid for by the Contractor at no additional cost to the Contract.

B. All utility cables and lines shall be located by the respective utility. Contact JULIE (Joint Utility Location Information for Excavators) for utility information, phone: 1-800-892-0123. Also coordinate work with all aboveground utilities.

C. Contractor shall locate and mark all existing cables within ten (10) feet of proposed excavating/trenching area. Any cables found interfering with proposed excavation or cable/trenching shall be hand dug and exposed. Any damaged cables shall be immediately repaired to the satisfaction of the respective utility and/or Owner’s Representative at the Contractor’s expense. The respective utility and Owner’s Representative shall be notified immediately if any cables are damaged.

D. Payment for locating and marking underground utilities and cables will not be paid for separately, but shall be considered incidental to the respective duct installation or respective item of work.

3.3 INSTALLATION

A. All exterior above grade exposed conduit located at the pump station shall be PVC coated rigid steel conduit or PVC coated rigid aluminum conduit. All conduits entering or leaving the pump station wet well shall be PVC coated rigid steel conduit or PVC coated rigid aluminum conduit.
B. Exterior above grade exposed conduit located at the site for the electric service and standby engine generator shall be galvanized rigid steel conduit.

C. Exposed above grade conduits for grounding electrode conductors shall be Schedule 40 (minimum) PVC conduit.

D. All below grade conduit shall be as detailed on the Plans and specified herein.

E. All work shall be laid out with sleeves for openings through slabs, pump station or valve vault walls, etc. as required. If sleeves and inserts are not properly installed, the Contractor will be required to do all necessary cutting and patching to accommodate conduits.

F. Conduit size and fill requirements shall comply with Chapter 9 and Annex C of the NEC. It should be noted these are minimum requirements and larger conduit sizes or smaller fill requirements shall be used whenever specified or detailed on the Drawings.

G. Use liquid-tight, flexible metal conduit or flexible metal conduit for final connection to engine generator set, transformers, motors, and for equipment subject to movement, vibration, and/or noise transmission. For each conduit size up to 1-in. trade size, flexible conduit shall be minimum length of 12 in. and a maximum length of 36 in. and for conduit sizes above 1-in. trade size, flexible conduit shall be minimum length of 20 in. and maximum length of 48 in. Liquid-tight, flexible metal conduit and/or flexible metal conduit that is used for flexibility (including connections to engine generator set, motors, and transformers) shall require and external bonding jumper or internal equipment grounding conductor per NEC 350.60. Do not install liquid-tight, flexible metal conduit that is not UL-listed. Confirm liquid-tight, flexible metal conduit bears the UL label prior to installation. Do not install liquid-tight flexible metal conduit in a classified hazardous location unless it is approved and listed suitable for use in the respective classified hazardous location.

H. Explosion-proof flexible conduit shall be provided as a connection between each motor junction box (or any other piece of equipment subject to movement or vibration) and the rigid conduit system where installed in a classified hazardous location.

I. Ream conduits only after threads are cut. Cut joints square to butt solidly into couplings. Where necessary to join two pieces of conduit and it is impossible to use standard coupling, use three piece malleable iron conduit coupling. The use of running thread is prohibited. This applies to all rigid conduit installations, underground or otherwise.

J. Make all joints in steel underground conduit watertight with approved joint compound. Temporarily plug conduit openings to exclude water, concrete or any foreign materials during construction. Clean conduit runs before pulling in conductors.

K. Hickey bends will not be acceptable for conduits 1-in. and larger. Use manufactured elbows or bends fabricated with bending machine. Field bending of all PVC conduit shall be accomplished with the use of equipment approved by the conduit manufacturer. Open flame bending equipment will not be acceptable.

L. A run of conduit between outlet and outlet, between fitting and fitting or between outlet and fitting shall not contain more than the equivalent of four 90 Degree bends, including bends immediately at an outlet or fitting.
M. Where conduit enters a box or fitting provide a steel locknut and an insulated metallic bushing. Use this method to terminate conduit in panels, pull boxes, safety switches, etc. Conduit terminations in panel boards (circuit breaker panels or load centers) shall have grounding bushings with ground wire connections between the bushing and the ground bus.

N. Do not run conduit below or adjacent to water piping, unless specifically detailed otherwise on the Plans.

O. Run exposed conduits parallel with the respective walls or supporting structure and at right angles to respective building, not diagonally. Make bends and turns with corrosion resistant pull boxes or cast aluminum or hot-dipped galvanized malleable iron fittings and covers.

P. Conduit terminations shall include bushings to protect conductors from damage from conduit.

Q. Set screw type fittings are prohibited.

R. Use only screws, bolts, washers, etc. fabricated from rust resisting metals for the supporting of boxes.

S. The electrical handholes and manholes shall be constructed in accordance with the details as shown on the Construction Plans.

3.4 EXCAVATION FOR UNDERGROUND DUCTS AND DUCT BANK

A. The ground shall be excavated in open trenches to width, depth, and in direction necessary for proper installation of underground duct work and any manholes, handholes, etc. and connections as may be shown on the Plans. Trench widths shall be held to a minimum.

B. Any necessary sheathing to prevent cave-ins, etc. shall be provided by and the responsibility of the respective Contractor installing the duct bank.

C. Where muck of unstable ground is encountered in bottom of trench, it shall be excavated to a depth of at least 12 in. below the line of the duct or slab. Where bottom of trench is excavated below necessary elevation, it shall be brought to proper grade by use of sand or 3/8 in. gravel, well compacted.

D. Where excavation for a respective portion of trench is in water or wet sand, Contractor shall install a pumping system to dewater the trench.

E. Excavations shall be deeper than minimum wherever required in order that ducts or conduits may be installed so as to avoid new or existing piping, etc., as dictated by site conditions or directed by Owner’s Representative.

F. Should conduits or ducts pass under sidewalks, roads, curbs, parking lots, or other paved areas Contractor shall take up same in order to install conduits or ducts. All sidewalks, roads, curbs, parking lots, or other paved areas shall be replaced with material equal to that removed and shall be as approved by the Owner’s Representative.
G. The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures, utilities, and piping, both known and unknown, may be determined, and the Contractor shall be held responsible for the repair of such structures, utilities, and piping when broken or otherwise damaged by the Contractor.

3.5 UNDERGROUND CONDUIT INSTALLATION

A. The proposed conduits and ducts shall be constructed at the locations and in accordance with the details shown on the Construction Plans. Ducts shall be installed 24 in. minimum below grade to the top of conduit. Ducts located in areas subject to farming shall be 42 in minimum below grade. Ducts located below roadways shall be 42 in minimum below grade. Where detailed on the Plans or where required to avoid obstructions, ducts shall be buried deeper. Where concrete-encased duct interfaces to directional-bored duct at a pavement crossing, the concrete encasement shall be installed up to the respective pavement edge. Where concrete-encased duct interfaces to an electrical handhole or manhole, the concrete encasement shall be installed up to the respective handhole or manhole. Provide bushings or bells at conduit terminations in electrical handholes or manholes.

B. Underground ducts installed by directional-boring method shall be installed in a manner that will not damage any existing underground utilities, and shall not disturb or damage the respective pavement or roadway surface. Ducts shall be directional-bored at the locations shown on the Construction Plans. The ducts will be bored at a minimum depth of 24 in. below the bottom of the pavement it is being bored under. Ducts installed under paved areas and roadways shall extend a minimum of 10 ft beyond the respective pavement or roadway surface. A pull wire will be left in the conduit if it is to be left vacant. The ends of the conduit will be sealed with approved plugs.

C. Conduit lines shall be laid with a minimum slope of 4 in. per 100-ft. Ells and offsets shall be made with factory ells or with field bends made in accordance with conduit manufacturer’s recommendations. The minimum bend radius shall be 36 in. Otherwise, long sweep bends having a minimum radius of 25 ft shall be used for a change of direction of more than 5 degrees, either horizontally or vertically. Both curved and straight sections may be used to form long sweep bends as required.

D. Conduits shall be kept clean of concrete, dirt, or foreign substances during storage and construction. After conduit installation, a standard flexible mandrel shall be used for cleaning followed by a brush with stiff bristles. Mandrel shall be at least 12 in. long and have a diameter ¼-in. less than the inside diameter of the conduit being cleaned. All obstructions in conduits shall be removed prior to pulling wires or final acceptance. Conduits unable to pass mandrel shall be replaced. All unused conduits shall be capped.

E. Trench widths shall be held to a minimum.

F. Examine all available site utility information in regard to existing utility lines and locate and protect existing lines. Repair all existing utility lines that are damaged by this construction.

G. All excavations shall be barricaded, lighted and protected during construction.

H. Contractor shall obtain approval from Owner for proposed schedules of any description of vehicular or pedestrian traffic for the installation of this work.
I. The Contractor will determine if there is a conflict between the installation of the proposed electrical ducts and any existing utilities. He will make all necessary adjustments in depth of installation to avoid any and all proposed underground improvements.”

J. Contractor shall backfill all excavations, grade, mulch, and seed to restore. Any and all trenches and disturbed areas will be backfilled and restored to a smooth grade and seeded to the satisfaction of the Engineer. All trench settlement shall be corrected for a period of one year. Restoration, grading, and seeding of areas disturbed during the installation of the proposed ducts will be incidental to the respective pay item for which the duct is installed.

3.6 CONCRETE PAD PENETRATIONS AND SLEEVE INSTALLATION

A. Provide sleeves for all electrical raceways, and wiring passing through concrete pads or other structures. Sleeves shall be of sufficient length to extend through the respective pad or structure. Interior diameter of sleeves shall provide 1/2 inch clearance all around conduit.

3.7 SPECIAL INSTALLATION

A. Hazardous Locations

1. Per Illinois Environmental Protection Agency Title 35: Environmental Protection, Subtitle C: Water Pollution, Chapter II: Environmental Protection Agency Part 370: Illinois Recommended Standards for Sewage Works all electrical equipment installed in a sewage pump station wet well shall be suitable for Class I, Division 1, Group D hazardous location. In addition equipment located in a sewage wet well shall be suitable for use under corrosive conditions. All electrical installations associated with a sewage pump station shall conform to the applicable sections of NEC 500, 501, and 504 in addition to the other applicable sections of NEC. Where electrical equipment is installed in a classified hazardous location it shall be UL-listed, Factory Mutual- listed, or ETL-listed suitable for use in the respective classified hazardous location.

2. Per NFPA 820, Standard for Fire Protection in Wastewater Treatment and Collection Facilities, a wastewater pumping station wet well (with no ventilation or ventilated at less than twelve (12) air changes per hour) is classified as a Class I, Division 1, Group D hazardous location. All electrical installations associated with the pumping station wet well shall conform to the applicable sections of NEC 500, 501, and 504 in addition to the other applicable sections of NEC. Where electrical equipment is installed in a classified hazardous location it shall be UL- listed, Factory Mutual-approved, or ETL-listed suitable for use in the respective classified hazardous location.

3. Perform all work in classified hazardous locations as defined by the NEC in strict accordance with the NEC for the particular "Class", "Division", and "Group" of hazardous locations involved or indicated on the Drawings. Provide conduit and cable seals in accordance with the NEC.

4. All conduits installed in classified hazardous locations (including Class I, Division 1 or 2, Group D) shall be suitable for the respective location. All boxes and fittings installed in Class I, Division 1 locations shall be approved (FM Approved or UL-listed) suitable for
NORTHWEST SANITARY SEWER SERVICE AREA RECONSTRUCTION  
CITY OF DANVILLE, IL

Class I, Division 1 locations. All boxes and fittings installed in Class I, Division 2 locations shall conform to the requirements of NEC 501.10 (B)(4).

5. Per Article 501.15 (C) (6) of the 2017 NEC and UL Standard 886, the cross sectional area for conductors installed in a conduit seal off fitting shall not exceed 25 percent, unless the conduit seal off fitting has been specifically approved for a higher percentage of fill.

6. Install explosion-proof conduit sealing fittings in conformance with the respective manufacturer’s instructions. Contact the respective seal off manufacturer if assistance is required for direction of installing packing fiber to form a dam and pouring the sealing compound.

7. Conduits to or from a sewage pump station wet well shall be PVC Coated Rigid Steel or PVC Coated Rigid Aluminum.

8. EMT is not suitable for use in classified hazardous locations and, therefore, shall not be installed in classified hazardous locations.

END OF SECTION 16111
PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The work included in this section is the supply of wire and cable to provide a complete and operational electrical system.

1.2 RELATED SECTIONS

A. Section 16010 – Basic Electrical Requirements.
B. Section 16111 – Conduit and Raceway.
C. Section 16450 – Grounding.

1.3 REFERENCE TO STANDARDS

E. NFPA 70 – National Electrical Code (most current issue in force).
F. NFPA 70E – Standard for Electrical Safety in the Workplace.

1.4 DELIVERY, STORAGE AND HANDLING
A. Wire and cable shall be delivered on reels or coiled in boxes. Wire and cables shall be stored and handled to prevent damage to conductor and insulation.

1.5 SUBMITTALS

A. The Contractor shall furnish shop drawings for approval before ordering equipment and/or materials. Shop drawings are required for all cable types and sizes to be used on the project. Shop drawings shall be clear and legible. Copies that are illegible will be rejected. The preferred shop drawing submittal format shall be electronic (PDF) copies. Contractor may submit hard copies of shop drawings instead of electronic copies where applicable. In the event that the Contractor provides hard copies of shop drawings he shall submit sufficient quantities to meet the needs of his personnel, sub-contractor personnel, and equipment suppliers plus four (4) copies to be retained by the Project Engineer. Shop drawings shall include the following information:

1. In order to expedite the shop drawing review, inspection and/or testing of materials and equipment, the Contractor shall furnish complete statements to the Project Engineer as to the origin and manufacturer of all materials and equipment to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials and equipment.

2. Shop drawings shall include cable and/or conductor cut sheets with type, size, specifications, product data, UL listing, manufacturer, and catalog or part number.

3. Where cable is required to have colored coded insulation, provide information on the color coding the respective conductors.

1.6 QUALIFICATIONS

A. The wire and cable shall be manufactured and supplied by a company regularly engaged in the business of furnishing wire and cable. If required by the Engineer, the manufacturer shall submit a certification to a minimum experience of five years in the manufacture of wire and cable.

1.7 MAINTENANCE SERVICE (WARRANTY)

A. Wire and cable shall be warranted to be free from defects in material and workmanship for a period of one year from date of substantial completion by the Owner.

PART 2 - PRODUCTS AND MATERIALS

2.1 GENERAL

A. All cable shall be UL-listed as suitable for installed application.
2.2 BUILDING WIRE SPECIFICATION

A. XHHW Wire. Cable shall comply with UL Standard 44, ICEA S-95-658/NEMA WC70 and Federal Specification A-A-59544. Conductors shall be Class B, stranded-annealed, uncoated copper per UL Standard 44. Insulation shall be rated for 600-Volts. Insulation shall be cross-linked polyethylene complying with the physical and electrical requirements of UL Standard 44 for Type XHHW-2. Cable shall be UL-listed and marked XHHW-2.

B. THWN Wire. Cable shall comply with Underwriters’ Laboratories Standard UL-83 and Federal Specification A-A-59544. Conductor shall be soft annealed uncoated copper and shall comply with ASTM B3 and B8. Insulation shall be rated for 600V. Insulation shall be polyvinyl-chloride conforming to Underwriters’ Laboratories requirements for Type THW. The outer covering shall be nylon conforming to Underwriters’ Laboratories for type THHN or THWN. Cable shall be UL-listed and marked THWN-2. Note where THWN wiring is referenced on the Plans it shall be THWN-2.


D. Joints and Splices

1. Make terminations, taps and splices with an indent type pressure connector with insulating cover for 8 AWG and smaller.

   a. Acceptable Manufacturers:

      (1) Buchanan,
      (2) Burndy,
      (3) Ideal, and
      (4) Thomas & Betts.

2. Instead of indent type connectors insulated spring compression connectors may be used for 10 AWG and smaller.

   a. Acceptable Products:

      (1) Buchanan,
      (2) Ideal, Wing Nut,
      (3) ITT Holub, Free Spring,
      (4) T&B, Piggy, and
      (5) 3M, Scotchlok.

3. Use mechanical compression or bolted type connector for 6 AWG or larger. Cover connector with insulating type of heat shrinkable insulation equivalent to 150% conductor insulation.

   a. Acceptable Manufacturers:
E. COLOR CODING: Color-code phase and neutral conductor insulation for No. 6 AWG or smaller. Provide colored marking tape for phase and neutral conductors for No. 4 AWG and larger. Insulated ground conductors shall have green-colored insulation for all conductor sizes (AWG and/or KCMIL) to comply with NEC 250.119. Contractor shall arrange with his supplier to provide conductors with green colored insulation for all insulated ground wires regardless of conductor size (AWG and/or KCMIL). Neutral conductors shall have white-colored insulation for No. 6 AWG and smaller to meet the requirements of NEC 200.6. Standard colors for power wiring and branch circuits shall be as follows:

<table>
<thead>
<tr>
<th></th>
<th>120/240 VAC, 1-Phase, 3-wire</th>
<th>208/120 VAC, 3-Phase, 4-wire</th>
<th>480/277 VAC, 3-Phase, 4-wire</th>
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</thead>
<tbody>
<tr>
<td>Phase A</td>
<td>Black</td>
<td>Black</td>
<td>Brown</td>
</tr>
<tr>
<td>Phase B</td>
<td>Red</td>
<td>Red</td>
<td>Orange</td>
</tr>
<tr>
<td>Phase C</td>
<td>(Not applicable)</td>
<td>Blue</td>
<td>Yellow</td>
</tr>
<tr>
<td>Neutral</td>
<td>White</td>
<td>White</td>
<td>Gray</td>
</tr>
<tr>
<td>Ground</td>
<td>Green</td>
<td>Green</td>
<td>Green</td>
</tr>
</tbody>
</table>

F. Intrinsically Safe Wiring: Intrinsically safe wiring shall be identified in accordance with NEC (National Electrical Code) 504.80 “Identification”. Color-code intrinsically safe wiring with light blue colored insulation in accordance with NEC 504.80 (C) “Color Coding.”

G. Wire Pulling Lubricant

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

2. The lubricant shall be compatible with the cable insulation and shall not cause any premature deterioration of the insulating material.

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

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

5. Acceptable Manufacturers/Products:
   a. American Colloid/Poly-X,
PART 3 - EXECUTION

3.1 INSTALLATION OF BUILDING WIRE AND CABLE

A. The Contractor shall install the specified cable at the approximate locations indicated on the Plans. Unless otherwise shown on the Plans, all cable required to cross under pavements shall be installed in concrete encased duct banks. Wherever possible, cable shall be run without splices, from connection to connection.

B. The Contractor shall furnish and install all materials necessary for complete and operational installation, as specified herein, and as shown on the Plans. The complete installation and wiring shall be done in a neat, workmanlike manner. All electrical work shall comply with the requirements of the NFPA 70 – National Electrical Code (NEC), most current issue in force, and all other applicable local codes, laws, ordinances, and requirements in force. Electrical equipment and materials shall be installed in conformance with the respective manufacturer’s directions and recommendations for the respective application. Any installations which void the UL listing, Intertek Testing Services verification/ETL listing, FM approval (or other third party listing), and/or the manufacturer’s warranty of a device will not be permitted.

C. Contractor shall coordinate work and any power outages with the Owner’s Representative. Any shutdown of existing systems shall be scheduled with and approved by the Owner’s Representative prior to shutdown. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures including, but not limited to, 29 CFR section 1910.147 The Control of Hazardous Energy (lockout/tagout).

D. Contractor shall comply with the applicable requirements of NFPA 70E – Standard for Electrical Safety in the Workplace.

E. All temporary installations shall comply with National Electrical Code Article 590 – “Temporary Installations”.

F. Wire and cable shall be warranted to be free from defects in material and workmanship. Wire and cable shall be installed using accepted industry methods to prevent damage to conductors and insulation.

G. Installation shall comply with all applicable sections of the NEC regarding conduit fill. Do not exceed conduit fill established by the NEC for number of conductors installed in a raceway.

H. Splices will not be permitted in conduit bodies. All splices shall be made in outlet boxes or junction boxes provided for that purpose as detailed or required by need. Make all feeder
cables continuous for origin to panel or equipment terminations without running splices in intermediate pull or boxes, unless specifically indicated on the Plans or approved in writing by the Owner’s Representative.

I. All conduits shall be swabbed until all moisture and grit is removed before any wires are pulled. Do not pull any cable or wire in a raceway until conduit system is complete and internal raceway has been cleaned.

J. Strain on cables shall not exceed manufacturer's recommendations during pulling. Use pulling lubricant, compatible with insulation and covering that will not cause deterioration of insulation or jacket covers of cables or conductors. Use pulling lubricant shall be as recommended by wire manufacturer.

K. Neatly train and lace wiring inside boxes, equipment and panelboards or load centers.

L. Provide each cable or conductor in panels, junction or pull boxes with a permanent pressure-sensitive label with suitable numbers or letters for easy identification. Identify wires at each end and in junction boxes with circuit numbers.

M. Provide wires and cables entering equipment or panels with enough slack to eliminate stretched, angular connection. Neatly arrange wiring, bundle and fan out to termination panels. Make minimum bending radius for conductors in accord with NEC.

N. Support all conductors in vertical raceways in accordance with National Electrical Code.

O. All cables installed by the Contractor shall be properly labeled and tagged at all points of access (junction structures, handholes, manholes, wireways, and junction boxes).

P. Intrinsically safe wiring shall maintain separation from power and non-intrinsically safe wiring in accordance with NEC 504.30 “Separation of Intrinsically Safe Conductors”.

3.2 INSTALLATION IN DUCT BANKS OR CONDUITS

A. The maximum number and voltage ratings of cables installed in each single duct or conduit, and the current-carrying capacity of each cable shall be per the latest version of the National Electric Code, or the code of the local agency or authority having jurisdiction.

B. The Contractor shall make no connections or splices of any kind in cables installed in conduits or duct banks.

C. Unless otherwise designated in the plans, where ducts are in tiers, use the lowest ducts to receive the cable first, with spare ducts left in the upper levels. Check duct routes prior to construction to obtain assurance that the shortest routes are selected and that any potential interference is avoided.

D. The Contractor shall run a mandrel through duct banks or conduit prior to installation of cable to ensure that the duct bank or conduit is open, continuous and clear of debris. The mandrel size shall be compatible with the conduit size. The Contractor shall swab out all conduits/ducts and clean light bases, manholes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed, the light bases and all accessible points of entry to the duct/conduit system shall be
kept closed except when installing cables. Cleaning of ducts, light bases, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be re-cleaned at the Contractor’s expense. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the Engineer of any blockage in the existing ducts.

E. The cable shall be installed in a manner that prevents harmful stretching of the conductor, damage to the insulation, or damage to the outer protective covering. The ends of all cables shall be sealed with moisture-seal tape providing moisture-tight mechanical protection with minimum bulk, or alternately, heat shrinkable tubing before pulling into the conduit and it shall be left sealed until connections are made. Where more than one cable is to be installed in a conduit, all cable shall be pulled in the conduit at the same time. The pulling of a cable through duct banks or conduits may be accomplished by hand winch or power winch with the use of cable grips or pulling eyes. Maximum pulling tensions shall not exceed the cable manufacturer’s recommendations. A non-hardening cable-pulling lubricant recommended for the type of cable being installed shall be used where required.

F. The Contractor shall submit the recommended pulling tension values to the Engineer prior to any cable installation. If required by the Engineer, pulling tension values for cable pulls shall be monitored by a dynamometer in the presence of the Engineer. Cable pull tensions shall be recorded by the Contractor and reviewed by the Engineer. Cables exceeding the maximum allowable pulling tension values shall be removed and replaced by the Contractor at the Contractor’s expense.

G. The manufacturer’s minimum bend radius or NEC requirements (whichever is more restrictive) shall apply. Cable installation, handling and storage shall be per manufacturer’s recommendations. During cold weather, particular attention shall be paid to the manufacturer’s minimum installation temperature. Cable shall not be installed when the temperature is at or below the manufacturer’s minimum installation temperature. At the Contractor’s option, the Contractor may submit a plan, for review by the Engineer, for heated storage of the cable and maintenance of an acceptable cable temperature during installation when temperatures are below the manufacturer’s minimum cable installation temperature.

H. Cable shall not be dragged across base can or manhole edges, pavement or earth. When cable must be coiled, lay cable out on a canvas tarp or use other appropriate means to prevent abrasion to the cable jacket.

I. Provide cable identification tags at points of access such as junction boxes, handholes, manholes, or other junction structures. Identification tags shall be waterproof and corrosion resistant.

3.3 LOCATING OF EXISTING UNDERGROUND UTILITIES AND CABLES

A. The location, size, and type of material of existing underground and/or aboveground utilities indicated on the Plans are not represented as being accurate, sufficient or complete. Neither the Owner nor the Engineer assumes any responsibility whatever in respect to the accuracy, completeness, or sufficiency of the information. There is no guarantee, either expressed or implied, that the locations, size and type of material of existing underground utilities indicated are representative of those to be encountered in the construction. It shall be the Contractor’s responsibility to determine the actual location of all such facilities, including service
connections to underground utilities. Prior to construction, the Contractor shall notify the utility companies of his operational plans and shall obtain from the respective utility companies detailed information and assistance relative to the location of their facilities and the working schedule of the companies for removal or adjustment where required. In the event an unexpected utility interference is encountered during construction, the Contractor shall immediately notify the utility company of jurisdiction. The Engineer shall also be immediately notified. Any such mains and services shall be restored to service at once and paid for by the Contractor at no additional cost to the Contract.

A. Contact JULIE (Joint Utility Location Information for Excavators) for utility information, phone: 1-800-892-0123. Also coordinate work with all aboveground utilities.

B. In areas where there is a congestion of buried cable or where the proposed cable crosses an existing cable, the Contractor shall be required to trench the proposed cable into place. When crossing existing circuits, the Contractor will be required to hand dig the trenches for the proposed cable. The hand digging of this cable will be considered incidental to the contract unit price of the proposed cable and no additional compensation will be allowed. In all other areas, the Contractor has the option to either trench or plow the proposed cable in unit duct into place. The trenching or plowing of this cable will be considered incidental to the contract unit price of the proposed cable and no additional compensation will be allowed.

C. The Contractor shall identify all existing underground utilities located within the area where the proposed cables are being installed, and will take all precautions to protect these utilities from damage. Care shall be taken so as not to damage any existing circuits. Any existing circuits damaged shall be immediately repaired to the satisfaction of the Engineer and/or the respective utility or owner where applicable. Any underground utility damaged will be repaired or replaced at the Contractor’s own expense. Any repairs of existing cables will be considered incidental to the contract, and no additional compensation will be allowed.

3.4 TESTING

A. Inspect wiring for physical damage and proper connection.

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

C. Verify proper phasing and correct or adjust connections, where applicable.

D. Torque test conductor terminations to manufacturer's values.

END OF SECTION 16120
PART 1 - GENERAL

1.1 DESCRIPTION OF THE WORK
   A. The work included in this section is the supply and installation of all junction and pull boxes to provide a complete and operational electrical system.

1.2 RELATED SECTIONS
   A. Section 16010 – Basic Electrical Requirements.
   B. Section 16111 – Conduit and Raceway.
   C. Section 16120 – Wire and Cable.
   D. Section 16450 – Grounding.

1.3 REFERENCE TO STANDARDS
   A. NEMA 4.
   B. NEMA 4X.
   C. NEMA 7.
   D. NFPA 70 – National Electrical Code (NEC) (most current issue in force).

1.4 DELIVERY, STORAGE AND HANDLING
   A. Boxes shall be stored away from contact with the earth and protected from the weather.

1.5 SUBMITTALS
   A. The Contractor shall furnish shop drawings for approval before ordering equipment and/or materials. Shop drawings are required for junction and pull boxes to be used on the project. Shop drawings shall be clear and legible. Copies that are illegible will be rejected. The preferred shop drawing submittal format shall be electronic (PDF) copies. Contractor may submit hard copies of shop drawings instead of electronic copies where applicable. In the event that the Contractor provides hard copies of shop drawings he shall submit sufficient quantities to meet the needs of his personnel, sub-contractor personnel, and equipment suppliers plus four (4) copies to be retained by the Project Engineer. Shop drawings shall include the following information:
1. In order to expedite the shop drawing review, inspection and/or testing of materials and equipment, the Contractor shall furnish complete statements to the Project Engineer as to the origin and manufacturer of all materials and equipment to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials and equipment.

2. Shop drawings shall include junction and pull boxes cut sheets with type, size, specifications, UL listing, manufacturer, and catalog or part number.

1.6 QUALIFICATIONS

A. The junction and pull boxes shall be manufactured and supplied by a company regularly engaged in the business of furnishing junction and pull boxes. If required by the Engineer, the manufacturer shall submit a certification to a minimum experience of five years in the manufacture of junction and pull boxes.

1.7 MAINTENANCE SERVICE (WARRANTY)

A. Junction and pull boxes shall be warranted to be free from defects in materials and workmanship for a period of one year from date of substantial completion by the Owner.

PART 2 - PRODUCTS AND MATERIALS

2.1 EQUIPMENT SPECIFICATION

A. In interior conduit runs, located in dry, clean areas, boxes shall be constructed of 14 gauge sheet steel with either galvanized finish or two coats of approved enamel paint. Boxes shall have screw held access covers, or hinged covers. Boxes shall be of sizes noted on the Plans or shall be sized per the NEC Article 314 for the size and number of conduits, wires, and/or splices entering them. Boxes shall be UL listed.

B. Exterior junction and pull boxes located in non-hazardous, non-classified areas shall be NEMA 4X stainless steel sized for conductors and splices per NEC Article 314. Boxes shall be U.L. listed. Boxes shall have hinged covers.

C. Junction boxes located in classified hazardous locations (Class I, Division 1, or 2, Group D), shall be NEMA 7 (explosion proof) cast aluminum with threaded screw on covers and shall comply with applicable provisions of the NEC including but not limited to Articles 500 and 501. NEMA 7 junction boxes shall be UL listed or FM approved suitable for use in Class I, Division 1, Group D locations.

D. Acceptable manufacturers:

1. Appleton Electric Co.,

2. Crouse-Hinds Co.,
3. E-Box Inc.

4. Hoffman Co.,


6. O.Z./Gedney Co.

7. Saginaw Control & Engineering

8. Wiegmann

9. Or approved equal

PART 3 - EXECUTION

3.1 INSTALLATION

A. All electrical work shall comply with the requirements of the NFPA 70 – National Electrical Code (NEC), most current issue in force, and all other applicable local codes, laws, ordinances, and requirements in force. Electrical equipment and materials shall be installed in conformance with the respective manufacturer’s directions and recommendations for the respective application. Any installations which void the UL listing, Intertek Testing Services verification/ETL listing, FM approval (or other third party listing), and/or the manufacturer’s warranty of a device will not be permitted.

B. All pull or junction boxes surface mounted in any interior damp location shall be “standoff” mounted ½-in. from the wall in a manner to promote air circulation completely around the box.

C. Boxes required by code or need which are not detailed on the Plans shall be considered incidental to the proposal price and will not be paid for separately.

D. The Contractor shall coordinate the installation of junction boxes with the general and mechanical work as required at the facility.

E. Any damage to pull or junction boxes shall be immediately repaired or replaced to the satisfaction of the Owner’s Representative.

F. Protect all boxes from entry of foreign materials. Clean out metal shavings, scrap wire, dirt, and debris from each junction or pull box.

G. Provide NEMA 4 hubs for all conduit entries into boxes or enclosures rated NEMA 4 or NEMA 4X to maintain the NEMA 4, 4X rating of the respective enclosure. Provide NEMA 4X stainless steel hubs for NEMA 4X stainless steel enclosures.

H. Independently support all boxes. No parts of the weight or stress thereof shall be borne by the conduits termination therein.
I. Avoid installations in classified hazardous locations. Where boxes are installed in a classified hazardous location they shall be UL listed or FM listed suitable for the respective classified hazardous location, and installed in conformance with the respective requirements of NEC for the respective location.

J. All boxes shall be bonded to ground with a ground lug or screw and a ground wire.

K. Plug all unused openings. Use threaded plugs for cast boxes.

END OF SECTION 16130
PART 1 - GENERAL

1.1 DESCRIPTION OF WORK
   A. Conduit and equipment supports as required and specified herein.
   B. Anchors and Fasteners.

1.2 RELATED SECTIONS
   A. Section 16010 – Basic Electrical Requirements.
   B. Section 16111 – Conduit and Raceway.
   C. Section 16130 – Boxes.
   D. Section 16470 – Panelboards.

1.3 REFERENCE TO STANDARDS
   A. NFPA 70 – National Electrical Code (NEC) (most current issue in force).

1.4 DELIVERY, STORAGE AND HANDLING
   A. Stored conduit and equipment supports shall not be in contact with the earth, but shall be on pallets or other above-grade supports. Conduit and equipment supports shall be covered to minimize exposure to the weather.
   B. Anchors and fasteners shall be stored in their original containers in a clean, dry place. They shall not be exposed to weather.

1.5 SUBMITTALS
   A. The Contractor shall furnish shop drawings for approval before ordering equipment and/or materials. Shop drawings shall be clear and legible. Copies that are illegible will be rejected. The preferred shop drawing submittal format shall be electronic (PDF) copies. Contractor may submit hard copies of shop drawings instead of electronic copies where applicable. In the event that the Contractor provides hard copies of shop drawings he shall submit sufficient quantities to meet the needs of his personnel, sub-contractor personnel, and equipment suppliers plus four
(4) copies to be retained by the Project Engineer. Shop drawings shall include the following information:

1. In order to expedite the shop drawing review, inspection and/or testing of materials and equipment, the Contractor shall furnish complete statements to the Project Engineer as to the origin and manufacturer of all materials and equipment to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials and equipment.

2. Product Data: Provide manufacturer’s catalog data for fastening systems and supports.

3. Manufacturer’s Instructions: Include application conditions and limitations for use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage handling, protection, examination and installation of Product.

1.6 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and shown.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Unistrut.

B. B-Line.

C. Approved Equivalent.

2.2 EQUIPMENT SPECIFICATION

A. Strut-type stainless steel supports shall be provided to support all free standing equipment enclosures and other equipment enclosures as indicated on Plans.

B. Strut supports for outdoor locations or areas that are damp, wet, or subject to corrosion shall be stainless steel P-1000SS as produced by Unistrut Corporation, 35660 Clinton Street, Wayne, Michigan 48184, Phone: 1-800-521-7730, or approved equal. All hardware shall be corrosion resistant stainless steel.

C. Strut support for equipment located in the wet well, valve vault, or other corrosive areas shall be stainless steel or reinforced fiberglass material as manufactured by Unistrut, B-Line, or approved equal.
D. Strut supports for indoor locations in dry non-corrosive areas shall be steel with hot dipped galvanized finish, roll formed from 12 gauge (.105 U.S.S. Gage) cold rolled steel, galvanized material ASTM Des. A-446 Grade A. Material (cold rolled steel) shall be hot dipped galvanized coating conforming to ASTM Specification A-525, Des. G-90. Zinc coating shall form an excellent bond with steel surface so as not to be affected by subsequent forming operations. Supports shall be hot dipped galvanized steel strut, P-1000HG as produced by Unistrut Corporation, 35660 Clinton Street, Wayne, Michigan 48184, Phone: 1-800-521-7730, or approved equal. All hardware shall be corrosion resistant stainless steel.

E. Provide necessary hardware, such as floor flanges, etc., as required to install equipment.

F. Provide materials, sizes and types of anchors, fasteners, and supports necessary to carry the loads of equipment and conduits. Consider weights of conduit when selecting products.

G. Fasteners and anchors shall be corrosion resistant, stainless steel or cadmium plated. Where suitable, non metallic clamps and fasteners may be used.

H. Cable hangers located in the pump station wet well and/or in electrical manholes shall be heavy duty nylon saddle rack with 3 in. throat opening Underground devices, Northbrook, IL, Cat. No. 3SR1 or 3SR2, or approved equal. Cable hangers shall be adequately sized to accommodate the respective cables. Secure cables to cable hangers with corrosion resistant cable ties.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine all supports and fasteners for straightness, rust and corrosion. Do not use any equipment that is not straight or is rusted or corroded.

3.2 PREPARATION

A. All equipment shall be clean at time of installation. Remove all burs.

3.3 INSTALLATION

A. Install products in conformance with manufacturer’s instruction and as detailed on the Plans.

B. Provide anchors, fasteners and supports in accordance with NECA Standard of Installation.

C. Do not fasten supports to pipes, ducts, mechanical equipment or conduit.

D. Do not use spring steel clips or clamps.

E. Install surface mounted cabinets, enclosures and panelboards with a minimum of four anchors.

F. Use spring-lock washers under all nuts.
G. Provide zinc rich paint applied to field cuts of galvanized steel strut support to minimize the potential for corrosion per the respective strut support manufacturer’s recommendation.

H. Concrete work associated with support structures shall conform to Section 1020 PORTLAND CEMENT CONCRETE of the Standard Specifications for Road and Bridge Construction and as detailed on the Plans.

END OF SECTION 16190
PART 1 - GENERAL

1.1 DESCRIPTION OF WORK
A. This section includes field-installed nameplates, labeling and identification methods for electrical equipment, components and wiring.

1.2 RELATED SECTIONS
A. Section 16010 – Basic Electrical Requirements.
B. Section 16120 – Wire and Cable.
C. Section 16130 – Boxes
D. Section 16410 – Enclosed Circuit Breakers
E. Section 16470 – Panelboards
F. Section 16495 – Automatic Transfer Switches
G. Section 16620 Standby Power Generator Systems

1.3 REFERENCE TO STANDARD
A. NFPA 70 – National Electrical Code (NEC) (most current issue in force).

1.4 REGULATORY REQUIREMENTS
A. Conform to requirements of NFPA 70 – National Electrical Code (NEC), most current issue in force.

PART 2 - PRODUCTS

2.1 EQUIPMENT SPECIFICATION
A. Legend plates shall be provided for all equipment. Legend plates shall be provided to identify the equipment controlled, the power source, and the function of each device. Each individual circuit breaker, transfer switch, control panel, motor starter, safety switch, panelboard, load center shall be furnished with a phenolic engraved legend plate that identifies the respective
device, the power source, and the respective voltage, phase, and wire. Furnish additional phenolic engraved legend plates as detailed on the Plans and/or where required by code. Legend plates shall be weatherproof and abrasion resistant phenolic/plastic engraved material and fastened with contact type permanent adhesive, screws, or rivets. Installation shall not break, crack, or deform the legend plate. Lettering shall be 1/4-inch high. Equipment that is powered from a utility power source only (for example the main service disconnect) shall have black lettering on a white background. Equipment that is powered from an emergency/standby power source only (for example the generator breaker) shall have black lettering on a yellow background. Equipment that is normally powered from the utility and backed up by the generator (for example the auto transfer switch) shall have white lettering on a red background.

B. Furnish and install weatherproof warning label for each meter socket, enclosed circuit breaker, disconnect switch, switchboard, panelboard, load center, motor control center, and control panel to warn persons of potential electric arc flash hazards, per the requirements of NEC 110.16 “Flash Protection”. Labels shall also conform to ANSI Z535.4-2002 “American National Standard for Product Safety Signs and Labels”. NEC 110.16 requires that switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing or maintenance while energized, shall be field marked to warn qualified persons of potential arc flash hazards. The markings shall be located so as to be clearly visible to qualified persons before examination, adjustment, servicing, or maintenance of the equipment. This new requirement is intended to help reduce the occurrence of serious injury or death due to arcing faults to those working on or near energized electrical equipment. The warning labels are to indicate to a qualified worker who intends to open the equipment for analysis of work that a serious hazard exists and that the worker should follow appropriate work practices and wear appropriate personal protective equipment (PPE) for the specific hazard. Labels shall be as detailed on the Plans or shall include at least the following information: “Warning - Potential Arc-Flash Hazards exist while working on this energized equipment. Appropriate PPE Required.”

C. Provide legend plates for service equipment with the information on the maximum available fault current and the date the fault current calculation was performed to meet the requirements of NEC 110.24 “Available Fault Current”.

D. All power and control cables in handholes, manholes, and junction boxes shall be tagged to identify the respective cable. A minimum of two cable tags shall be provided on each cable in a manhole: one at the cable entrance and one at the cable exit. Cable tags shall be stamped brass tags or other weatherproof/waterproof corrosion resistant material.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive nameplates and markers.

3.2 INSTALLATION

A. Secure nameplates to equipment using screws or adhesive.
B. Nameplates shall be provided for all panelboards, load centers, disconnects, enclosed starters, control panels, emergency stop stations, etc.

END OF SECTION 16195
PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes solid-state, PWM, VFDs for speed control of three-phase, submersible pump motors. VFDs to be furnished as part of control system package.

B. Related Sections include the following:
   1. Division 11 Section 11302 - Sewage Pump Station.
   2. Division 16 Section 16010 – Basic Electrical Requirements.
   3. Division 16 Section 16111 - Conduit and Raceway.
   4. Division 16 Section 16120 - Wire and Cable
   5. Division 16 Section 16190 - Supporting Devices.
   6. Division 16 Section 16195 - Electrical Identification.
   7. Division 16 Section 16450 - Grounding and Bonding
   8. Division 16 Section 16900 – Control and Instrumentation

1.3 DEFINITIONS

A. BMS: Building management system.

B. IGBT: Integrated gate bipolar transistor.

C. LAN: Local area network.

D. PID: Control action, proportional plus integral plus derivative.

E. PWM: Pulse-width modulated.

F. VFD: Variable frequency drive controller.

1.4 SUBMITTALS

A. Product Data: For each type of VFD. Include dimensions, mounting arrangements, location for conduit entries, shipping and operating weights, and manufacturer's technical data on features, performance, electrical ratings, characteristics, and finishes.
B. Shop Drawings: For each VFD:

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:

   a. Each installed unit's type and details.
   b. Nameplate legends.
   c. Short-circuit current rating of integrated unit.
   d. Listed and labeled for series rating of overcurrent protective devices in combination controllers by an NRTL acceptable to authorities having jurisdiction.
   e. Features, characteristics, ratings, and factory settings of each motor-control center unit.

2. Wiring Diagrams: Power, signal, and control wiring for VFDs. Provide schematic wiring diagram for each type of VFD.

C. Qualification Data: For manufacturer.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For VFDs, all installed devices, and components to include in operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Routine maintenance requirements for VFDs and all installed components.
2. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

F. Load-Current and Overload-Relay Heater List: Compile after motors have been installed and arrange to demonstrate that selection of heaters suits actual motor nameplate full-load currents.

G. Load-Current and List of Settings of Adjustable Overload Relays: Compile after motors have been installed and arrange to demonstrate that dip switch settings for motor running overload protection suit actual motor to be protected.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer. Maintain, within 100 miles of Project site, a service center capable of providing training, parts, and emergency maintenance and repairs.

B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction:

1. Testing Agency's Field Supervisor: Person currently certified by the International Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
C. Source Limitations: Obtain VFDs of a single type through one source from a single manufacturer.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

E. Comply with NFPA 70.

F. Product Selection for Restricted Space: Drawings indicate maximum dimensions for VFDs, minimum clearances between VFDs, and adjacent surfaces and other items. Comply with indicated maximum dimensions and clearances.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store VFDs indoors in clean, dry space with uniform temperature to prevent condensation. Protect VFDs from exposure to dirt, fumes, water, corrosive substances, and physical damage.

B. If stored in areas subject to weather, cover VFDs to protect them from weather, dirt, dust, corrosive substances, and physical damage. Remove loose packing and flammable materials from inside controllers; install electric heating of sufficient wattage to prevent condensation.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Rate equipment for continuous operation, capable of driving full load without derating, under the following conditions, unless otherwise indicated:

1. Ambient Temperature: 0 to 40°C.
2. Humidity: Less than 90 percent (noncondensing).
3. Altitude: Not exceeding 3,300 ft.

1.8 COORDINATION

A. Coordinate layout and installation of VFDs with other construction including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Coordinate features of VFDs, installed units, and accessory devices with pilot devices and control circuits to which they connect.

C. Coordinate features, accessories, and functions of each VFD and each installed unit with ratings and characteristics of supply circuit, motor, required control sequence, and duty cycle of motor and load.

1.9 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents:
1. Spare Fuses: Furnish one spare for every three installed, but no fewer than one (1) set of three (3) of each type and rating.
2. Indicating Lights: Two (2) of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Eaton Corporation; Cutler-Hammer Products Model SVX-9000 VFDs or a comparable product by one of the following:

2. Danfoss Inc.; Danfoss Electronic Drives Div.
3. Eaton Cutler-Hammer
5. Square D; a brand of Schneider Electric.

2.2 VARIABLE FREQUENCY MOTOR CONTROLLERS (DRIVES)

A. All VFD’s shall utilize a voltage source inverter (VSI) design with a pulse width modulated (PWM) output waveform. The VFD shall generate a sine-coded, adjustable voltage/frequency three (3) phase output for complete speed control of any 3 phase, NEMA Design B, squirrel cage induction motor.

B. Provide each VFD with 3 contactor electrical bypass feature for ease of maintenance.

C. The VFD shall have the following basic design:

1. Converter: Converter shall consist of a 3 percent AC line reactor as minimum per IEEE 519, a diode rectifier, and a capacitor bank which will first filter, convert AC to DC, and maintain a fixed DC voltage source from the fixed voltage and frequency input. The minimum impedance of the line reactor shall be 3 percent. If DC Buss Choke’s are standard by a given manufacturer, an AC line reactor shall also be provided (see paragraph 2.2.B.1.c below):

   a. The VFD shall be 95 percent efficient of 100 percent rated output power at 60 Hz.
   b. The VFD shall maintain a power factor of not less than 0.95 throughout its speed range.
   c. AC line reactors with 3 percent impedance on the input power line are required to protect the converter section from transient voltage spikes and to reduce the line side harmonic emissions (EMI) to conform with the requirements of IEEE 519.

2. Inverter: Inverter shall use Insulated Gate Bipolar Transistors (IGBT’s) with a minimum rating of 1000 VDC on 240-VAC controls to invert the converter fixed DC voltage into a pulse width modulated output.
3. Control Logic: Consists of a single printed circuit board and incorporates an 8 bit, or larger, microcomputer central processing unit to control all inverter, converter, base drive, and external interface functions.

4. NEMA 1 enclosure with a full capacity, door interlocked input heavy duty motor circuit protector (MCP) (IEC not acceptable), sized to meet NEC requirements. This disconnect will remove all power to the VFD and any components located within the enclosure. The enclosure shall be of sufficient size to allow mounting of additional relays, signal conditioners, etc. when necessary.

5. Fast acting semiconductor fusing is required to protect the input diode bridge of the converter section.

6. Fusing in the VFD shall be as manufactured by Bussman.

7. All VFD’s shall have a dust-tight, rotary speed potentiometer mounted on the front cover that can be used to control the speed of the VFD while in “Hand” mode.

8. All VFD’s shall have an oil-tight, heavy duty Hand-Off-Auto switch on the front cover. When the Hand-Off-Auto switch is in the “Hand” position, the VFD gets its speed reference signal from the door mounted speed potentiometer. The “Hand” start command shall come from the Hand-Off-Auto switch.

9. When the Hand-Off-Auto switch is in the “Auto” position, the VFD gets its speed reference signal from the Pump Control Panel in the form of a 0-10 VDC, 4-20 mA or serial communication signal. The “Auto” start command shall come from the Pump Control Panel.

10. 120-Volt Control transformer as required plus 100 VA for users external devices. The minimum size of this transformer shall be 150 VA.

11. VFD External Fault and Auto Start circuits shall be able to supply 115 VAC to customer supplied dry contact closures. The 115 VAC power source shall originate within the VFD enclosure and shall only be present when the input circuit breaker is in the “ON” or closed position.

   a. Auto Start signal (from Pump Control Panel). Once the Auto Start contact is closed, a 115 VAC relay located within the VFD enclosure shall be energized. A dry set of contacts from the 115 VAC Auto Start relay shall be used to start the VFD in “Auto”. In “Hand”, the VFD shall ignore the Auto Start command.

12. External Fault signal (from customer supplied safety devices). Once the External Fault contact is closed (normal operation), a 115 VAC relay located within the VFD enclosure shall be energized. A dry set of contacts from the 115 VAC

   a. External Fault relay shall be used to enable the VFD to operate when a start command is present. Loss of the External Fault input signal shall cause the VFD to stop operating, whether the VFD is in “Hand” or “Auto”.

13. Terminal Blocks for Input and Output power and common customer connections shall be provided. Customer connections shall be clearly labeled and shall include the following terminals as a minimum and function as follows:

   a. 115 VAC power (hot and neutral) from control transformer.
   b. External Fault (Safety or Run Enable) input signal.
   c. “Auto” start signal from Pump Control Panel.
   d. “Auto” speed reference signal (from Pump Control Panel).
   e. Motor run status (contact from VFD).
D. The VFD shall have, as a minimum, the following design features as standard:

1. 2-12 kHz sine-coded carrier frequency with a pulse width modulated output. VFD’s with an asynchronous PWM signal that limit or cannot change the carrier frequency may be accepted, pending final decision by Owner.
2. Minimum and maximum speed adjustment capability.
3. Controlled speed range of 20:1, or greater.
4. Overload capability of 110 percent for sixty (60) seconds.
5. Critical frequency jump control.
7. A back lighted LCD alphanumeric display capable of providing in complete English words the following information: Output Frequency, Output Speed, VFD Status, Output Current (AMPS), Output Voltage, DC Bus Voltage, Percent Response Signal, Energy (kWh and MWH), Output Power (kW or HP), Elapsed Time (VFD running hours), Heat Sink Temperature, Input Reference Values and all Fault and Warning Messages.
8. Coast or ramp to stop.
10. Adjustable acceleration and deceleration.
11. On loss of speed reference signal, the VFD shall operate at a preset minimum speed so that the VFD will not drive the pump at a speed capable of causing system problems.
12. VFD shall be provided with an isolation contactor to electrically isolate the drive from the motor feeder.

E. The VFD shall have, as a minimum, the following protective features:

1. Ground fault protection, active at start and while running.
2. Current limit adjustable 60 – 100 percent.
3. Current limited stall prevention during acceleration, deceleration, and run conditions.
4. Automatic voltage boost to prevent nuisance tripping during load or line side transient conditions.
5. Automatic restart after momentary power loss or momentary over-voltage. No restart into ground fault.
6. Start into a rotating motor (flying start). The VFD shall be able to start the motor in the correct direction when it is freewheeling backwards.
7. Anti-windmill protection.
9. Heat sink over temperature protection.

F. The VFD shall have the following adjustments available:

1. Acceleration - 0.1 to 300 seconds.
2. Deceleration - 0.1 to 300 seconds.
3. Volts/hertz adjustments.
4. Maximum frequency range.
5. Minimum frequency or speed.
6. Maximum frequency or speed.
7. Carrier frequency (2 kHz to 12 kHz) adjustable to tenths.

G. The VFD shall have the following minimum I/O requirements:

1. Software and Programming setup:
a. Shall have at minimum, a high speed interface service port (for an individual manufacturers laptop service tools) to permit uploading and downloading of VFD configuration parameters. All necessary software and service port to computer interface hardware shall be provided by the VFD Manufacturer.

b. Programming software shall allow setup of all system parameters.

c. Programming software shall allow monitoring of any VFD tests and allow proper operation to be verified.

2. Analog inputs shall be able to be inverted (direct or indirect acting), and have the ability to be programmed for a minimum and maximum input. The VFD shall have provisions for:

   a. One (1) 0-10 VDC analog input.
   b. One (1) 4-20 mA analog input.

3. Analog outputs shall be programmable to provide the following signals from the VFD as a minimum: Output Frequency, Output Speed, and Output Current. Analog outputs shall be programmable for a minimum and maximum output. The VFD shall have provisions for:

   a. Two (2) 0-10 VDC or two (2) 4-20 mA analog outputs.

4. The VFD shall have six (6) digital inputs capable of accepting a dry contact closure as an input. The digital inputs shall be programmable to represent the following functions as a minimum:

   a. Start signal when in “Hand” (contact from Hand-Off-Auto switch).
   b. “Auto” selected signal (contact from Hand-Off-Auto switch).
   c. Start signal when in “Auto” (contact from 115 VAC Auto-Start relay).
   d. External Fault signal (contact from 115 VAC safety circuit).

5. Three (3) separate preset speed selections using three separate digital inputs. Each digital input shall be programmable to represent one (1) of three (3) preset speeds:

   a. High, Medium and Low (100, 80, and 60 percent respectively).

6. The VFD shall have three (3) digital outputs, each capable of providing a 2 Amp SPDT relay contact as an output. The digital outputs shall be programmable to represent the following functions as a minimum:

   a. Ready (VFD ready to run safety contacts are made and no fault conditions exist. Contacts close when VFD is “Ready”).
   b. Run (VFD has started and is running. Contacts closed when VFD is running).
   c. Fault (VFD Fault condition that has stopped VFD operation. Contacts close when VFD has tripped on a fault condition).

H. The VFD shall be designed to operate within the following environmental and service conditions:

1. Ambient service temperature: 0°C to 40°C.
2. Ambient storage temperature: 0°C to 60°C.
3. Humidity: Non-condensing to 95 percent.
4. Altitude to 3,300 ft.
5. Input voltage: three phase, 240 VAC +/- 10% for 240 VAC series.
6. Input frequency: 60 hertz +/- 3 percent.

I. Software Programming and Setup:

1. Provide VFD programming software and any adapters necessary for operation. As a minimum, software shall allow parameter up/downloading capability from an IBM compatible PC. Software shall be Y2K compliant and support operation on multiple operating systems, i.e. Windows XP, Windows 7.
2. Programming software shall allow setup of all system parameters.
3. Programming software shall allow monitoring of any VFD tests and allow proper operation to be verified.
4. The VFD shall have an RS-485 serial communication port capable of communicating with a laptop PC with the appropriate manufacturer’s software.

J. Long Lead Filter (where required by drive manufacturer):

1. LCR filter for excessive motor lead lengths between VFD and motor exceeding 75 feet for motors below 25 hp and 100 feet for all other motors.
2. Filter manufactured by TCI (Trans-Coil. Inc. - Milwaukee, WI), part number KLCxxBE, where xx is equal to or greater than the motor Full Load Amps.
3. Locate filter within 10 (wire) feet from the VFD that it services.
4. Set the VFD carrier frequency to 8 kHz or below and operating frequency to 60 Hz or below.

2.3 FACTORY FINISHES

A. Finish: Manufacturer's standard paint applied to factory-assembled and -tested VFDs before shipping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, surfaces, and substrates to receive VFDs for compliance with requirements, installation tolerances, and other conditions affecting performance.

B. Examine roughing-in for conduit systems to verify actual locations of conduit connections before VFD installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Select features of each VFD to coordinate with ratings and characteristics of supply circuit and motor; required control sequence; and duty cycle of motor, controller, and load.
B. Select horsepower rating of controllers to suit motor controlled.

3.3 INSTALLATION

A. Anchor each VFD assembly to steel-channel sills arranged and sized according to manufacturer's written instructions. Attach by bolting. Level and grout sills flush with mounting surface.

B. Comply with mounting and anchoring requirements specified in Division 16 Section "Hangers and Supports for Electrical Systems."

C. Comply with mounting and anchoring requirements specified in Division 16 Section "Vibration and Seismic Controls for Electrical Systems."

D. Controller Fuses: Install fuses in each fusible switch. Comply with requirements in Division 16 Section "Fuses."

3.4 IDENTIFICATION

A. Identify VFDs, components, and control wiring according to Division 16 Section "Electrical Identification."

3.5 CONNECTIONS

A. Conduit installation requirements are specified in other Division 16 Sections. Drawings indicate general arrangement of conduit, fittings, and specialties.

B. Ground equipment according to Division 16 Section "Grounding and Bonding."

3.6 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each enclosed controller element, bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to perform the following:

1. Inspect controllers, wiring, components, connections, and equipment installation.
2. Report results in writing.

C. Perform the following field tests and inspections and prepare test reports:

1. Perform each electrical test and visual and mechanical inspection, except optional tests, stated in NETA ATS. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate
3. compliance; otherwise, replace with new units and retest.
4. Motors:
   a. Inspect each motor installed under all divisions of the Specifications for damage, moisture, alignment, proper lubrication, oil leaks, phase identification and cleanliness. Each motor shall be given a megger test. All motors shall be tested as specified herein and the results transmitted to the Engineer.
   b. All motors shall pass a minimum megger reading with windings at ambient temperature. Any motor not meeting this minimum test shall be conditioned and retested until it passes or replaced if it cannot meet the test requirements.
   c. Test Voltage: 500V; Minimum Acceptable Resistance in Megohms: 5.
   d. Apply megger test on three phase motors between all phases tied together and ground. For single phase motors, apply megger test between phase and neutral conductor tied together and ground.
   e. Hold all megger tests for one minute or until the reading maintains a constant value for 15 seconds.
   f. All non-induction type motors or special application motors shall be megger tested as recommended by the motor manufacturer.
   g. Each motor shall be tested for correct rotation, where reverse rotation could damage equipment, the motor shall be mechanically uncoupled before testing.
   h. An operating load test shall be conducted on all motors and the individual phase current readings taken. Under no condition shall the load current exceed the nameplate rating of the motor. If this condition exists, the Engineer shall be notified immediately.
   i. Each motor shall be run long enough to prove satisfactory performance under operating load including but not limited to operating temperature, lubrication, alignment and vibration.
   j. Refer to Division 16 Section "Control and Instrumentation" for Motor Startup Certification and Testing Report.

3.7 ADJUSTING
   A. Set field-adjustable switches and circuit-breaker trip ranges.

3.8 DEMONSTRATION
   A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain variable frequency controllers. Provide minimum one – two (2) hour session.

END OF SECTION 16269
PART 1 - GENERAL

1.1 WORK INCLUDES
   A. Enclosed circuit breakers as detailed on the Plans and specified herein.

1.2 RELATED SECTIONS
   A. Section 16010 – Basic Electrical Requirements.
   B. Section 16111 – Conduit and Raceway.
   C. Section 16120 – Wire and Cable.
   D. Section 16190 – Supporting Devices.
   E. Section 16195 – Electrical Identification.
   F. Section 16421 – Utility Service Entrance and Metering
   G. Section 16450 – Grounding and Bonding.

1.3 REFERENCE TO STANDARDS
   A. NFPA 70 – National Electrical Code (NEC) (most current issue in force).
   B. NFPA 70E – Standard for Electrical Safety in the Workplace.
   C. NEMA AB 1 – Molded Case Circuit Breakers, Molded Case Switches, and Circuit Breaker Enclosures.
   D. NEMA AB 3 – Molded-Case Circuit Breakers and Their Application.
   E. NEMA AB 4 - Guidelines for Inspection and Preventative Maintenance of Molded-Case Circuit Breakers Used in Commercial and Industrial Applications.
   F. NEMA KS1 Enclosed and Miscellaneous Distribution Equipment Switches (600V Maximum)
   G. NEMA 1.
   H. NEMA 4, 4X.
   I. NEMA 12.
J. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum).


L. UL 50 – Cabinets and Boxes.

M. UL Standard 489 – Molded Case Circuit Breakers.

1.4 DELIVERY, STORAGE AND HANDLING

A. Circuit breakers shall be stored in containers as delivered to job site, in a clean and dry location, protected from construction.

1.5 SUBMITTALS

A. The Contractor shall furnish shop drawings for approval before ordering equipment and/or materials. Shop drawings are required for safety switches and disconnects to be used on the project. Shop drawings shall be clear and legible. Copies that are illegible will be rejected. The preferred shop drawing submittal format shall be electronic (PDF) copies. Contractor may submit hard copies of shop drawings instead of electronic copies where applicable. In the event that the Contractor provides hard copies of shop drawings he shall submit sufficient quantities to meet the needs of his personnel, sub-contractor personnel, and equipment suppliers plus four (4) copies to be retained by the Project Engineer. Shop drawings shall include the following information:

1. In order to expedite the shop drawing review, inspection and/or testing of materials and equipment, the Contractor shall furnish complete statements to the Project Engineer as to the origin and manufacturer of all materials and equipment to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials and equipment.

2. Enclosure types and details.


4. Short-circuit current ratings (interrupting and withstand, as appropriate).

5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.

6. Provide catalog sheets and showing manufacturer, model number, voltage, circuit breaker size, Amperage ratings, number of poles, withstand and closing ratings, dimensions, and enclosure details.

7. Coordinate with auto transfer switch withstand and closing ratings with the service entrance breaker/disconnect and the generator breaker/disconnect to maintain the
“withstand and closing ratings” of the switch. Include this information with the submittal.

1.6 QUALIFICATIONS
A. Circuit breakers shall be furnished by a manufacturer regularly engaged in the construction of circuit breakers, with at least ten years of experience in furnishing circuit breakers.

1.7 REGULATORY REQUIREMENTS
A. Conform to requirements of NFPA 70 – National Electrical Code.
B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

1.8 MAINTENANCE SERVICE (WARRANTY)
A. Circuit breakers shall be warranted to be free from defects in material and workmanship for period of one year from date of substantial completion established by the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
B. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
C. Square D; a brand of Schneider Electric.
D. Or approved equivalent manufacturer’s circuit breaker that is compatible and rated suitable for the respective application.

2.2 ENCLOSED CIRCUIT BREAKERS
A. General Requirements: Circuit breaker to be used with service applications shall be rated suitable for use as service entrance equipment, comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents. Circuit breaker Amp Interrupting Current (AIC) rating shall be greater than the available fault current.
B. Coordinate selection of service breaker and generator breaker with the automatic transfer switch (ATS) to maintain the “withstand and closing ratings” of the ATS.
NORTHWEST SANITARY SEWER SERVICE AREA RECONSTRUCTION
CITY OF DANVILLE, IL


D. Circuit breakers shall use standard frame sizes, trip ratings, and number of poles as detailed on the Plans and/or in accordance with the respective applications. Circuit breaker lugs shall be mechanical type, suitable for number, size, trip ratings, and conductor material.

E. Circuit breaker enclosures shall meet the applicable sections of NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location. Circuit breaker enclosures located outdoors shall be rated NEMA 4X stainless steel, UL listed suitable for service entrance. Circuit breaker enclosures located in dry, non-corrosive, non-hazardous interior locations shall be rated NEMA 1 or NEMA 12. Circuit breaker enclosures shall be pad lockable in the “off” position.

F. Provide NEMA 4 hubs for all conduit entries into boxes or enclosures rated NEMA 4 or NEMA 4X to maintain the NEMA 4, 4X rating of the respective enclosure. Provide NEMA 4X stainless steel hubs for NEMA 4X stainless steel enclosures.

G. Include equipment ground bar kit with each circuit breaker.

H. Include neutral bar kit where applicable with respective circuit breakers.

PART 3 - EXECUTION

3.1 INSTALLATION/APPLICATION

A. All electrical work shall comply with the requirements of the NFPA 70 – National Electrical Code (NEC), most current issue in force, and all other applicable local codes, laws, ordinances, and requirements in force. Electrical equipment and materials shall be installed in conformance with the respective manufacturer’s directions and recommendations for the respective application. Any installations which void the UL listing, Intertek Testing Services verification/ETL listing, FM approval (or other third party listing), and/or the manufacturer’s warranty of a device will not be permitted.

B. Install circuit breaker enclosures plumb. Secure circuit breaker to building, structure, or equipment surface as shown. Where the surface is not adaptable for mounting, provide stainless steel strut support (Unistrut P-1000-SS, or approved equal) with corrosion resistant hardware to secure circuit breakers. All circuit breakers shall be supplied with appropriate mounting hardware and strut support in accordance with Section 16190 – Supporting Devices. Mounting hardware shall be corrosion resistant.

C. Mount circuit breakers securely in accordance with the manufacturer’s recommendations/instructions for the respective application. Installation of circuit breakers shall be in conformance with the manufacturer’s requirements and as detailed on the Plans. Installations that void the third party certification, or void the manufactures warranty, will NOT be permitted.
D. Secure circuit breaker to structure as shown on Plans. Provide stainless steel strut to secure electrical equipment. Mounting hardware shall be corrosion resistant stainless steel. Install equipment enclosures plumb.

E. Inspect all circuit breakers for proper operation, tight and secure connections, and correctness. Adjust as necessary to assure proper operation.

F. Nuts, bolts, and screws shall be tightened to manufacturer’s specifications/requirements.

G. Provide weatherproof, abrasion resistant, legend plates, for all circuit breakers, indicating the device being fed, the voltage and phase, and the origin of the respective feeder.

H. All circuit breaker enclosures shall be bonded to ground with a ground lug or screw and a ground conductor.

I. Do not use circuit breaker enclosures for a splice box or for a pull box. Do not route control wires or other circuit wiring through a circuit breaker enclosure. Where splices are required or other control circuit wires are installed in the respective conduit to a circuit breaker, provide a separate junction box to accommodate the splices and/or other circuit conductors.

J. Field cut holes in circuit breaker enclosures to accommodate conduit entrances. Where circuit breaker enclosures are provided with concentric knockouts, and the respective conduit does not use the largest knockout, install a grounding bushing with ground wire connections between the bushing and the ground bus. Standard locknuts or bushings shall not be the sole means for bonding where a conduit enters an enclosure through a concentric or eccentric knockout.

K. Provide grounding bushing with ground wire connections between the bushing and the ground bus for all conduits terminating in a service disconnect breaker enclosure.

L. Provide NEMA 4 hubs for all conduit entries into circuit breaker enclosures that are rated NEMA 4, 4X to maintain NEMA 4, 4X rating.

3.2 TESTING

A. Perform visual and mechanical inspection.

B. Test all circuit breakers for proper operation and continuity on all poles when in the closed (on) position.

C. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

D. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. The work included in this section is the supply and installation of electric service entrance from the utility transformer bank to the service entrance meter and disconnect. Included in this work shall be the utility transformation equipment to provide the service voltage and capacity for the facility. This section shall include all labor, coordination, equipment and materials necessary to provide a complete and operational electric service entrance.

1.2 REFERENCE TO STANDARDS

A. NFPA 70 – National Electrical Code (most current issue in force).

B. NFPA 70E – Standard for Electrical Safety in the Workplace.


D. Contractor shall confirm the requirements and standards as specified by the respective serving electric utility company.

E. Ameren Electric Service Manual (current issue in effect)

1.3 RELATED WORK

A. 16010 – Basic Electrical Requirements.

B. 16110 – Raceways.

C. 16120 – Building Wire and Cable.

D. 16410 – Enclosed Circuit Breakers.

E. 16450 – Grounding.
2.1 GENERAL

A. Products for the new electric service entrance shall be as detailed on the Plans and specified herein.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall coordinate the work with the serving electric utility company; Ameren Call Center Phone: 1-888-672-5252 and Mr. Tyler Rodeffer, Ameren Illinois, 1155 East Voorhees Street, Danville, IL, Phone: (217) 431-9726, Email: TRodeffer@ameren.com. Installation of the new service entrance shall be as detailed on the Plans, per the serving electric utility requirements, and as specified herein.

B. The Contractor shall coordinate and obtain the required permit(s) for new electric service from the local city building/electrical inspector as applicable.

C. The Contractor shall coordinate new electric service work with the City of Danville, Illinois.

D. The City of Danville, Illinois will pay for all associated electric utility company charges required to provide electric service to the pump stations. The Contractor is not responsible for electric utility company charges associated with the proposed electric service to the pump station. The Contractor shall coordinate the new electric service with the serving electric utility company and the Owner’s Representative. The service entrance shall include, but not be limited to, all service entrance equipment, labor, and materials, as detailed on the Plans and specified herein, in order to provide a complete and operational electrical system.

E. Contractor shall coordinate work and any power outages with the Owner’s Representative. Any shutdown of existing systems shall be scheduled with and approved by the Owner’s Representative prior to shutdown. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures, including, but not limited to, 29 CFR Section 1910.147 The Control of Hazardous Energy (lockout/tagout).

F. Contractor shall comply with the applicable requirements of NFPA 70E – Standard for Electrical Safety in the Workplace.

3.2 UTILITY

A. Will provide and install a 240/120 VAC, 3 phase, 4 wire solidly grounded power sufficient to handle the connected loads for a 600 Amp service or as required for the respective equipment loads at the Denmark Pump Station at Danville, Illinois.
B. Will provide and install a 480/277 VAC, 3 phase, 4 wire solidly grounded power sufficient to handle the connected loads for a 100 Amp service or as required for the respective equipment loads at the Rose Hill Pump Station at Danville, Illinois.

C. Will provide and install a 240/120 VAC, 3 phase, 4 wire solidly grounded power sufficient to handle the connected loads for a 200 Amp service or as required for the respective equipment loads at the Chateau Pump Station at Danville, Illinois.

D. Will install metering.

E. Will retain the right to review and approve drawings prior to installation.

3.3 CONTRACTOR

A. Shall coordinate work and verify requirements with the serving electric utility.

B. Shall coordinate work with the Owner’s Representative. This will included coordinating the electric service entrance work and billing arrangements with the serving electric utility company.

C. Shall coordinate work and verify requirements with the City Electrical Inspector and applicable local codes.

D. Shall provide the necessary equipment, conduit, interface, coordination, load data, etc. for utility service as required by the serving electric utility.

E. Shall furnish and install a meter base, current transformer cabinet, and/or other metering equipment conforming to the serving electric utility company’s requirements and as detailed on the Plans.

F. Shall furnish and install conduit and fittings to interface to the respective service equipment and extend to the utility transformer.

G. Shall furnish and install service conductors from the utility transformer to the metering equipment and service disconnect.

H. Shall furnish and install a service disconnect as detailed on the Plans and as specified herein.

I. Shall provide grounding as detailed on the Plans, specified herein and in conformance with the serving electric utility company requirements. The service entrance neutral shall be solidly grounded in the service disconnect enclosure.

J. Shall provide additional work as required by the serving electric utility and as required to provide a complete and operational electric service entrance system.

END OF SECTION 16421
PART 1 - GENERAL

1.1 DESCRIPTION OF WORK
   A. The work included in this section is the supply and installation of temporary electrical power as required to complete the work as indicated on the Plans and detailed herein.

1.2 REFERENCE TO STANDARDS
   A. NFPA 70 – National Electrical Code (most current issue in force).
   B. NFPA 70E – Standard for Electrical Safety in the Workplace.
   D. Contractor shall confirm the requirements and standards as specified by the respective serving electric utility company.

1.3 RELATED WORK
   A. 16010 – Basic Electrical Requirements.
   B. 16110 – Raceways.
   C. 16120 – Wire and Cable.
   D. 16450 – Grounding.
   E. 16470 – Panelboards.

PART 2 - PRODUCTS

2.1 MATERIALS
   A. Materials may be new or used, but shall be adequate for the purposed used, shall not create unsafe conditions, nor violate specific codes. Comply with NFPA 70 - National Electrical Code (most current issue in force), and all applicable Federal, State, and local codes in force.
3.1 TEMPORARY ELECTRICITY DURING CONSTRUCTION

A. All temporary power connections shall be coordinated with the Owner’s Representative, the Serving Electric Utility Company and the City Electrical Inspector. The serving electric utility company is Ameren Call Center Phone: 1-888-672-5252 and Mr. Tyler Rodeffer, Ameren Illinois, 1155 East Voorhees Street, Danville, IL, Phone: (217) 431-9726, Email: TRodeffer@ameren.com. The Contractor shall make necessary arrangements to provide temporary electric service/power and lighting required during the entire construction period, including required fees and permits. Cost of such electricity used shall be borne by the Contractor.

B. Temporary Wiring shall comply with NEC Article 590 Temporary Installations as well as the other applicable articles of NEC (most current issue in force).

C. Contractor shall coordinate work and any power outages with the Owner’s Representative. Any shutdown of existing systems shall be scheduled with and approved by the Owner’s Representative, prior to shutdown. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures, including, but not limited to, 29 CFR Section 1910.147 The Control of Hazardous Energy (lockout/tagout).

D. Contractor shall comply with the applicable requirements of NFPA 70E – Standard for Electrical Safety in the Workplace.

E. Electric services/power shall be of sufficient capacity and characteristics to supply proper voltage and current for various types of construction tools, motors, welding machines, lights, heating plant, air conditioning/ventilation system, pumps, and other equipment required. The Contractor shall provide all necessary temporary wiring, panelboards, load centers, outlets, switches, lamps, fuses, controls, and accessories. A sufficient number of electric outlets shall be provided in each work area or floor along with adequate lighting in all work areas, stairwells, and corridors.

F. Materials used for temporary service shall not be used in permanent system unless the Resident Engineer/Resident Project Representative gives specific approval. Temporary electric service shall be so constructed and arranged as not to interfere with the progress of other trades. This system shall be erected and maintained strictly in accordance with all ordinances and requirements for temporary service pertaining thereto inclusive of OSHA and NEC.

G. All 120 VAC, 15 Amp, 20 Amp, and 30 Amp receptacle circuits shall have ground fault circuit interrupter protection for personnel, in accordance with 2017 NEC 590.6. Ground fault circuit interrupter protection will automatically disconnect the circuit when leakage current of 4-6 milli-Amps is detected.

H. Receptacles shall not be placed on the same branch circuit with temporary lighting.
I. Any Contractor who has installed a temporary utility connection as herein specified, shall, prior
to final acceptance, remove temporary connections and installations and leave premises
restored to condition in which it was found or upgraded.

END OF SECTION 16422
PART 1 - GENERAL

1.1 WORK INCLUDES

A. The work in this section includes grounding of electrical systems and equipment and basic requirements for grounding for protection of personnel, life, equipment, circuits, and systems. Grounding requirements specified in this Section may be supplemented in other Sections of these Specifications. See grounding details on the Drawings and refer to other related work sections included with these Specifications for further details.

B. Furnish and install grounding as detailed on the Plans and as specified herein.

1.2 RELATED SECTIONS

A. Section 16010 – Basic Electrical Requirements.
B. Section 16111 – Conduit and Raceway.
C. Section 16120 – Wire and Cable.
D. Section 16130 – Boxes.
E. Section 16410 – Enclosed Circuit Breakers.
F. Section 16421 – Utility Service Entrance and Metering.
G. Section 16422 – Temporary Power.
H. Section 16460 - Dry Type Transformers.
I. Section 16470 – Panelboards.
J. Section 16495 – Automatic Transfer Switches.
K. Section 16620 – Standby Power Generator Systems.
L. Section 16615 – Surge Protector Devices.

1.3 REFERENCE TO STANDARDS

A. NFPA 70 – National Electrical Code (NEC) (most current issue in force)
1.4 DELIVERY, STORAGE, AND HANDLING

A. Exothermic welds and hardware items shall not be shipped loose but shall be in boxes, labeled with material and equipment enclosed. Boxes shall be stored away from contact with earth and shall be protected from weather.

1.5 SUBMITTALS

A. The Contractor shall furnish shop drawings for approval before ordering equipment and/or materials. Shop drawings shall be clear and legible. Copies that are illegible will be rejected. The preferred shop drawing submittal format shall be electronic (PDF) copies. Contractor may submit hard copies of shop drawings instead of electronic copies where applicable. In the event that the Contractor provides hard copies of shop drawings he shall submit sufficient quantities to meet the needs of his personnel, sub-contractor personnel, and equipment suppliers plus four (4) copies to be retained by the Project Engineer. Shop drawings shall include the following information:

1. In order to expedite the shop drawing review, inspection and/or testing of materials and equipment, the Contractor shall furnish complete statements to the Project Engineer as to the origin and manufacturer of all materials and equipment to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials and equipment.

2. Shop drawings shall include cut sheets for ground rods with type, size, specifications, product data, UL listing, manufacturer, and catalog or part number.

3. Shop drawings shall include cut sheets for grounding conductors/ground wire with type, size, specifications, product data, UL listing, manufacturer, and catalog or part number.

4. Shop drawings shall include cut sheets for grounding connectors (including exothermic weld type connectors) with type, size, specifications, product data, manufacturer, and catalog or part number.

1.6 MAINTENANCE SERVICE (WARRANTY)

A. All equipment shall be warranted to be free from defects in material and workmanship for a period of one year from date of substantial completion established by the Owner.

PART 2 - PRODUCTS

2.1 EQUIPMENT SPECIFICATION

A. All grounding products shall be UL listed and labeled and suitable for the respective application.

B. Ground rods shall be UL listed, 3/4 in. diameter by 10 ft long copper-clad steel with 10 mil minimum copper coating. Where shown on the Plans or required to obtain a better grounding system, ground rods shall be coupled together to form 20 ft, 30 ft, or longer ground rods.
Couplers shall be as recommended by the respective ground rod manufacturer. Steel used to manufacture ground rods shall be 100 percent domestic steel.

C. Connections to equipment enclosure frames shall be with the respective manufacturer’s grounding lugs or terminals or shall be with two-hole tongue long barrel compression lugs bolted with stainless steel bolts, nuts, and washers as detailed on the Plans.

D. Connection of ground wire to ground rod shall be with exothermic weld type connections. Exothermic weld type connectors shall be Cadweld by Pentair Erico Products, Inc., Thermoweld by Continental Industries, Inc., Ultraweld by Harger, or approved equal. Where exothermic weld connections are used they shall be installed in conformance with the respective manufacturer’s directions using proper molds suitable for each respective application.

E. Pipe grounding clamps shall be as detailed on the Plans.

F. Equipment ground wires shall be copper conductors sized as detailed on the Plans. Insulation shall be 600-Volt, same type as phase conductors, green in color.

G. Grounding electrode conductors shall be bare stranded annealed copper, sized as detailed on the Plans.

PART 3 - EXECUTION

3.1 INSTALLATION

The Contractor shall furnish and install all grounding shown on the Plans and/or as may be necessary or required to make a complete grounding system as required by the latest National Electrical Code (NFPA 70) in force. The reliability of the grounding system is dependent on careful, proper installation and choice of materials. Improper preparation of surfaces to be joined to make an electrical path, loose joints or corrosion can introduce impedance that will seriously impair the ability of the ground path to protect personnel and equipment and to absorb transients that can cause noise in communications circuits. The following functions are particularly important to ensure a reliable ground system:

A. All products associated with the grounding system shall be UL-listed and labeled.

B. All bolted or mechanical connections shall be coated with a corrosion preventative compound before joining, Sanchem Inc. “NO-OX-ID “A-Special” compound, Burndy Penetrox E, or approved equal.

C. Metallic surfaces to be joined shall be prepared by the removal of all non-conductive material, per 2017 National Electrical Code Article 250-12 (or most current issue in force). All copper bus bars must be cleaned prior to making connections to remove surface oxidation.

D. Metallic raceway fittings shall be made up tight to provide a permanent low impedance path for all circuits. Metal conduit terminations in enclosures shall be bonded to the enclosure with UL-listed fittings suitable for grounding. Provide grounding bushings with bonding jumpers for all metal conduits entering service equipment (meter base, CT cabinet, main service breaker enclosure, etc.). Provide grounding bushings with bonding jumpers for all metal conduits entering an enclosure.
through concentric or eccentric knockouts that are punched or otherwise formed so as to impair the 
electrical connection to ground. Standard locknuts or bushings shall not be the sole means for 
bonding where a conduit enters an enclosure through a concentric or eccentric knockout.

E. All motor frames, pump bases, electrical equipment enclosures, panel housings, conduits, 
boxes, etc. have a continuous copper wire ground connection and shall be positively bonded to 
the respective grounding system. Conduit connectors will not be considered as adequate 
grounding.

F. Furnish and install ground fields, ground rings, and/or ground rods at all locations where shown 
on the Plans or specified herein. Ground rods for electrical installations shall be 3/4-in. 
diameter by 10-ft long, UL-listed, copper clad with 10-mil minimum copper coating. Top of 
ground rods shall be a minimum of 30 in. below finish grade unless otherwise noted on the 
Plans. Ground rods shall be spaced as detailed on the Plans and in no case spaced less than one 
rod length apart. All connections to ground rods, ground fields, and/or ground rings shall be 
made with exothermic weld type connectors, Cadweld by Pentair Erico Products, Inc., 
Thermoweld by Continental Industries, Inc., Ultraweld by Harger, or approved equal. 
Exothermic weld connections shall be installed in conformance with the respective 
manufacturer’s directions using molds as required for each respective application. Bolted 
connections will not be permitted at ground rods or at buried grounding electrode conductors. 
Grounding electrode conductors shall be bare copper sized as detailed on the Plans. In addition 
to the grounding work described herein and shown on the Plans, the Contractor shall test the 
made electrode ground rod/ground field/ground ring with an instrument specifically designed 
for testing ground field systems. If ground resistance exceeds 25 Ohms, contact the Project 
Engineer for further direction. Copies of ground rod/ground field/ground ring test results shall 
be furnished to the Owner’s Representative and/or the Project Engineer.

G. All connections, located above grade, between the different types of grounding conductors shall 
be made using UL-listed double compression crimp type connectors or UL-listed bolted ground 
connectors. For ground connections to enclosures, cases and frames of electrical equipment not 
supplied with ground lugs the Contractor shall drill required holes for mounting a bolted ground 
connector. All bolted ground connectors shall be Burndy, Thomas and Betts, or equal. Tighten 
connections to comply with tightening torques in UL Standard 486A to assure permanent and 
effective grounding.

H. All metal equipment enclosures, conduits, cabinets, boxes, receptacles, motors, etc. shall be 
bonded to the respective grounding system.

I. Provide all boxes for proposed outlets, switches, circuit breakers, etc. with grounding screws. 
Provide all control panel, panelboard, transfer switch, etc., enclosures with grounding bars with 
individual screws, lugs, clamps, etc., for each of the grounding conductors that enter their 
respective enclosures. Do not terminate more than one (1) ground wire in ground lug or 
terminal unless the respective lug or terminal is rated for multiple conductors.

J. Each feeder circuit and/or branch circuit shall include an equipment ground wire. Metal 
raceway or conduit shall not meet this requirement. The equipment ground wire from 
equipment shall not be smaller than allowed by 2017 NEC Table 250-122 “Minimum Size 
Conductors or Grounding Raceway and Equipment”, (or most current issue in force). When 
conductors are adjusted in size to compensate for voltage drop, equipment-grounding 
conductors shall be adjusted proportionately according to circular mil area. All equipment 
ground wires shall be copper, either bare or insulated green in color. Where the equipment
grounding conductors are insulated, they shall be identified by the color green, and shall be the
same insulation type as the phase conductors.

K. Equipment ground wires shall be identified with green colored insulation for all conductors
AWG or KCMIL. Green tape will not meet this requirement.

L. All utility transformer bank grounds shall be installed in accordance with the serving electric
utility company’s recommendation and in accordance with NEC.

M. Bond the main electrical service neutral to ground at the main service disconnect. Bond the
service neutral to ground at one location only per the NEC. A grounding connection shall not
be made to any neutral circuit conductor on the load side of the service disconnecting means,
except as permitted by 2017 NEC 250-24, (or most current issue in force).

N. The secondary neutral of all transformers (separately derived system transformers) shall be
grounded in accordance with the NEC. The respective grounding electrode conductor shall be
connected to the neutral point of the transformer between the transformer and the output
disconnecting means. Size of the grounding electrode conductor shall be in accordance with
2017 NEC Article 250-66 and Table 250-66 unless shown larger on the Drawings. A bond
shall be provided between the neutral and transformer case, or other metal that is part of the AC
equipment grounding system, so as to complete a circuit for fault current to the transformer
winding from the AC equipment grounding system. Size of the neutral bonding conductor shall
be in accordance with 2017 NEC Article 250-102, (or most current issue in force).

O. All exterior metal conduit, where not electrically continuous because of manholes, handholes,
non-metallic junction boxes, etc., shall be bonded to all other metal conduit in the respective
duct run, and at each end, with a copper-bonding jumper sized in conformance with 2017 NEC
250-102, (or most current issue in force). Where metal conduits terminate in an enclosure
(such as a motor control center, switchboard, etc) where there is not electrical continuity with
the conduit and the respective enclosure, provide a bonding jumper from the respective
enclosure ground bus to the conduit sized per 2017 NEC 250-102, (or most current issue in force).

P. Install grounding electrode conductors, lightning protection down conductors and separate
ground conductors in Schedule 40 or Schedule 80 PVC conduit or exposed where acceptable to
local codes. Where grounding electrode conductors, lightning protection down conductors or
individual ground conductors are run in PVC conduit, Do Not completely encircle conduit with
ferrous and/or magnetic materials. Use non-metallic reinforced fiberglass strut support. Where
metal conduit clamps are installed, use nylon bolts, nuts, washers and spacers to interrupt a
complete metallic path from encircling the conduit. This is required to avoid girdling of
ground conductors. Girdling of a ground conductor is the result of placing the conductor in a
ring of magnetic material. This ring could be a metallic conduit, u-bolt or strut support pipe
clamp, or other support hardware. The result of girdling ground conductors significantly
increases the inductive impedance of the ground conductor. Inductive and capacitive
impedance is a type of resistance that opposes the flow of alternating current. Any increase in
the impedance of a ground conductor reduces its ability to effectively mitigate radio frequency
noise in the ground system. The condition where a ground conductor is girdled during a
lightning strike results in phenomena known as Surge Impedance Loading. Surge impedance
loading is a result of voltage and current reaching 500,000 volts and 10,000 amps for a short
duration. Girdling further increases the impedance at lightning frequencies of 100 kilohertz to
100 megahertz. At these power and frequency levels any increase in the impedance of the
ground conductor must be controlled. During lightning discharge conditions a low inductive impedance path is more important than a low DC resistance path.

Q. Never remove, alter, or attempt to repair conductors on conduit systems providing grounding or electrical bonding for any electrical equipment until all power is removed from equipment. Warn all personnel of the ungrounded conditions of the equipment. Display appropriate warning signs, such as danger tags, to warn personnel of the possible hazards.

R. Buried or concealed ground systems: Shall be accepted by Owner’s Representative before backfilling or covering.

### 3.2 TESTING

A. Entire ground system shall be tested. Measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer’s recommendations using fall-of-potential method. Maximum grounding system resistance shall be 25 Ohms.

B. Contractor shall test the made grounding electrode system (ground rods/ground ring/ground field/or other grounding electrodes) with an instrument specifically designed for testing grounding electrode systems. If ground resistance exceeds 25 Ohms, contact the Owner’s Representative and/or the respective Project Engineer for further direction. Copies of grounding electrode system test results shall be furnished to the Owner’s Representative and/or Project Engineer.

C. Copies of data and test reports shall be furnished to Owner’s Representative. Report data to include technician’s name, date of test, site conditions, Testing equipment manufacture and model number, and certification of test results.

END OF SECTION 16450
PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section includes the supply and installation of enclosed dry type transformers, and all required work to provide a complete and operational electrical system.

1.2 RELATED SECTIONS

A. Section 16010 – Basic Electrical Requirements.

B. Section 16111 – Conduit and Raceway.

C. Section 16120 – Wire and Cable.

D. Section 16190 - Supporting Devices.

E. Section 16195 – Electrical Identification.

F. Section 16450 – Grounding.

1.3 REFERENCE TO STANDARDS

A. IEEE C57.12.01 - Standard General Requirements for Dry-Type Distribution and Power Transformers including those with Solid Cast and/or Resin Encapsulated Windings.

B. ANSI C57.12.50 - Requirements for Ventilated Dry-Type Distribution Transformers, 1 to 500 kVA, Single-Phase and 15 to 500 kVA, Three-Phase, with High Voltage 601 to 34,500 V, Low-Voltage 120 to 600 V.

C. ANSI C57.110 - Recommended Practice for Establishing Transformer Capability when Supplying Non-Sinusoidal Load Currents.

D. IEEE C57.94 - Recommended Practice for Installation, Application, Operation and Maintenance of Dry-Type General Purpose Distribution and Power Transformers.

E. IEEE C57.96 - Guide for Loading Dry-Type Distribution and Power Transformers

F. NEMA ST-20 - Dry-Type Transformers for General Application

G. UL 1561 – Standard for Dry-Type General Purpose and Power Transformers
H. NFPA 70 – National Electrical Code (most current issue in force).

I. NFPA 70E – Standard for Electrical Safety in the Workplace.


1.4 DELIVERY, STORAGE AND HANDLING

A. Dry type transformers shall be stored indoors from time of delivery to job site, protected from weather and construction.

1.5 SUBMITTALS

A. The Contractor shall furnish shop drawings for approval before ordering equipment and/or materials. Shop drawings are required for panelboards to be used on the project. Shop drawings shall be clear and legible. Copies that are illegible will be rejected. The preferred shop drawing submittal format shall be electronic (PDF) copies. Contractor may submit hard copies of shop drawings instead of electronic copies where applicable. In the event that the Contractor provides hard copies of shop drawings he shall submit sufficient quantities to meet the needs of his personnel, sub-contractor personnel, and equipment suppliers plus four (4) copies to be retained by the Project Engineer. Shop drawings shall include the following information:

1. In order to expedite the shop drawing review, inspection and/or testing of materials and equipment, the Contractor shall furnish complete statements to the Project Engineer as to the origin and manufacturer of all materials and equipment to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials and equipment.

2. Submittals for panelboards shall include outline and support point dimensions, voltage, main bus ampacity, bus material, integrated short circuit ampere rating, circuit breaker arrangement and sizes and respective enclosure. Information on circuit breakers shall include manufacturer’s catalog numbers, description with number of poles, voltage ratings, Amp trip ratings, Amp interrupting current ratings, and any special features (for example switched neutral, shunt trip, etc.). Submittals shall also include manufacturer’s installation instructions; indicating application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting the product.

1.6 QUALITY ASSURANCE

A. Dry-type transformers shall be manufactured and supplied by a company regularly engaged in the business of furnishing transformers. If required by the Engineer, the manufacturer shall submit certification to a minimum of ten years experience in the manufacturer of transformers.
1.7 MAINTENANCE SERVICE (WARRANTY)

A. Transformers shall be warranted to be free from defects, material and workmanship for a period of one year from date of substantial completion established by the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Dry type transformers shall be manufactured by Square D, Acme Transformer, General Electric, Cutler Hammer, or approved equal.

2.2 EQUIPMENT

A. Step-Down Transformer for Denmark Pump Station. Step-down transformer for powering the 120/240 VAC Panelboard shall be rated 25 KVA, 480 VAC, single phase, primary, 120/240 VAC, single phase, 3-wire secondary, 60 Hz, with UL Class 180 degree C insulation system, and 115 degree maximum temperature rise. Windings shall be Copper or Aluminum. Transformers shall be suitable for indoor/outdoor installation with a NEMA 3R weatherproof enclosure. Transformers shall be UL-listed and shall include electrostatic shielding.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Dry type transformers shall be inspected for physical damage. Touch up paint matching transformer shall be used as needed.

3.2 INSTALLATION

A. All electrical work shall comply with the requirements of the NFPA 70 – National Electrical Code (NEC), most current issue in force, and all other applicable local codes, laws, ordinances, and requirements in force. Electrical equipment and materials shall be installed in conformance with the respective manufacturer’s directions and recommendations for the respective application. Any installations which void the UL listing, Intertek Testing Services verification/ETL listing, FM approval (or other third party listing), and/or the manufacturer’s warranty of a device will not be permitted.

B. Contractor shall coordinate work and any power outages with the Owner’s Representative. Any shutdown of existing systems shall be scheduled with and approved by the Owner’s Representative prior to shutdown. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures.
including, but not limited to, 29 CFR section 1910.147 The Control of Hazardous Energy (lockout/tagout).

C. Contractor shall comply with the applicable requirements of NFPA 70E – Standard for Electrical Safety in the Workplace.

D. Install transformers in accordance with manufacturer’s instructions.

E. Set transformer plumb and level.

F. Install transformers in accordance with the seismic requirements for the area in which the installation is located as well as manufacturer’s recommendations.

G. Use extreme care to eliminate noise and vibration.

H. Provide liquid tight flexible metal conduit (2 feet minimum length) for connections to transformer case. Liquid-tight, flexible metal conduit and associated fittings shall be UL-listed to meet the requirements of NEC 350.6. Do not install liquid-tight, flexible metal conduit that is not UL listed. Contractor shall confirm liquid-tight, flexible metal conduit bears the UL label prior to installation. Make conduit connections to side panel(s) of transformer enclosure.

3.3 GROUNDING OF TRANSFORMERS

A. The secondary neutral of all transformers shall be grounded unless specifically shown otherwise. See Section 16450 Grounding.

B. Size of neutral bonding conductor shall be in accordance with 2014 NEC 250.102 (or most current issue in force) unless shown larger on drawings. Size of grounding electrode conductor shall be in accordance with 2017 NEC Article 250.66 and Table 250.66 unless shown larger on the drawings.

C. The grounding electrode conductor from the transformer secondary shall be bonded and referenced to the respective grounding electrode system as detailed on the Plans.

3.4 TESTING

A. Check for damage and tight connections prior to energizing transformer.

B. Adjust primary taps so that secondary voltage is with 2% of rated voltage.

C. Transformers shall be tested and calibrated per manufacturer’s guidelines before energizing.

D. Measure and record input primary voltage to transformer and output secondary voltage from transformer.

END SECTION 16460
NORTHWEST SANITARY SEWER SERVICE AREA RECONSTRUCTION
CITY OF DANVILLE, IL
PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section includes the supply and installation of panelboards, circuit breakers, and all required work to provide a complete and operational electrical system.

1.2 RELATED SECTIONS

A. Section 16010 – Basic Electrical Requirements.
B. Section 16111 – Conduit and Raceway.
C. Section 16120 – Wire and Cable.
D. Section 16190 - Supporting Devices.
E. Section 16195 – Electrical Identification.
F. Section 16450 – Grounding.
G. Section 16615 – Surge Protector Devices.

1.3 REFERENCE TO STANDARDS

A. Federal Specification W-P-115b, Type I, Class I.
C. NECA (National Electrical Contractors Association) “Standard of Installation”.
D. NEMA AB 1 – Molded Case Circuit Breakers, Molded Case Switches, and Circuit Breaker Enclosures.
E. NEMA ICS 2 – Industrial Control Devices, Controllers, and Assemblies.
F. NEMA KS1 Enclosed and Miscellaneous Distribution Equipment Switches (600V Maximum)
G. NEMA PB 1 – Panelboards.
H. NEMA PB 1.1 – Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
I. NFPA 70 – National Electrical Code (most current issue in force).
J. NFPA 70E – Standard for Electrical Safety in the Workplace.

L. UL 50 – Cabinets and Boxes.

M. UL Standard 67 – Panelboards.

N. UL Standard 489 – Molded Case Circuit Breakers.

1.4 DELIVERY, STORAGE AND HANDLING

A. Panelboards shall be stored indoors in the original container as delivered to the jobsite, protected from weather and construction.

1.5 SUBMITTALS

A. The Contractor shall furnish shop drawings for approval before ordering equipment and/or materials. Shop drawings are required for panelboards to be used on the project. Shop drawings shall be clear and legible. Copies that are illegible will be rejected. The preferred shop drawing submittal format shall be electronic (PDF) copies. Contractor may submit hard copies of shop drawings instead of electronic copies where applicable. In the event that the Contractor provides hard copies of shop drawings he shall submit sufficient quantities to meet the needs of his personnel, sub-contractor personnel, and equipment suppliers plus four (4) copies to be retained by the Project Engineer. Shop drawings shall include the following information:

1. In order to expedite the shop drawing review, inspection and/or testing of materials and equipment, the Contractor shall furnish complete statements to the Project Engineer as to the origin and manufacturer of all materials and equipment to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials and equipment.

2. Submittals for panelboards shall include outline and support point dimensions, voltage, main bus ampacity, bus material, integrated short circuit ampere rating, circuit breaker arrangement and sizes and respective enclosure. Information on circuit breakers shall include manufacturer’s catalog numbers, description with number of poles, voltage ratings, Amp trip ratings, Amp interrupting current ratings, and any special features (for example switched neutral, shunt trip, etc.). Submittals shall also include manufacturer’s installation instructions; indicating application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting the product.

1.6 QUALITY ASSURANCE

A. Panelboards shall be manufactured and supplied by a company regularly engaged in the business of furnishing panelboards. If required by the Engineer, the manufacturer shall submit
1.7 REGULATORY REQUIREMENTS

A. Conform to requirements of NFPA 70.

B. Furnish products listed and classified by Underwriters Laboratories, Inc., as suitable for purpose specified and shown.

1.8 MAINTENANCE SERVICE (WARRANTY)

A. Panelboards shall be warranted to be free from defects, material and workmanship for a period of one year from date of substantial completion by the Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Panelboards shall be as manufactured by Square D, Eaton Cutler-Hammer, or approved equal.

2.2 EQUIPMENT

A. Main Distribution Panelboard “A” for Denmark Pump Station. Main distribution panel shall be 400 Amp, 480/277 VAC, 3-phase, 4-wire with a 400 Amp, 3-pole main breaker (reverse feed main breaker is acceptable), copper bus braced for 35,000 Amperes symmetrical (minimum) at 480 VAC, 45 inches minimum of breaker mounting space, suitable for 400 Amp frame branch breakers, in a NEMA 1 enclosure UL-listed suitable for service entrance, Square D, I-line, Type HCP Series, or approved equal. All bussing shall be copper. Neutral bus shall be copper. Include separate copper equipment ground bars adequately sized for all ground wires and grounding electrode conductors to and from the panel. Main breaker and all branch and feeder breakers shall have an interrupting rating of 35,000 Amps minimum at 480 VAC and shall be constructed in accordance with NEMA AB1 and UL 489. Circuit breakers shall be equipped with individually insulated braced and protected connectors. The front faces of all circuit breakers shall be flush with each other. Large, permanent, individual circuit numbers shall be affixed to each breaker in a uniform position (or equip each breaker with a circuit card holder and neatly printed card identifying the circuit). Tripped indication shall be clearly shown by the breaker handle taking a position between ON and OFF. Provisions for additional breakers shall be such that no additional connectors will be required to add breakers. See Plans for details on size and quantity of branch and feeder breakers. Panel shall be UL-listed and bear the UL label. Provide legend plates as detailed on the Plans. Coordinate selection of two pole breakers with the manufacturer to confirm proper bus connections.

B. 480/277 VAC, 3 Phase, 4-Wire Panelboards: Panelboard bus structure shall be copper. Bus and main lugs or main circuit breaker shall have voltage, current, and amp interrupting current ratings as shown on the Plans. Such ratings shall be in accordance with UL Standard 67. Bus
bar connections to the branch circuit breakers shall be the “distributed phase” or phase sequence type. All current carrying parts of copper bus structures shall be plated to prevent corrosion. Panelboards for service entrance applications shall be UL listed suitable for service entrance. All panelboards shall be Dead-Front Safety Type, equipped with thermal-magnetic molded case breakers, and solid neutral bus. Bussing shall be such that adjacent single pole breakers will be on different phases or polarities, and that two pole breakers can be installed at any location. Panelboard numbering shall be such that starting at the top, odd numbers shall be used in sequence down the left hand side and even numbers shall be used in sequence down the right hand side. Cabinets shall be fabricated of code gauge galvanized steel with gutters sized per National Electrical Code and shall be suitable for the respective location. Cabinets shall be finished with rust inhibiting primer and baked enamel. For outdoor installations (in non-hazardous areas) the enclosure shall be rated NEMA 3R (rain proof) and NEMA 12 (dust tight) with a hinged cover or NEMA 4X stainless steel with hinged cover. For indoor installations (in non-hazardous areas) the enclosure shall be rated NEMA 1 or NEMA 12. Panelboard shall be provided with bolt-on circuit breakers of size, type, and ratings as detailed on the Plans. Contractor shall confirm and adjust circuit breaker amperage trip ratings as required for the respective equipment or device being fed, in accordance with the respective equipment manufacturer’s recommendation and NEC. Breakers shall be 1 pole, 2 pole, or 3 pole with an integral crossbar to assure simultaneous opening of all poles in multiple circuit breakers. Breakers shall have an over-center, trip-free, toggle-type operating mechanism with quick-make, quick-break action and positive handle indication. Handles shall have “ON,” “OFF,” and “TRIPPED” positions. Circuit breakers shall be UL-listed in accordance with UL Standard 489 and shall be rated 277 volts AC, for single pole breakers and 480/277 volts AC for two pole and three pole breakers. A circuit directory frame and card with a clear plastic cover shall be provided on door interior. Circuit directory shall be typed or neatly hand written indicating each branch circuit of the panel board. Revise directory to reflect circuiting changes as required. All panelboards shall be UL-listed and bear the UL label. Panelboards shall be furnished with a copper equipment ground bar(s) and a separate insulated copper neutral bus.

C. 240/120 VAC, 3 Phase, 4-Wire Panelboards: Panelboard bus structure shall be copper. Bus and main lugs or main circuit breaker shall have voltage, current, and amp interrupting current ratings as shown on the Plans. Such ratings shall be in accordance with UL Standard 67. Bus bar connections to the branch circuit breakers shall be the “distributed phase” or phase sequence type. All current carrying parts of copper bus structures shall be plated to prevent corrosion. Panelboards for service entrance applications shall be UL listed suitable for service entrance. All panelboards shall be Dead-Front Safety Type, equipped with thermal-magnetic molded case breakers, and solid neutral bus. Bussing shall be such that adjacent single pole breakers will be on different phases or polarities, and that two pole breakers can be installed at any location. Panelboard numbering shall be such that starting at the top, odd numbers shall be used in sequence down the left hand side and even numbers shall be used in sequence down the right hand side. Cabinets shall be fabricated of code gauge galvanized steel with gutters sized per National Electrical Code and shall be suitable for the respective location. Cabinets shall be finished with rust inhibiting primer and baked enamel. For outdoor installations (in non-hazardous areas) the enclosure shall be rated NEMA 3R (rain proof) and NEMA 12 (dust tight) with a hinged cover or NEMA 4X stainless steel with hinged cover. For indoor installations (in non-hazardous areas) the enclosure shall be rated NEMA 1 or NEMA 12. Panelboard shall be provided with bolt-on circuit breakers of size, type, and ratings as detailed on the Plans. Contractor shall confirm and adjust circuit breaker amperage trip ratings as required for the respective equipment or device being fed, in accordance with the respective equipment manufacturer’s recommendation and NEC. Breakers shall be 1 pole, 2 pole, or 3 pole with an integral crossbar to assure simultaneous opening of all poles in multiple circuit breakers.
Breakers shall have an over-center, trip-free, toggle-type operating mechanism with quick-make, quick-break action and positive handle indication. Handles shall have “ON,” “OFF,” and “TRIPPED” positions. Circuit breakers shall be UL-listed in accordance with UL Standard 489 and shall be rated 120 volts AC, for single pole breakers and 240 volts AC for two pole and three pole breakers. A circuit directory frame and card with a clear plastic cover shall be provided on door interior. Circuit directory shall be typed or neatly hand written indicating each branch circuit of the panel board. Revise directory to reflect circuiting changes as required. All panelboards shall be UL-listed and bear the UL label. Panelboards shall be furnished with a copper equipment ground bar(s) and a separate insulated copper neutral bus.

D. 120/240 VAC, 1 Phase, 3-Wire Panelboards: Panelboard bus structure shall be copper. Bus and main lugs or main circuit breaker shall have voltage, current, and amp interrupting current ratings as shown on the Plans. Such ratings shall be in accordance with UL Standard 67. Bus bar connections to the branch circuit breakers shall be the “distributed phase” or phase sequence type. All current carrying parts of copper bus structures shall be plated to prevent corrosion. Panelboards for service entrance applications shall be UL listed suitable for service entrance. All panelboards shall be Dead-Front Safety Type, equipped with thermal-magnetic molded case breakers, and solid neutral bus. Bussing shall be such that adjacent single pole breakers will be on different phases or polarities, and that two pole breakers can be installed at any location. Panelboard numbering shall be such that starting at the top, odd numbers shall be used in sequence down the left hand side and even numbers shall be used in sequence down the right hand side. Cabinets shall be fabricated of code gauge galvanized steel with gutters sized per National Electrical Code and shall be suitable for the respective location. Cabinets shall be finished with rust inhibiting primer and baked enamel. For outdoor installations (in non-hazardous areas) the enclosure shall be rated NEMA 3R (rain proof) and NEMA 12 (dust tight) with a hinged cover or NEMA 4X stainless steel with hinged cover. For indoor installations (in non-hazardous areas) the enclosure shall be rated NEMA 1 or NEMA 12. Panelboard shall be provided with bolt-on circuit breakers of size, type, and ratings as detailed on the Plans. Contractor shall confirm and adjust circuit breaker amperage trip ratings as required for the respective equipment or device being fed, in accordance with the respective equipment manufacturer’s recommendation and NEC. Breakers shall be 1 pole or 2 pole with an integral crossbar to assure simultaneous opening of all poles in multiple circuit breakers. Breakers shall have an over-center, trip-free, toggle-type operating mechanism with quick-make, quick-break action and positive handle indication. Handles shall have “ON,” “OFF,” and “TRIPPED” positions. Circuit breakers shall be UL-listed in accordance with UL Standard 489 and shall be rated 120 volts AC, for single pole breakers and 120/240 volts AC for two pole breakers. A circuit directory frame and card with a clear plastic cover shall be provided on door interior. Circuit directory shall be typed or neatly hand written indicating each branch circuit of the panel board. Revise directory to reflect circuiting changes as required. All panelboards shall be UL-listed and bear the UL label. Panelboards shall be furnished with a copper equipment ground bar(s) and a separate insulated copper neutral bus.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Panelboards shall be thoroughly inspected for physical damage, proper alignment, anchorage and grounding. The exterior finish shall be inspected for blemishes, nicks, and bare spots and
touched up as required (where applicable) using touch-up paint provided. Inspection shall be made for proper installation and tightness of connections of all circuit breakers.

3.2 PREPARATION

A. Test for shorts and high resistance grounds. Check for faulty operation of circuit breakers.

3.3 INSTALLATION

A. All electrical work shall comply with the requirements of NFPA 70 - National Electrical Code (NEC), most current issue in force, and all other applicable local codes, laws, ordinances, and requirements in force. Electrical equipment shall be installed in conformance with the respective manufacturer’s directions and recommendations for the respective application. Any installations which void the UL listing, ETL listing, FM approval, or other third party listing, and/or the manufacturer’s warranty of a device will not be permitted.

B. Contractor shall coordinate work and any power outages with the Owner’s Representative. Any shutdown of existing systems shall be scheduled with and approved by the Owner’s Representative prior to shutdown. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures including, but not limited to, 29 CFR section 1910.147 The Control of Hazardous Energy (lockout/tagout).

C. Contractor shall comply with the applicable requirements of NFPA 70E – Standard for Electrical Safety in the Workplace.

D. Install panelboards in accordance with NEMA PB1.1 per manufacturer’s instructions and as detailed on the Plans. Install panelboards plumb. Provide filler plates for unused spaces in panelboards.

E. Panelboards shall be installed such that the center of the grip of the operating handle of the upper most circuit breaker, shall not exceed 6 ft-6 in. from finished grade elevation or the working platform to comply with NEC 404.8(A). Panelboards shall not be installed in classified hazardous locations.

F. Where surge arrestors are required to be furnished on panelboards install them in conformance with manufacturer’s instructions for the surge arrestor and the panelboard. Maintain leads as short and as straight as possible. Locate the surge protector device on the same side of the panelboard as the circuit breaker that connects it to the panelboard. Install the circuit breaker for the surge protector device as close as possible to the panelboard main breaker or main lugs. For example for a top feed main breaker/main lugs type panelboard install the circuit breaker for the surge protector device in positions 1 and 3 or in circuit positions 2 and 4. For a bottom feed main breaker/main lugs type panelboard (42 circuit) install the circuit breaker for the surge protector device in positions 39 and 41 or in circuit positions 40 and 42.
G. Install grounding bushings with ground wire connections between the bushing and the ground bus at all metal conduit terminations that enter or leave the panelboard through concentric knockouts. This does not apply to conduits sized to match the largest knockout.

H. Furnish and install circuit directory indicating the respective equipment fed by each circuit breaker. Circuit directory shall be typed or neatly hand written and shall correctly identify each circuit in the panelboard. Revise directory to reflect circuiting changes as required.

I. Provide legend plates for all panelboards to identify the area and/or equipment controlled by the panelboard. Legend plates shall be weatherproof and abrasion resistant phenolic material as specified in Section 16195. Letters shall be black on white background.

3.4 TESTING

A. Panelboards shall be thoroughly tested after installation and connection to respective loads. Lighting panelboard phases shall be measured with all major items operating. Phase loads shall be within 20 percent of each other. Rearrange circuits if required maintaining proper phasing for multi-wire circuits.

END SECTION 16470
NORTHWEST SANITARY SEWER SERVICE AREA RECONSTRUCTION
CITY OF DANVILLE, IL

DIVISION 16 – ELECTRICAL
SECTION 16495 – AUTOMATIC TRANSFER SWITCHES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK
A. This section includes the supply and installation of electrically operated, mechanically held, automatic transfer switches, and all required work to provide a complete and operational electrical system, as detailed on the Plans and Specified herein.

1.2 RELATED SECTIONS
A. Section 16010 – Basic Electrical Requirements.
B. Section 16111 – Conduit and Raceway.
C. Section 16120 – Wire and Cable.
D. Section 16190 - Supporting Devices.
E. Section 16195 – Electrical Identification.
F. Section 16450 – Grounding.
G. Section 16620 – Standby Power Generator Systems

1.3 REFERENCE TO STANDARDS
A. NEMA ICS 1 – General Standards for Industrial Control Devices, Controllers, and Assemblies.
B. NEMA ICS 2 – Standards for Industrial Control Devices, Controllers, and Assemblies.
C. NEMA ICS 6 – Enclosures for Industrial Controls and Systems.
D. NFPA 70 – National Electrical Code (most current issue in force).
E. NFPA 70E – Standard for Electrical Safety in the Workplace.
G. UL 1008 – Standard for Safety Transfer Switch Equipment.
1.4 DELIVERY, STORAGE AND HANDLING

A. Transfer switches shall be stored indoors from time of delivery to job site, protected from weather and construction.

1.5 SUBMITTALS

A. The Contractor shall furnish shop drawings for approval before ordering equipment and/or materials. Shop drawings are required for panelboards to be used on the project. Shop drawings shall be clear and legible. Copies that are illegible will be rejected. The preferred shop drawing submittal format shall be electronic (PDF) copies. Contractor may submit hard copies of shop drawings instead of electronic copies where applicable. In the event that the Contractor provides hard copies of shop drawings he shall submit sufficient quantities to meet the needs of his personnel, sub-contractor personnel, and equipment suppliers plus four (4) copies to be retained by the Project Engineer. Shop drawings shall include the following information:

1. In order to expedite the shop drawing review, inspection and/or testing of materials and equipment, the Contractor shall furnish complete statements to the Project Engineer as to the origin and manufacturer of all materials and equipment to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials and equipment.

2. Provide catalog sheets and showing manufacturer, model number, voltage, switch size, Amperage ratings, number of poles, operating logic, withstand and closing ratings, dimensions, and enclosure details. Coordinate auto transfer switch withstand and closing ratings with the service entrance breaker/disconnect and the generator breaker/disconnect to maintain the withstand and closing ratings of the switch. Include this information with the submittal.

3. Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

4. Operation and Maintenance Data: Include instructions for operating equipment. Include instructions for operating equipment under emergency conditions when engine generator is running. List all factory settings of relays and provide relay setting and calibration instructions. Include routine preventative maintenance and lubrication schedule. List special tools, maintenance materials, and replacement parts.

1.6 QUALITY ASSURANCE

A. Automatic transfer switches shall be manufactured and supplied by a company regularly engaged in the business of furnishing automatic transfer switches. If required by the Engineer, the manufacturer shall submit certification to a minimum of ten years experience in the manufacturer of automatic transfer switches.
1.7 MAINTENANCE SERVICE (WARRANTY)

A. Automatic transfer switches shall be warranted to be free from defects, material and workmanship for a period of one year from date of substantial completion by established by the Owner.

PART 2 - PRODUCTS

2.1 AUTOMATIC TRANSFER SWITCH

A. Switch shall function to automatically transfer predetermined loads from the main service to the generator service in the event of a power failure and to retransfer these loads to normal source after restoration of power.

B. The automatic transfer switch for the Denmark Hill Pump Station at Danville, Illinois shall be a 600 Amp, 240/120 VAC, 3 Phase, 4-Wire, 3-Pole with solid neutral mechanically held and electrically operated by a single-solenoid mechanism energized from the source to which the load is to be transferred. The switch shall be rated for continuous duty and be inherently double throw. The switch shall be mechanically interlocked to insure only one (1) of two (2) possible positions - normal or emergency. Transfer switch shall have withstand and closing rating of 65,000 RMS Sym. Amps, minimum per UL Standard 1008.

C. The automatic transfer switch for the Chateau Pump Station at Danville, Illinois shall be a 200 Amp, 240/120 VAC, 3 Phase, 4-Wire, 3-Pole with solid neutral mechanically held and electrically operated by a single-solenoid mechanism energized from the source to which the load is to be transferred. The switch shall be rated for continuous duty and be inherently double throw. The switch shall be mechanically interlocked to insure only one (1) of two (2) possible positions - normal or emergency. Transfer switch shall have withstand and closing rating of 22,000 RMS Sym. Amps, minimum per UL Standard 1008.

D. All main contacts shall be the silver alloy wiping action type. They shall be protected by arcing contacts. The operating transfer time in either direction shall not exceed 1/6 of a second. All replaceable contacts, coils, springs and control elements shall be conveniently removable from the front of the transfer switch without major disassembly or disconnection of power conductors.

E. The automatic transfer switch shall conform to the requirements of NEMA Standard ICS2 and Underwriters' Laboratories UL-1008 and shall be rated in amperes for total system transfer including control of motors, electric-discharge lamps, electric-heating and tungsten-filament lamp loads. Voltage and current ratings shall be as shown on the drawings. Transfer switches shall have withstand and closing ratings as detailed on the plans and specified herein. Coordinate selection of the service entrance breaker/disconnect and the generator breaker/disconnect to maintain the withstand and closing ratings of the switch.

F. Automatic transfer switch controls shall be microprocessor based.
2.2 PRODUCT OPTIONS AND FEATURES

A. Voltage sensing for each phase of normal source. Pick-up voltage is adjustable from 85 percent to 100 percent nominal, and drop-out voltage is adjustable from 75 percent to 98 percent pick-up value. Factory set for pick-up at 90 percent and drop-out at 85 percent.

B. Time-delay override of normal source voltage-sensing delays transfer and engine start signals. Adjustable zero (0) to six (6) seconds, and factory set at one (1) second.

C. Voltage/Frequency Lockout Relay: Prevent premature transfer. Voltage pick-up is adjustable from 85 percent to 100 percent nominal. Factory set to pick-up at 90 percent. Pick-up frequency is adjustable from 90 percent to 100 percent nominal. Factory set to pick-up at 95 percent.

D. Retransfer Time Delay: Adjustable from zero (0) to thirty (30) minutes and factory set at ten (10) minutes. Provides automatic defeat of the delay upon loss of voltage or sustained undervoltage of the emergency source, provided the normal supply has been restored.

E. Bidirectional In-Phase Transfer System to control transfer operation between live sources. Shall provide variable transfer initiation which limits motor inrush current to magnitude or normal starting current ignoring unequal source voltages and wave shape distortion from solid state controlled loads. Operation shall be over a frequency difference range of ± 2 Hz. If voltage of the source carrying load drops below 70 percent, the in-phase function shall be automatically bypassed.

F. Test Switch: Simulates normal source failure.

G. Switch-Position Pilot Lights: Indicate source to which the load is connected.

H. Source-Available Indicating Lights: Supervise sources via the transfer switch normal and emergency source-sensing circuits:
   1. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."

I. Unassigned Auxiliary Contacts: Two (2) normally open SPDT contacts for each switch positions: Rating: 10 amperes at 240 VAC.

J. Transfer Override Switch: Overrides automatic retransfer control so the ATS will remain connected to the emergency power source regardless of the condition of the normal source. A pilot light indicates the override status.

K. Engine Starting Contacts: One isolated normally closed and 1 isolated normally open. Contacts are gold flashed or gold plates and rated 10 amperes at 32-Volt direct current minimum.

L. Engine Shut-Down Contacts: Instantaneous, to initiate shut-down sequence at engine-generator control panel after retransfer of the load to normal or preferred source. Provide manual engine disconnect switch.
M. Provide network card compatible with remote monitoring requirements in Section 16620 Standby Power Generation Systems.

N. Equipment ground bar adequately sized for all ground wires to and from the transfer switch.

2.3 ENCLOSURE

A. Enclosure for automatic transfer switch located indoors in a dry non-corrosive area shall be NEMA 12 steel with hinged cover.

B. Enclosure for automatic transfer switch located outdoors or in a damp or wet location shall be NEMA 4X stainless steel with hinged cover.

2.4 ACCEPTABLE PRODUCTS

A. Automatic Switch Co. 7000 Series.

B. Kohler KC Series

C. Onan/Cummins Model OHPCD Power Command.

D. Or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All electrical work shall comply with the requirements of NFPA 70 - National Electrical Code (NEC), most current issue in force, and all other applicable local codes, laws, ordinances, and requirements in force. Electrical equipment and materials shall be installed in conformance with the respective manufacturer’s directions and recommendations for the respective application. Any installations which void the UL listing, Intertek Testing Services verification/ETL listing, FM approval, or other third party listing, and/or the manufacturer’s warranty of a device will not be permitted.

B. Contractor shall coordinate work and any power outages with the Owner’s Representative. Any shutdown of existing systems shall be scheduled with and approved by the Owner’s Representative prior to shutdown. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures including, but not limited to, 29 CFR section 1910.147 The Control of Hazardous Energy (lockout/tagout).

C. Contractor shall comply with the applicable requirements of NFPA 70E – Standard for Electrical Safety in the Workplace.
D. Verify all power sources prior to disconnecting, removing, reconnection, installing, connecting, or working on the respective switch or other device.

E. Mount transfer switches in accordance with manufacturer’s recommendations and as detailed on the Plans. Level and anchor unit.

F. Match the type and number of cables and conductors to the control and communications requirements of the transfer switch used. Mounting hardware shall be corrosion resistant stainless steel.

G. Tighten factory-made connections, including connectors, terminals, bus joints, mountings, and grounding. Tighten field-connected connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque tightening values. When manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A.

H. Make equipment grounding connections for transfer switch unit as indicated and as required by the NEC.

I. Provide NEMA 4 hubs for all conduit entries into boxes or enclosures rated NEMA 4 or NEMA 4X to maintain the NEMA 4, 4X rating of the respective enclosure. Provide NEMA 4X stainless steel hubs for NEMA 4X stainless steel enclosures.

J. Coordinate selection of the electric service breaker or disconnect and the engine generator feeder breaker or disconnect to maintain the withstand and closing ratings of the transfer switch.

K. Identify the normal and/or utility power source and identify the standby and/or engine generator power source and connections on the transfer switch.

L. Equipment and Testing:

1. The services of a qualified representative of the equipment supplier shall be provided to check the installation, perform start-up adjustments, and instruct maintenance personnel in the care and proper operation of the equipment.

2. Contractor shall notify the Owner a minimum of seven (7) days prior to conducting test. The Owner must be present during testing to validate results.

3. Instruct Owner personnel on the complete operation and maintenance of transfer switch. Provide minimum of one (1) two (2) hour session.

END SECTION 16495
PART 1 - GENERAL

1.1 WORK INCLUDES
A. Fiberglass support pole for pump control antenna.

1.2 DEFINITIONS
A. EPA: Equivalent projected area.
B. Pole: Supporting structure.
C. Standard: See "Pole."

1.3 ACTION SUBMITTALS
A. Product Data: For each pole, accessory, and antenna-supporting and device.
   1. Include data on construction details, profiles, EPA, cable entrances, materials, dimensions, weight, rated design load, and ultimate strength of individual components.
   2. Include finishes for lighting poles.
B. Shop Drawings:
   1. Include plans, elevations, sections, and mounting and attachment details.
   2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Detail fabrication and assembly of poles and pole accessories.
   4. Method and procedure of pole installation. Include manufacturer's written installations.

1.4 INFORMATIONAL SUBMITTALS
A. Pole and Support Component Certificates: Signed by manufacturers of poles, certifying that products are designed for indicated load requirements according to AASHTO LTS-6-M and that load imposed by antenna and attachments has been included in design. The certification shall be based on design calculations signed and sealed by a professional engineer.
B. Material Test Reports:
   1. For each pole, by a qualified testing agency.
C. Source quality-control reports.

D. Field quality-control reports.

E. Sample Warranty: Manufacturer's standard warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store poles on decay-resistant skids at least 12 in. above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.

B. Retain factory-applied pole wrappings on fiberglass and laminated wood poles until right before pole installation. Handle poles with web fabric straps.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of pole(s) that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within a specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs from special warranty period.

   1. Warranty Period: Five (5) years from date of Substantial Completion.
   2. Warranty Period for Corrosion Resistance: Five (5) years from date of Substantial Completion.
   3. Warranty Period for Color Retention: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Characteristics: Comply with AASHTO LTS-6-M.

B. Dead Load: Weight of antenna and its horizontal and vertical supports, lowering devices, and supporting structure, applied according to AASHTO LTS-6-M.

C. Wind Load: Pressure of wind on pole and luminaire, calculated and applied according to AASHTO LTS-6-M.

   1. Basic wind speed for calculating wind load for poles 50 ft high or less is 120 mph.
      
      a. Wind Importance Factor: 1.0.
      c. Velocity Conversion Factor: 1.0.
D. Strength Analysis: For each pole, multiply the actual EPA of antenna and brackets by a factor of 2.0 to obtain the EPA to be used in pole selection strength analysis. Minimum rating of 5.9 at 120 mph.

2.2 FIBERGLASS POLES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Lithonia Lighting; Acuity Brands Lighting, Inc.
2. Shakespeare Composite Structures.
3. W.J. Whately/Valmont.

B. Poles:

1. Not less than 65 percent by weight of fiberglass roving, with resin and pigment making up the remainder.
2. Roving shall be continuously applied with uniform tension, with multiple layers placed to meet axial and compressive strength requirements.
5. Resin Color: Dark bronze; uniform coloration throughout entire wall thickness.
7. Paint Finish: Pigmented polyurethane, with a minimum dry film thickness of 1.5 mils. Polyurethane may be omitted if the surface layer of the pole is inherently UV inhibited.

C. Fasteners: Stainless steel, size and type as determined by manufacturer. Corrosion-resistant items compatible with support components.

1. Materials: Compatible with poles and standards as well as the substrates to which poles and standards are fastened and shall not cause galvanic action at contact points.

D. Handhole: Oval shaped, with minimum clear opening of 2-1/2 by 5 in., with cover secured by stainless-steel captive screws.

E. Grounding and Bonding Lugs: Bolted 1/2-in. threaded lug, complying with requirements in Section 16450 "Grounding and Bonding," listed for attaching grounding and bonding conductors of type and size listed in that Section, and accessible through handhole.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
B. Examine poles, mounting devices, and pole accessories before installation. Components that are scratched, dented, marred, wet, moisture damaged, or visibly damaged are considered defective.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 POLE FOUNDATION

A. Direct-Buried Poles: Set poles in augered holes to depth below finished grade indicated on Drawings, but not less than 6 ft. To ensure a plumb installation, continuously check pole orientation with plumb bob while tamping.

1. Make holes 6 in. in diameter larger than pole diameter.
2. Fill augered hole around pole with sand or fine soils.

3.3 POLE INSTALLATION

A. Clearances: Maintain the following minimum horizontal distances of poles from surface and underground features unless otherwise indicated on drawing.

1. Fire Hydrants and Water Piping: 60 in.
3. Trees: 15 ft from tree trunk.

B. Raise and set pole using web fabric slings (not chain or cable) at locations indicated by manufacturer.

3.4 GROUNDING

A. Ground Nonmetallic Poles and Support Structures: Comply with requirements in Section 16450 "Grounding and Bonding."

1. Install grounding electrode for each pole.
2. Install grounding conductor and conductor protector.
3. Install lightning rod and grounding conductor as indicated on the Plans.

3.5 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 16 specifications and as indicated on the Plans.

END OF SECTION 16521
PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Furnish and install AC Surge Protectors as detailed on the Plans and as specified herein.

1.2 RELATED WORK

A. Section 16111 – Conduit and Raceway.
B. Section 16120 – Wire and Cable.
C. Section 16470 – Panelboards.
D. Section 16450 – Grounding.

1.3 SUBMITTALS

A. The Contractor shall furnish shop drawings for approval before ordering equipment and/or materials. Shop drawings are required for all AC surge protectors/Transient Voltage Surge Suppressors to be used on the project. Shop drawings shall be clear and legible. Copies that are illegible will be rejected. The preferred shop drawing submittal format shall be electronic (PDF) copies. Contractor may submit hard copies of shop drawings instead of electronic copies where applicable. In the event that the Contractor provides hard copies of shop drawings he shall submit sufficient quantities to meet the needs of his personnel, sub-contractor personnel, and equipment suppliers plus four (4) copies to be retained by the Project Engineer. Shop drawings shall include the following information:

1. In order to expedite the shop drawing review, inspection and/or testing of materials and equipment, the Contractor shall furnish complete statements to the Project Engineer as to the origin and manufacturer of all materials and equipment to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials and equipment.

2. Provide Shop Drawings for all AC Surge Protectors/Transient Voltage Surge Suppressors to be installed on this project. Include specification sheets and cut sheets with manufacturer, model number, voltage rating, surge rating, and housing/enclosure rating.

1.4 STANDARDS

A. NFPA 70 – National Electrical Code (most current issue in force)
NORTHWEST SANITARY SEWER SERVICE AREA RECONSTRUCTION  
CITY OF DANVILLE, IL  

B. UL 1449, third edition, Surge Protective Devices, (or most current issue in effect).  
C. ANSI/IEEE C62.41, Recommended Practice on Surge Voltages in Low Voltage AC Power Circuits.  

1.5 DELIVERY, STORAGE AND HANDLING  
A. Surge protector devices shall be stored in the original containers as delivered to the job site. Surge protector devices shall be stored in warm, dry, indoor area to prevent contact with the earth and to protect them from the weather.  

PART 2 - PRODUCTS  

2.1 AC SURGE PROTECTORS  
A. AC power surge protectors shall be as detailed on the Plans, UL listed per UL 1449, (most current edition) and shall be manufactured in the United States of America.  
B. AC power surge protector for the pump control panel shall be as specified in the pump control panel requirements.  

PART 3 - EXECUTION  

3.1 INSTALLATION  
A. Install Surge Protector Devices (SPD) in conformance with the respective manufacturer’s directions and recommendations. Contractor shall confirm all connections to the surge arrester (phases, neutral, and ground) are completed and secure. Connection leads to the surge arrester shall be sized per the respective manufacturer’s recommendation, and as detailed herein and shall be maintained as short as possible, maximum 2 ft in length where possible, and laced together for mutual coupling. The conduit or conduit nipple connecting the SPD enclosure to the panel enclosure shall be sealed with duct seal or other nonflammable medium to prevent soot from entering the enclosure in the event of a SPD failure.  
B. Maintain leads as short and as straight as possible. Locate the surge protector device on the same side of the panelboard as the circuit breaker that connects it to the panelboard.  
C. Install the circuit breaker for the surge protector device as close as possible to the panelboard main breaker or main lugs. For example for a top feed main breaker/main lugs type panelboard install the circuit breaker for the surge protector device in positions 1 and 3 or in circuit positions 2 and 4. For a bottom feed main breaker/main lugs type panelboard (42 circuit) install the circuit breaker for the surge protector device in positions 39 and 41 or in circuit positions 40 and 42.  

END OF SECTION 16615
PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section consists of furnishing and installing a standby diesel engine generator system for the Denmark Hill Pump Station, Danville, Illinois as detailed on the Plans and specified herein. The engine generator set shall be a legally required standby system as defined by National Electrical Code Article 701. The engine generator set shall be classified as a Class X (capable of providing 24 hours of continuous backup power without being refueled), Type 60 (power restoration within 60 seconds), Level 2 as defined by NFPA 110, Chapter 4. This item shall include all labor, equipment, fuel, lubricants, fluids, weatherproof housing, start battery, battery charger, muffler, sub-base fuel tank, fuel piping, concrete pad, wiring, raceways, grounding, materials, tools, utility coordination, operational instructions, labeling, startup and check out services, testing and all incidentals required to place the engine generator system, automatic transfer switch, and all associated accessories into proper working order as a completed unit to the satisfaction of the Owner and Engineer. Contractor shall also include three copies of instruction manuals, operation and maintenance manuals, and parts list bound in a durable plastic binder for the engine generator set and automatic transfer switch.

1.2 RELATED SECTIONS

A. Section 16010 – Basic Electrical Requirements.
B. Section 16111 – Conduit and Raceway.
C. Section 16120 – Wire and Cable.
D. Section 16195 – Electrical Identification.
E. Section 16450 – Grounding.
F. Section 16495 – Automatic Transfer Switches

1.3 REFERENCE TO STANDARDS

A. NFPA 30 - Flammable and Combustible Liquids Code.
B. NFPA 37 - Installation and Use of Stationary Combustion Engines and Gas Turbines.
C. NFPA 70 - National Electrical Code (most current issue in force).
D. NFPA 70E – Standard for Electrical Safety in the Workplace.

F. UL 142 Standard for Safety- Steel Aboveground Tanks for Flammable and Combustible Liquids.

G. UL 2200 Standard for Stationary Engine Generator Assemblies


J. Engine Exhaust Emissions: Comply with applicable state and local government requirements.

K. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

1.4 SUBMITTALS

A. The Contractor shall furnish shop drawings for approval before ordering equipment and/or materials. Shop drawings are required for panelboards to be used on the project. Shop drawings shall be clear and legible. Copies that are illegible will be rejected. The preferred shop drawing submittal format shall be electronic (PDF) copies. Contractor may submit hard copies of shop drawings instead of electronic copies where applicable. In the event that the Contractor provides hard copies of shop drawings he shall submit sufficient quantities to meet the needs of his personnel, sub-contractor personnel, and equipment suppliers plus four (4) copies to be retained by the Project Engineer. Shop drawings shall include the following information:

1. In order to expedite the shop drawing review, inspection and/or testing of materials and equipment, the Contractor shall furnish complete statements to the Project Engineer as to the origin and manufacturer of all materials and equipment to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials and equipment.

2. Certified outline and installation drawings.

3. Performance data and operating characteristics.

4. Arrangement drawings showing piping, controls and accessory equipment.

5. Drawings on non-standard components and accessories.

6. Drawings on fuel system and fuel tank.

7. Product data: Catalog data marked to indicate materials being furnished.
8. Drawings detailing point to point wiring and type, diagram specific to the components being supplied on the project.

9. Manufacturers specific sizing file detailing the results on the generator being supplied for the loads and voltage dips specified.

10. Operating and Maintenance Data: Instructions Manuals, Maintenance and Operational Manuals. Provide three copies of bound manuals in durable plastic binders (8-1/2 in. x 11 in.). The manuals shall include manufacturer’s maintenance and operating instructions and parts list and serial numbers for equipment.

1.5 QUALITY ASSURANCE

A. Comply with specified ANSI, NEMA, NFPA, and UL requirements for engine generator set components and installation.

1.6 MAINTENANCE SERVICE (WARRANTY)

A. Engine generator set shall be warranted to be free from defects, material and workmanship for a period of five years from date of substantial completion as established by the Owner. Defective parts shall be repaired or replaced at the respective manufacturer’s options, free of charge including travel and labor. Warranty level shall include engine generator set components at shipped from the excluding filters, fluids, belts, hoses, paint, and batteries. Any damage to the engine generator set during installation shall also be repaired and corrected.

PART 2 - PRODUCTS

2.1 STANDBY POWER ENGINE GENERATOR SET

A. Generator shall be rated 150 KW/188 KVA minimum at 1,800 RPM, 60 Hz, 0.8 PF, and 125° C maximum temperature rise. Unit shall be UL 2200 listed. The generator output voltage shall be 240/120 Volt, 3 phase, 4 wire, 60 Hz. The generator shall be capable of delivering rated output (KVA) at rated frequency and power factor, at any voltage not more than five percent above or below rated voltage. The diesel engine-generator set shall be capable of single step load pick of 100 percent nameplate kW and power factor. Generator maximum allowable transient momentary voltage dip shall be 20 percent for the following loads in a two-step application:

1. Step 1: One 50 HP, 230 VAC, three phase, submersible pump, KVA Code Letter F, 127.7 Full load Amps, Locked rotor 690.4 Amps, with a Variable Frequency Drive controller,

   25 KVA, 120/240 VAC, single phase heating loads, lights, receptacles, ventilation fans, and control power circuits.

   HVAC Unit 230 VAC, 3 Phase, with 2.5 Tons cooling capacity and 9 KW of electric heating,
2. Step 2: One 50 HP, 230 VAC, thee phase, submersible pump, KVA Code Letter F, 127.7 Full load Amps, Locked rotor 690.4 Amps, with a Variable Frequency Drive controller,

Note where the actual equipment loads exceed the above loads, the engine generator set rating shall be adjusted to meet the demand loads for the actual equipment furnished and comply with the Specifications.

B. Engine shall be diesel fueled, four cycle, water-cooled with integral mounted radiator, fan and water pump. Engine shall have six (6) cylinders or eight (8) cylinders and a minimum rating of 1.5 HP/KW at its operating speed of 1,800 rpm when corrected to the altitude and temperature conditions of the respective location. Intake and exhaust valves shall be heat resisting alloy steel. Exhaust valve seat inserts shall be provided. Full pressure lubrication shall be supplied by a positive displacement lube oil pump. The engine shall have air cleaners and fuel and oil filters with replaceable elements. Engine speed shall be governed by an electronic governor to maintain automatic isochronous frequency regulation. The engine governing system shall not utilize any exposed operating linkage. Remote 2-wire, starting shall be by a 12-Volt or 24-Volt solenoid shift, electric starter. Engine shall comply with and be certified to U.S. EPA New Source Performance Standards, 40 CFR 60 Subpart III, Tier 3 exhaust emission levels for emergency standby rated engine generator.

C. The engine control panel shall contain an oil pressure gauge, coolant temperature gauge, and battery charger rate ammeter and non-resettable service hour meter.

D. The fuel system shall be integral with the engine. It shall consist of fuel filter, injection pumps, lines, and nozzles. The injection pumps shall obtain fuel from basin fuel tank. The injection pumps shall be driven from the camshaft and simultaneously controlled by a rack and pinion assembly that is hydraulically actuated by signals from the engine governor. The pumps shall be of a variable displacement type to alter the volume of fuel delivered to the spray nozzles according to load demand. The nozzles shall inject fuel directly into the cylinder in the optimum spray pattern for efficient combustion. A manual fuel priming pump shall facilitate priming and bleeding air from the system.

E. Generating set shall contain a complete engine start-stop control which starts engine on closing contact and stops engine on opening contact. A cycle cranking system shall be provided to open the starting circuit if the engine is not started within the selected periods. System shall be set for three (3) cranking periods of fifteen (15) seconds each with fifteen (15) second rest period between cranking periods. All settings shall be adjustable. The engine controls shall also include provisions for remote starting. High engine temperature, low coolant temperature, high coolant temperature, low coolant level, low oil pressure, overcrank and overspeed shutdown with signal light and alarm terminals shall also be provided.

F. Generator shall be four-pole, 2/3 pitch winding, revolving field design with temperature compensated solid-state voltage regulator and Permanent Magnet exciter system. No brushes shall be allowed. The stator shall be directly connected to the engine flywheel housing, and the rotor shall be driven through a semi-flexible driving flange to insure permanent alignment. The insulation system shall be Class H as defined by NEMA MG1-1.65. The alternator shall have a 125°C Temperature rise at full load for a standby system.

G. Frequency regulation shall not exceed 0.25 percent from no load to rated load for any steady load. Voltage regulation shall be within plus or minus 0.5 percent of rated voltage, from no
load to full rated load. The instantaneous voltage dip shall be less than 26 percent of rated voltage when full, three-phase, load and rated power factor is applied to alternator. Recovery to stable operation shall occur within two (2) seconds. Stable or steady state operation is defined as operation with terminal voltage remaining constant within plus or minus 1 percent of rated voltage. Temperature rise shall be within NEMA MG1-22.40, B5-4999 Part 32 and IEC 34-1.

H. The generator shall include a 600 Amp, 3 pole, 4 wire, 240 VAC, main circuit breaker in a NEMA 1 enclosure with solid neutral ground bar. Circuit breaker enclosure shall include provisions for pad locking the circuit breaker in the “off” position. The generator breaker shall be selected to have an Amp Interrupting Current rating that exceeds the available fault current from the generator. The generator breaker shall be selected and coordinated with the respective automatic transfer switch to maintain the withstand and closing ratings of the respective transfer switch. The generator breaker must be on the transfer switch manufacturer’s approved list to maintain the switch withstand and closing ratings as detailed on the Plans and specified herein. Confirm generator breaker size with the respective engine generator manufacturer. Include legend plates labeled “GENERATOR BREAKER, 240/120 VAC, 3 PHASE, 4 WIRE”.

I. The generator control panel shall contain frequency display; non-resettable running time meter; AC voltmeter display with phase selector, and AC ammeter display with phase selector.

J. The engine jacket water cooling system shall be a closed circuit design with provision for filling, expansion, and de-aeration. The cooling pump shall be driven by the engine. The cooling system shall tolerate at least 25 PSI static head. Coolant recirculation shall begin when generator starts, coolant temperature shall be regulated by thermostat.

K. Engine coolant heat shall be discharged to the atmosphere by means of a unit-mounted radiator.

L. Jacket water heater(s) shall be provided to maintain coolant temperature above 90°F while the engine is idle. Heaters shall be powered at 120 VAC or 240 VAC, single phase, and include thermostatic controls. Hoses to and from the heater shall be industrial quality which exhibit long life in operational environments. Manual shut off valves shall be incorporated to isolate the heater during servicing, including before and after heater and bleed/vent line.

M. The engine and generator shall be assembled to a common base. The generator set base shall be designed and built to resist deflection, maintain alignment, and minimize resonant linear vibration. The base shall be of heavy duty steel construction with rolled "C" channel structural members reinforced to maintain engine and generator alignment during lifting, installing, and generator operation. Structural side members shall have sufficient bottom mounting holes to locate vibration isolators. Restricted motion steel spring isolators or integral restricted rubber isolation shall be provided between the engine/generator set and its subbase frame or mounting surface. The pads shall be resistant to heat and age, and impervious to oil, water, antifreeze, and cleaning compounds. The base shall incorporate a battery tray with hold-down clamps within the rails.

N. Provide muffler for unit. Muffler shall be "critical" type capable of attenuation of a minimum of 28 dB throughout the range of 60 through 8,000 hertz. Provide seamless stainless steel flexible exhaust tube and rain cap. Exhaust discharge shall be vertical.

O. Batteries for starting and control shall be heavy duty SLI lead acid type with battery cables and connectors. Battery tray shall be located within the frame. Starting batteries shall be rated 12-
Volt DC or 24 Volt DC with a minimum of 180 ampere-hour and 700 CCA. Sizing shall consider specific application requirements of engine oil viscosity, ambient starting temperature, control voltage, overcharging and vibration. Batteries shall be located as close to the starting motor as practical, away from spark sources, in a relatively cool ambient, and permit easy inspection and maintenance.

P. Battery charger shall provide a rated output voltage of plus/minus 1 percent from no load to full load with A.C. variation of plus/minus 10 percent, minimum of 10 ampere output. Unit shall have automatic adjustable float and equalize ranges, overload protection, and automatic d.c. voltage regulation. Unit shall be solid state type employing silicone diode full wave rectifiers and shall have d.c. ammeter and voltmeter. Unit shall have fused input and output and shall be mounted on wall. Alarm circuits per NFPA 110, for low battery voltage, high battery voltage, and battery charger malfunction. Battery charger shall be located inside the engine generator set enclosure.

Q. Provide a weather protective, level 2 quiet, tamper-proof, enclosure rated for a maximum of 73 to 75 dBA at 23 feet. Enclosure shall be constructed of reinforced sheet steel, prime coated, and finish painted. Enclosure wind load rating shall be not less than 150 mph. Provide enclosure for engine, generator, control panel, engine safety control, start batteries, battery charger and accessories. Enclosure shall have sufficient louvered openings to allow entrance of outside air for engine and generator cooling at full load. Louvered openings shall be designed to exclude driving rain and snow. Provide properly arranged and sized hinged panels in the enclosure to allow convenient access to engine, generator, and control equipment for maintenance and operation. Provide lockable, hinged panels with spring latches to hold panels closed securely and not allow panels to vibrate. Brace housing internally to prevent excessive vibration when generator set is in operation. All exterior bolts shall be tamper-proof. Enclosure shall be rodent proofed. Provide a GFCI receptacle inside the enclosure for maintenance.

R. Include an emergency stop red mushroom head type push button on the engine generator control panel and a second emergency stop station located remote from the engine generator set per the requirements of NFPA 37. Include all associated control and interface wiring and conduit. Remote emergency stop push button shall be front operated red mushroom knob, with “PUSH EMERGENCY STOP” printed on the knob, maintained contact push pull type with two (2) universal contact blocks (one (1) normally open and one (1) normally closed for each block), with contacts rated 10 Amps at 120 VAC and 125 VDC, Square D, Class 9001, SKR9RO5H2, or equal. Include extra deep push button enclosure rated NEMA 12, Hoffman E1PBX or approved equal. Contractor shall verify push button enclosure is adequately sized for the respective operator and contact blocks. Verify quantity of contact blocks required as detailed on the plans or as recommended by the engine generator set manufacturer. Provide guard for emergency stop push button to prevent accidental activation, Square D Class 9001, Type K56YM, or similar type guard. Include weatherproof engraved phenolic legend plate with red background labeled:

“ENGINE GENERATOR
EMERGENCY STOP
PUSH TO STOP
PULL TO RESET”
S. Radiator Exhaust Duct Adapter. Contractor shall include a radiator exhaust duct adapter as recommended by the respective engine generator set manufacturer, and as required to interface to the respective exhaust air system.

T. The generator set shall be built, tested and shipped by one (1) manufacturer so there is one (1) source of supply and responsibility. The performance of the generating set shall be certified by an independent testing laboratory as to the set's full power rating, stability and voltage and frequency regulation.

U. Acceptable Manufacturers:
   1. Caterpillar
   2. Cummins Power Generation, Inc.
   3. Kohler
   4. Or approved equal.

2.2 FUEL TANK

A. Generator set shall be furnished with sub-base mounted fuel tank, minimum usable fuel capacity to operate the engine generator set at full load for 24 hours. The tank shall be dual wall corrosion resistant steel channel and sheet construction, with all welded seams. The tank shall be manufactured to UL 142 standards and shall be UL 142 listed and bear the UL label on tank. The engine generator set with base mounted tank will be located outdoors. The tank volume shall not be greater than 660 gallons. Where necessary provide a custom size tank to accommodate the available space.

B. The tank shall be installed and anchored within a steel secondary containment basin having a minimum capacity of 100 percent that of the tank. The containment shall be protected against intrusion of debris, falling water. The containment shall be equipped with a leak detector that shall activate the “rupture” alarm described below. A drain with ball valve shall be supplied.

C. Fuel tank shall include float and alarm bell with silence pushbutton to alert the operator when tank is full. Floats shall activate and deactivate the sounding of the bell. Set high level float at 90 percent full. Provide float switch for low and high level remote alarms.

D. Tank accessories shall include liquid level fuel gage, pressure relief vents, foot/check valve and locking gas cap.

E. Tank shall have a rupture basin float switch to activate remote alarm when liquid is sensed in tank containment basin.

F. Provide fill port. Include lockable lid or lockable access and associated fuel piping to accommodate fuel filling.

G. Provide flexible fuel lines and engine supply and return piping and shut off valves.
H. Capacity: Fuel for twenty-four (24) hours continuous operation at 100 percent rated power output. Adjust/increase tank capacity indicated in Item 2.02-A above, if required, to ensure the engine generator set will have a minimum fuel capacity of twenty-four (24) hours' continuous operation at 100 percent rated load.

I. The fuel tank shall be painted in accordance with tank manufacturer recommendations.

J. Contractor is responsible for coordination and assisting with application of permit for the base mounted fuel tank with the Office of the State Fire Marshal.

2.3 CONCRETE

A. Concrete for engine generator pad shall conform to Section 03300 – CAST IN PLACE CONCRETE.

B. Concrete for electrical work shall be composed of fine aggregate, coarse aggregate, portland cement, and water so proportioned and mixed as to produce a plastic, workable mixture. Fine aggregate shall be of hard, dense, durable, clean, and uncoated sand. The coarse aggregate shall be reasonably well graded from 3/16 to 1 in. The fine and coarse aggregates shall be free from injurious amounts of dirt, vegetable matter, soft fragments or other deleterious substances. Water shall be fresh, clean, and free from salts, alkali, organic matter, and other impurities. Concrete shall have a compressive strength of 4,500 psi at the age of twenty-eight (28) days. Slump shall not exceed 3 in. Re-tempering of concrete will not be permitted. Exposed, unformed concrete surfaces shall be given a smooth, wood float finish. Concrete shall be cured for a period of not less than seven (7) days, and concrete made with high early strength portland cement shall be repaired by patching honeycombed or otherwise defective areas with cement mortar as directed by the Architect/Engineer. Air entrain concrete exposed to weather using and air-entraining admixture conforming to ASTM C 260. Air content shall be between 4 and 6 percent.

2.4 REMOTE ANNUNCIATOR PANEL

1. Annunciator panel shall be in accord with NFPA 110, surface mounted and provide as a minimum audible and visual signals for the following:
   a. High Battery Voltage
   b. Low Battery Voltage
   c. Generator Running
   d. Generator on Load
   e. Pre-Low Oil Pressure
   f. Low Oil Pressure
   g. Pre-High Engine/Coolant Temperature
   h. High Engine/Coolant Temperature
   i. Low Engine/Coolant Temperature
   j. Overspeed
   k. Overcrank
NORTHWEST SANITARY SEWER SERVICE AREA RECONSTRUCTION  
CITY OF DANVILLE, IL

1. Control switch not in "Auto" position (This alarm shall also be activated in the event that an emergency stop push button is pressed.)
   m. Battery Charger Malfunction
   n. Low Coolant Level

2. Panel shall contain Silence Switch and Lamp Test Switch.

3. Output alarm contacts shall be provided for the following:
   a. Engine Generator Running
   b. Engine Generator Pre-alarm Condition. This alarm shall be activated for the following conditions:
      (1) High Battery Voltage
      (2) Low Battery Voltage
      (3) Pre-Low Oil Pressure
      (4) Pre-High Engine/Coolant Temperature
      (5) Low Engine/Coolant Temperature
      (6) Battery Charger Malfunction
      (7) Other conditions as recommended by the engine generator rep
   c. Engine Generator Failure Condition. This alarm shall be activated for the following conditions:
      (1) Low oil pressure
      (2) High Engine/Coolant Temperature
      (3) Overspeed
      (4) Overcrank
      (5) Control switch not in "Auto" position
      (6) Any other failure or shut down conditions

2.5 FIRE EXTINGUISHERS

A. Furnish and install two fire extinguishers. Fire extinguishers shall be UL rating of at least 4A:60B:C, 10 pound dry chemical, Amerex Model B456 or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The Contractor shall coordinate the work associated with the engine generator set with the serving electric utility company. The electric utility might require inspection of the standby power system prior to connection the respective electric service.
B. The Contractor shall coordinate and obtain the required permit(s) for engine generator set installation from the local city building/electrical inspector as applicable.

C. All electrical work shall comply with the requirements of NFPA 70 - National Electrical Code (NEC), most current issue in force, and all other applicable local codes, laws, ordinances, and requirements in force. Electrical equipment and materials shall be installed in conformance with the respective manufacturer’s directions and recommendations for the respective application. Any installations which void the UL listing, Intertek Testing Services verification/ETL listing, FM approval (or other third party listing), and/or the manufacturer’s warranty of a device will not be permitted.

D. Contractor shall coordinate work and any power outages with the Owner’s Representative. Any shutdown of existing systems shall be scheduled with and approved by the Owner’s Representative prior to shutdown. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures including, but not limited to, 29 CFR section 1910.147 The Control of Hazardous Energy (lockout/tagout).

E. Contractor shall comply with the applicable requirements of NFPA 70E – Standard for Electrical Safety in the Workplace.

F. Contractor shall install unit to conform to manufacturers written installation requirements and in accord with NFPA 30, 37, 70, 110 and all applicable local codes.

G. Maintain 10 feet minimum separation between the engine generator fuel tank and combustible materials.

H. Base mounted fuel tank and fill supply piping shall be installed in accordance with manufacturer's written instructions and in accord with applicable referenced standards, code and ordinances.

I. The engine exhaust system shall be installed to discharge combustion gases quickly and silently with minimum restriction. System including silencer shall be designed for minimum restriction and, in no case, shall back pressure exceed 29 in. H2O.

J. Generator set shall be shimmed and leveled and bolted to concrete base.

K. Concrete work shall conform to the requirements of these specifications and as detailed on the Plans.

L. All final conduit connections to the engine generator set shall be with UL listed liquid tight flexible metal conduit. Liquid-tight, flexible metal conduit and associated fittings shall be UL-listed to meet the requirements of NEC 350.6. Do not install liquid-tight, flexible metal conduit that is not UL listed. Contractor shall confirm liquid-tight, flexible metal conduit bears the UL label prior to installation.

M. Bond the engine generator set frame, battery support rack, and the base mounted fuel tank to the building grounding electrode system as detailed on the Plans.
N. Provide start-up services as recommended by manufacturer, including but not limited to, fill coolant system with anti-freeze solution for freeze protection to -20°F, all oil reservoirs filled, fuel system filled and checked.

O. Demonstrate at site in presence of Owner full functional capability under manual and automatic modes of operation. Perform a full load test using building load and resistive load banks to provide 100 percent specified KW rating for a four (4) hour test period. Correct all defects that occur during load testing. Contractor shall notify the Owner a minimum of seven (7) days prior to conducting test:

1. Test the operation of the unit at 100 percent full load rating for four (4) hours.

2. After the first half-hour operation and at 100 percent full load, record the following: Voltage and amperage (3-phase), frequency, fuel pressure, oil pressure, water temperature, and exhaust gas temperature at engine exhaust outlet.

3. Include cost of fuel for testing and fill engine generator fuel tank to normal full level upon completion of testing.

P. Contractor shall fill the fuel tank and system with No. 2 diesel fuel meeting manufacturer’s recommendations as part of this contract.

Q. Clean interior of engine generator set.

R. Include the services of the manufacturer’s representative to check final connections, inspect the installation, and supervise start-up and testing of the system.

S. Instruct Owner's personnel on the complete operation and maintenance of system:

1. Instruction shall consist of minimum two (2), two (2) hour sessions.

2. Contractor shall notify the Owner a minimum of seven (7) days prior to conducting instruction sessions.

END OF SECTION 16620
PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. This section consists of furnishing and installing a standby natural gas engine generator system for the **Chateau Pump Station, Danville, Illinois** as detailed on the Plans and specified herein. The engine generator set shall be a legally required standby system as defined by National Electrical Code Article 701. The engine generator set shall be classified as a Class X (capable of providing 96 hours or more of continuous backup power with natural gas fuel supply), Type 60 (power restoration within 60 seconds), Level 2 as defined by NFPA 110, Chapter 4. This item shall include all labor, equipment, fuel, lubricants, fluids, weatherproof housing, start battery, battery charger, muffler, fuel piping, concrete pad, wiring, raceways, grounding, materials, tools, utility coordination, operational instructions, labeling, startup and check out services, testing and all incidentals required to place the engine generator system, automatic transfer switch, and all associated accessories into proper working order as a completed unit to the satisfaction of the Owner and Engineer. Contractor shall also include three copies of instruction manuals, operation and maintenance manuals, and parts list bound in a durable plastic binder for the engine generator set and automatic transfer switch.

1.2 RELATED SECTIONS

A. Section 16010 – Basic Electrical Requirements.
B. Section 16111 – Conduit and Raceway.
C. Section 16120 – Wire and Cable.
D. Section 16195 – Electrical Identification.
E. Section 16450 – Grounding.
F. Section 16495 – Automatic Transfer Switches

1.3 REFERENCE TO STANDARDS

A. NFPA 30 - Flammable and Combustible Liquids Code.
B. NFPA 37 - Installation and Use of Stationary Combustion Engines and Gas Turbines.
C. NFPA 70 - National Electrical Code (most current issue in force).
D. NFPA 70E – Standard for Electrical Safety in the Workplace.

F. UL 2200 Standard for Stationary Engine Generator Assemblies


H. Engine Exhaust Emissions: Comply with applicable state and local government requirements.

I. Noise Emission: Comply with applicable state and local government requirements for maximum noise level at adjacent property boundaries due to sound emitted by generator set including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

1.4 SUBMITTALS

A. The Contractor shall furnish shop drawings for approval before ordering equipment and/or materials. Shop drawings are required for panelboards to be used on the project. Shop drawings shall be clear and legible. Copies that are illegible will be rejected. The preferred shop drawing submittal format shall be electronic (PDF) copies. Contractor may submit hard copies of shop drawings instead of electronic copies where applicable. In the event that the Contractor provides hard copies of shop drawings he shall submit sufficient quantities to meet the needs of his personnel, sub-contractor personnel, and equipment suppliers plus four (4) copies to be retained by the Project Engineer. Shop drawings shall include the following information:

1. In order to expedite the shop drawing review, inspection and/or testing of materials and equipment, the Contractor shall furnish complete statements to the Project Engineer as to the origin and manufacturer of all materials and equipment to be used in the work. Such statements shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials and equipment.

2. Certified outline and installation drawings.

3. Performance data and operating characteristics.

4. Arrangement drawings showing piping, controls and accessory equipment.

5. Drawings on non-standard components and accessories.

6. Product data: Catalog data marked to indicate materials being furnished.

7. Drawings detailing point to point wiring and type, diagram specific to the components being supplied on the project.

8. Manufacturers specific sizing file detailing the results on the generator being supplied for the loads and voltage dips specified.
9. Operating and Maintenance Data: Instructions Manuals, Maintenance and Operational Manuals. Provide three copies of bound manuals in durable plastic binders (8-1/2 in. x 11 in.). The manuals shall include manufacturer’s maintenance and operating instructions and parts list and serial numbers for equipment.

1.5 QUALITY ASSURANCE

A. Comply with specified ANSI, NEMA, NFPA, and UL requirements for engine generator set components and installation.

1.6 MAINTENANCE SERVICE (WARRANTY)

A. Engine generator set shall be warranted to be free from defects, material and workmanship for a period of five years from date of substantial completion as established by the Owner. Defective parts shall be repaired or replaced at the respective manufacturer’s options, free of charge including travel and labor. Warranty level shall include engine generator set components at shipped from the excluding filters, fluids, belts, hoses, paint, and batteries. Any damage to the engine generator set during installation shall also be repaired and corrected.

PART 2 - PRODUCTS

2.1 STANDBY POWER ENGINE GENERATOR SET

A. Generator shall be rated 50 KW/62.5 KVA minimum at 1,800 RPM, 60 Hz, 0.8 PF, and 125° C maximum temperature rise. Generator sizing shall be subject to confirmation by the respective engine generator set manufacturer representative that it is suitable for operating the respective loads and in compliance with the specifications. Unit shall be UL 2200 listed. The generator output voltage shall be 240/120 Volt, 3 phase, 4 wire, 60 Hz. The generator shall be capable of delivering rated output (KVA) at rated frequency and power factor, at the respective voltage not more than five percent above or below rated voltage. The Engine generator will need to provide 240/120 VAC, 3 phase, 4 wire power, 125 degree C Temperature Rise, and maximum of 20 percent voltage dip to accommodate the following loads in a two-step application:

1. Step 1: One 10 HP, 230 VAC, thee phase, submersible pump, rated current 26.5 Amps, starting current 170 Amps, and 2 KW miscellaneous 120/240 VAC single phase loads such as pump control panel, 120 VAC receptacle, HID pole light, controls, radio.

2. Step 2: One 10 HP, 230 VAC, thee phase, submersible pump, rated current 26.5 Amps, starting current 170 Amps,

Note where the actual equipment loads exceed the above loads, the engine generator set rating shall be adjusted to meet the demand loads for the actual equipment furnished and comply with the Specifications.

B. Engine shall be natural gas fueled, four cycle, spark ignited, water-cooled with integral mounted radiator, fan and water pump. Engine shall have six (6) cylinders or eight (8)
cylinders and a minimum rating of 1.5 HP/KW at its operating speed of 1,800 rpm when corrected to the altitude and temperature conditions of the respective location. Intake and exhaust valves shall be heat resisting alloy steel. Exhaust valve seat inserts shall be provided. Full pressure lubrication shall be supplied by a positive displacement lube oil pump. The engine shall have air cleaners and fuel and oil filters with replaceable elements. Engine speed shall be governed by an electronic governor to maintain automatic isochronous frequency regulation. The engine governing system shall not utilize any exposed operating linkage. Remote 2-wire, starting shall be by a 12-Volt or 24-Volt solenoid shift, electric starter. Engine shall comply with and be certified to U.S. EPA New Source Performance Standards, 40 CFR 60 Subpart III, Tier 3 exhaust emission levels for emergency standby rated engine generator.

C. The engine control panel shall contain an oil pressure gauge, coolant temperature gauge, and battery charger rate ammeter and non-resettable service hour meter.

D. The fuel system shall be designed for primary operation on Natural Gas having a BTU content of 905 BTU per cubic foot delivered to the unit in a vapor state. A carburetor, secondary regulator, fuel lock off solenoid, flexible fuel line, and all piping shall be installed at the factory terminating at a single pipe opening external to the mounting base.

E. Generating set shall contain a complete engine start-stop control which starts engine on closing contact and stops engine on opening contact. A cycle cranking system shall be provided to open the starting circuit if the engine is not started within the selected periods. System shall be set for three (3) cranking periods of fifteen (15) seconds each with fifteen (15) second rest period between cranking periods. All settings shall be adjustable. The engine controls shall also include provisions for remote starting. High engine temperature, low coolant temperature, high coolant temperature, low coolant level, low oil pressure, overcrank and overspeed shutdown with signal light and alarm terminals shall also be provided.

F. Generator shall be four-pole, 2/3 pitch winding, revolving field design with temperature compensated solid-state voltage regulator and Permanent Magnet exciter system. No brushes shall be allowed. The stator shall be directly connected to the engine flywheel housing, and the rotor shall be driven through a semi-flexible driving flange to insure permanent alignment. The insulation system shall be Class H as defined by NEMA MG1-1.65. The alternator shall have a 125°C Temperature rise at full load for a standby system.

G. Frequency regulation shall not exceed 0.25 percent from no load to rated load for any steady load. Voltage regulation shall be within plus or minus 0.5 percent of rated voltage, from no load to full rated load. The instantaneous voltage dip shall be less than 20 percent of rated voltage when full, three-phase, load and rated power factor is applied to alternator. Recovery to stable operation shall occur within two (2) seconds. Stable or steady state operation is defined as operation with terminal voltage remaining constant within plus or minus 1 percent of rated voltage. Temperature rise shall be within NEMA MG1-22.40, B5-4999 Part 32 and IEC 34-1.

H. The generator shall include a 200 Amp, 3 pole, 240 VAC, main circuit breaker in a NEMA 1 enclosure with solid neutral ground bar. Circuit breaker size shall be adjusted where recommended by the engine generator representative for the respective engine generator furnished. Circuit breaker enclosure shall include provisions for pad locking the circuit breaker in the “off” position. The generator breaker shall be selected to have an Amp Interrupting Current rating that exceeds the available fault current from the generator. The generator breaker shall be selected and coordinated with the respective automatic transfer switch to
maintain the withstand and closing ratings of the respective transfer switch. The generator breaker must be on the transfer switch manufacturer's approved list to maintain the switch withstand and closing ratings as detailed on the Plans and specified herein. Confirm generator breaker size with the respective engine generator manufacturer. Include legend plates labeled “GENERATOR BREAKER, 240/120 VAC, 3 PHASE, 4 WIRE”.

I. The generator control panel shall contain frequency display, non-resettable running time meter; AC voltmeter display, with phase selector and AC ammeter display with phase selector.

J. The engine jacket water cooling system shall be a closed circuit design with provision for filling, expansion, and de-aeration. The cooling pump shall be driven by the engine. The cooling system shall tolerate at least 25 PSI static head. Coolant recirculation shall begin when generator starts, coolant temperature shall be regulated by thermostat.

K. Engine coolant heat shall be discharged to the atmosphere by means of a unit-mounted radiator.

L. Jacket water heater(s) shall be provided to maintain coolant temperature above 90°F while the engine is idle. Heaters shall be powered at 120 VAC or 240 VAC, single phase, and include thermostatic controls. Hoses to and from the heater shall be industrial quality which exhibit long life in operational environments. Manual shutoff valves shall be incorporated to isolate the heater during servicing, including before and after heater and bleed/vent line.

M. The engine and generator shall be assembled to a common base. The generator set base shall be designed and built to resist deflection, maintain alignment, and minimize resonant linear vibration. The base shall be of heavy duty steel construction with rolled "C" channel structural members reinforced to maintain engine and generator alignment during lifting, installing, and generator operation. Structural side members shall have sufficient bottom mounting holes to locate vibration isolators. Restricted motion steel spring isolators or integral restricted rubber isolation shall be provided between the engine/generator set and its subbase frame or mounting surface. The pads shall be resistant to heat and age, and impervious to oil, water, antifreeze, and cleaning compounds. The base shall incorporate a battery tray with hold-down clamps within the rails.

N. Provide muffler for unit. Muffler shall be "critical" type capable of attenuation of a minimum of 28 dB throughout the range of 60 through 8,000 hertz. Provide seamless stainless steel flexible exhaust tube and rain cap. Exhaust discharge shall be vertical.

O. Batteries for starting and control shall be heavy duty SLI lead acid type with battery cables and connectors. Battery tray shall be located within the frame. Starting batteries shall be rated 12-Volt DC or 24 Volt DC with a minimum of 180 ampere-hour and 700 CCA. Sizing shall consider specific application requirements of engine oil viscosity, ambient starting temperature, control voltage, overcharging and vibration. Batteries shall be located as close to the starting motor as practical, away from spark sources, in a relatively cool ambient, and permit easy inspection and maintenance.

P. Battery charger shall provide a rated output voltage of plus/minus 1 percent from no load to full load with A.C. variation of plus/minus 10 percent, minimum of 10 ampere output. Unit shall have automatic adjustable float and equalize ranges, overload protection, and automatic d.c. voltage regulation. Unit shall be solid state type employing silicone diode full wave rectifiers and shall have d.c. ammeter and voltmeter. Unit shall have fused input and output and shall be
mounted on wall. Alarm circuits per NFPA 110, for low battery voltage, high battery voltage, and battery charger malfunction. Battery charger shall be located inside the engine generator set enclosure.

Q. Provide a weather protective, level 2 quiet, tamperproof, enclosure rated for a maximum of 73 to 75 dBA at 23 feet. Enclosure shall be constructed of reinforced sheet steel, prime coated, and finish painted. Enclosure wind load rating shall be not less than 150 mph. Enclosure shall be constructed of reinforced sheet steel, prime coated, and finish painted. Provide enclosure for engine, generator, control panel, engine safety control, start batteries, battery charger and accessories. Enclosure shall have sufficient louvered openings to allow entrance of outside air for engine and generator cooling at full load. Louvered openings shall be designed to exclude driving rain and snow. Provide properly arranged and sized hinged panels in the enclosure to allow convenient access to engine, generator, and control equipment for maintenance and operation. Provide lockable, hinged panels with spring latches to hold panels closed securely and not allow panels to vibrate. Brace housing internally to prevent excessive vibration when generator set is in operation. All exterior bolts shall be tamper-proof. Enclosure shall be rodent proofed. Provide a GFCI receptacle inside the enclosure for maintenance.

R. Include an emergency stop red mushroom head type push button on the engine generator control panel and a second emergency stop station located remote from the engine generator set per the requirements of NFPA 37. Include all associated control and interface wiring and conduit. Remote emergency stop push button shall be front operated red mushroom knob, with “PUSH EMERGENCY STOP” printed on the knob, maintained contact push pull type with two (2) universal contact blocks (one (1) normally open and one (1) normally closed for each block), with contacts rated 10 Amps at 120 VAC and 125 VDC, Square D, Class 9001, SKR9RO5H2, or equal. Include extra deep push button enclosure rated NEMA 4X stainless steel for outdoor applications, Hoffman E-1PBGXSS or equal. Contractor shall verify push button enclosure is adequately sized for the respective operator and contact blocks. Verify quantity of contact blocks required as detailed on the plans or as recommended by the engine generator set manufacturer. Provide guard for emergency stop push button to prevent accidental activation, Square D Class 9001, Type K56YM, or similar type guard. Include weatherproof engraved phenolic legend plate with red background labeled:

“ENGINE GENERATOR
EMERGENCY STOP
PUSH TO STOP
PULL TO RESET”

S. The generator set shall be built, tested and shipped by one (1) manufacturer so there is one (1) source of supply and responsibility. The performance of the generating set shall be certified by an independent testing laboratory as to the set's full power rating, stability and voltage and frequency regulation.

T. Acceptable Manufacturers:

1. Kohler
2. Cummins Power Generation, Inc.
3. Caterpillar
4. Or approved equal.

2.2 CONCRETE

A. Concrete for engine generator pad shall conform to Section 03300 – CAST IN PLACE CONCRETE.

B. Concrete for electrical work shall be composed of fine aggregate, coarse aggregate, portland cement, and water so proportioned and mixed as to produce a plastic, workable mixture. Fine aggregate shall be of hard, dense, durable, clean, and uncoated sand. The coarse aggregate shall be reasonably well graded from 3/16 to 1 in. The fine and coarse aggregates shall be free from injurious amounts of dirt, vegetable matter, soft fragments or other deleterious substances. Water shall be fresh, clean, and free from salts, alkali, organic matter, and other impurities. Concrete shall have a compressive strength of 4,500 psi at the age of twenty-eight (28) days. Slump shall not exceed 3 in. Re-tempering of concrete will not be permitted. Exposed, unformed concrete surfaces shall be given a smooth, wood float finish. Concrete shall be cured for a period of not less than seven (7) days, and concrete made with high early strength portland cement shall be repaired by patching honeycombed or otherwise defective areas with cement mortar as directed by the Architect/Engineer. Air entrain concrete exposed to weather using and air-entraining admixture conforming to ASTM C 260. Air content shall be between 4 and 6 percent.

2.3 FIRE EXTINGUISHERS

A. Furnish and install two fire extinguishers. Fire extinguishers shall be UL rating of at least 4A:60B:C, 10 pound dry chemical, Amerex Model B456 or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All electrical work shall comply with the requirements of NFPA 70 - National Electrical Code (NEC), most current issue in force, and all other applicable local codes, laws, ordinances, and requirements in force. Electrical equipment and materials shall be installed in conformance with the respective manufacturer’s directions and recommendations for the respective application. Any installations which void the UL listing, Intertek Testing Services verification/ETL listing, FM approval (or other third party listing), and/or the manufacturer’s warranty of a device will not be permitted.

B. Contractor shall coordinate work and any power outages with the Owner’s Representative. Any shutdown of existing systems shall be scheduled with and approved by the Owner’s Representative prior to shutdown. Once shut down, the circuits shall be labeled as such to prevent accidental energizing of the respective circuits. All personnel shall follow U.S. Department of Labor Occupational Safety & Health Administration (OSHA) 29 CFR Part 1910 Occupational Safety and Health Standards for electrical safety and lockout/tagout procedures including, but not limited to, 29 CFR section 1910.147 The Control of Hazardous Energy (lockout/tagout).
C. Contractor shall comply with the applicable requirements of NFPA 70E – Standard for Electrical Safety in the Workplace.

D. Contractor shall install unit to conform to manufacturers written installation requirements and in accord with NFPA 30, 37, 70, 110 and all applicable local codes.

E. Contractor shall install unit to conform to manufacturers written installation requirements.

F. Natural Gas piping shall be installed in accordance with the manufacturer’s written instructions and in accord with applicable referenced standards, codes and ordinances.

G. The engine exhaust system shall be installed to discharge combustion gases quickly and silently with minimum restriction. System including silencer shall be designed for minimum restriction and, in no case, shall back pressure exceed 27 in. H2O. Provide heavy walled piping, Schedule 40, with radii of 90 bends at least 1-1/2 times the pipe diameter. Piping shall be installed with 9 in. minimum clearance from combustible material or incorporate appropriate insulation and shielding. Piping shall be supported and braced to prevent weight or thermal growth being transferred to the engine and flexible expansion fittings provided to accommodate thermal growth. Support dampers and springs shall be included where necessary to isolate vibration. Long runs of pipe shall be pitched away from the engine and water traps with drain installed at the lowest point. Exhaust stack shall be extended to avoid nuisance fumes and odors, and outlet cut at 45 to minimize noise. Engine exhaust piping shall be completely insulated.

H. Generator set shall be shimmed and leveled and bolted to concrete base.

I. Concrete work shall conform to the requirements of these specifications and as detailed on the Plans.

J. All final conduit connections to the engine generator set shall be with UL listed liquid tight flexible metal conduit. Liquid-tight, flexible metal conduit and associated fittings shall be UL-listed to meet the requirements of NEC 350.6. Do not install liquid-tight, flexible metal conduit that is not UL listed. Contractor shall confirm liquid-tight, flexible metal conduit bears the UL label prior to installation.

K. Provide start-up service as recommended by manufacturer, including but not limited to, fill coolant system with anti-freeze solution for freeze protection to -20°F, all oil reservoirs filled, fuel system filled and checked.

L. Demonstrate at site in presence of Owner full functional capability under manual and automatic modes of operation. Perform a full load test using building load and resistive load banks to provide 100 percent specified KW rating for a four (4) hour test period. Correct all defects that occur during load testing. Contractor shall notify the Owner a minimum of seven (7) days prior to conducting test:

1. Test the operation of the unit at 100 percent full load rating for four (4) hours.

2. After the first half-hour operation and at 100 percent full load, record the following: Voltage and amperage (3-phase), frequency, fuel pressure, oil pressure, water temperature, and exhaust gas temperature at engine exhaust outlet.
M. Clean interior and exterior of engine generator enclosure.

N. Include the services of the manufacturer’s representative to check final connections, inspect the installation, and supervise start-up and testing of the system.

O. Instruct Owner's personnel on the complete operation and maintenance of system:

1. Instruction shall consist of minimum two (2), two (2) hour sessions.

2. Contractor shall notify the Owner a minimum of seven (7) days prior to conducting instruction sessions.

END OF SECTION 16621
PART 1 – GENERAL

1.1 SUMMARY

Contractor shall furnish and install a pump controller as specified below to control and operate each of the three lift stations proposed in this project. This work shall be performed in conjunction with the rest of the electrical work specified in other sections. This work shall also work in conjunction with the City’s existing SCADATA SCADA panels. The contractor shall work with the City’s current integrator to ensure compatibility between the controller and the City’s current system.

PART 2 - PRODUCTS

2.1 Pump Control Panel

The pump control manufacturer shall coordinate with the pump supplier to ensure compatibility between the two.

1. General
   a. The duplex pump control panel enclosures for outside installation shall be strut support-mounted UL-listed, NEMA 4X stainless steel rated for outdoor use, and pad lockable. Enclosure shall have three (3)-point latching mechanism and handle for easy release. Enclosure shall not have clasps around the door to maintain a NEMA 4 rating. Enclosure shall be manufactured by Hammond, Hoffman, Rittal, or approved equal and shall be sized to accommodate equipment furnished. The enclosure shall also provide for “dead-front” construction using hinged inner doors (swing out panel) to mount all operator devices. Bond all panels and panel doors to ground system. Hinges shall not be considered as an adequate grounding path. All hardware shall be corrosion resistant.
   b. The triplex pump control panel enclosures for inside installation shall be strut support-mounted UL-listed, NEMA 12 steel rated for indoor use, and pad lockable. Enclosure shall have three (3)-point latching mechanism and handle for easy release. Enclosure shall be manufactured by Hammond, Hoffman, Rittal, or approved equal and shall be sized to accommodate equipment furnished. The enclosure shall also provide for “dead-front” construction using hinged inner doors (swing out panel) to mount all operator devices. Bond all panels and panel doors to ground system. Hinges shall not be considered as an adequate grounding path. All hardware shall be corrosion resistant.
c. The panel manufacturer shall be a current Underwriters Laboratories listed UL 508 industrial control panel builder and shall show its follow-up service procedure file number on submittals. The control panel manufacturers shall be regularly engaged in the manufacture of controls for the water/wastewater industry. All devices within the panel shall be UL-listed and/or recognized where applicable and shall be mounted and wired in accordance with the most current edition of UL 508 and the NEC. All conduit runs entering or leaving the pump station wet well shall have explosion-proof conduit seals suitable for Class 1, Division 1, Group D environment. All conduits for intrinsically safe wiring shall enter the pump control panel enclosure at the intrinsically safe section of the panel. Non-intrinsically safe wiring including, but not limited to, power feeder conductors, branch circuit conductors, alarm circuits, and pump motor cables shall not enter the control panel at the intrinsically safe wiring section and shall maintain a minimum separation distance inside the control panel from the intrinsically safe conductors as required by NEC 504 and ANSI/ISA RP12.6.

d. All conduit entries into the Pump Control Panels shall have water-tight threaded hubs, UL-listed for the respective NEMA 4X enclosures.

e. Include a label placed on the inside of the panel door with the name, address, phone number and emergency phone number of the service representative for the pumps and control panel.

f. Contractor shall furnish all equipment, labor, services, submittals, tools and work required to provide a complete and operational Duplex Pump Control Panel and Triplex Pump Control Panel as shown on the Plans and specified herein.

g. The pump control panel enclosure shall be located adjacent to proposed pump stations as detailed on the Plans. Furnish and install stainless steel strut support Unistrut P1000SS or approved equal, and all mounting hardware. Include warning label on inner and outer door labeled “WARNING POTENTIAL ELECTRIC ARC FLASH HAZARD, DISCONNECT FEEDER BREAKER BEFORE SERVICING”, or similar note conforming to the requirements of NEC 110.16 “Arc Flash Hazard Warning.” Warning label shall also conform to ANSI Z535.4-2002 “Product Safety Signs and Labels.”

h. The power feeding the Chateau lift station is 120/240VAC three (3) phase, four (4) wire, 60 Hz. The power feeding the Rose Hill Cove and Denmark Hill lift station is 480Y/277VAC three (3) phase, four (4) wire, 60 Hz.

2. Panel Configuration

a. The control panels at the Rose Hill Cove and Chateau Estates lift stations shall be self-contained including pump controls and motor starters. The control
panel for the Denmark Hill lift station shall include the pump controls but the variable frequency drives shall be external to the panel.

3. Control Description

a. A microprocessor based pump controller shall be provided to monitor wet well level via remote sensor as specified hereinafter and provide duplex pump down mode pump control for Rose Hill Cove and Chateau Estates and triplex pump down mode pump control for Denmark Hill. The pumps shall start and stop as required to maintain an acceptable level.

b. For duplex and triplex operation, if the capacity of the lead pump is less than the influent flow, the lag 1 pump shall be called to start. If the capacity of both pumps running in parallel is greater than the influent flow, the lag shall stop when the wet well level falls to the lag pump stop setpoint. The lead pump will continue to run.

c. If the capacity of the lead pump is greater than the influent flow, it shall stop when the level falls to the lead pump stop setpoint. The pumps shall alternate after each complete operating cycle if alternation is enabled.

d. The triplex station will be designed to only run two of the three pumps at any given time.

e. The pump control panel shall include the following described equipment in Paragraph 3 of this document (installed complete and operational), as well as that shown on the Plans and specified herein.

4. Components

a. Power Distribution Blocks: Each power distribution terminal block shall be provided with a clear plexiglass cover. Terminal block shall be Square D Class 9080, or approved equal sized as required for the respective conductors. All terminal blocks shall be rated 600 volt with amperage ratings in conformance with NEC Table 310-16 using 75 degrees C wire for the respective lug wire range.

b. Secondary Surge Protector: AC surge protector shall be UL listed per UL 1449, third edition, suitable for 480 VAC, three (3) phase, three (3)-wire plus ground system, with surge current rating of 40 kA per mode 8/20 µs (20kV) wave, and status indication lights, Joslyn 1451-49 or approved equal.

c. Control Power Transformer (2 kVA minimum): Control transformer and power supply shall be provided to provide the 120 VAC for control circuits when required. Transformers shall have circuit breaker over current protection on the primary and secondary circuits. The secondary windings shall be grounded.
Control Power Transformer larger than 2 kVA shall be externally mounted on the control side of the enclosure and shall be supplied in a NEMA 4X stainless steel nonventilated weatherproof housing for external installations and NEMA 12 steel enclosures for interior installations. Primary and Secondary Protection shall be provided for transformer. The overcurrent protection shall be achieved with fuses. The control power transformer shall be Square D Type T, TF or approved equal.

d. Circuit breakers: Circuit breakers for motor circuits, control circuits, and other branch circuits shall be thermal magnetic, molded case, 100-Amp frame minimum, 10,000 Amps symmetrical, interrupting current rating at 120/240 VAC for one-pole and two-pole breakers and 22,000 Amps symmetrical, interrupting current rating at 480 VAC for three-pole breakers as manufactured by Square D, or approved equal. Breakers shall have “on”, “off” and “tripped” positions and shall be UL-listed. Breakers shall be sized as required for the respective equipment in accordance with NEC and the respective equipment manufacturer’s recommendation. Include breakers for the following equipment as a minimum.

   i. Pump motor #1 branch breaker (all stations.)
   ii. Pump motor #2 branch breaker (all stations.)
   iii. Pump motor #3 branch breaker (Denmark Hill only)
   iv. Pump control panel control circuit.
   v. Accessories (GFCI receptacle, and heater)
   vi. Alarm System

e. Variable Frequency Controllers:
   i. See Section 16269 Variable Frequency Controllers.

f. Mode Select: Method of operation shall be by a three position maintained “Hand-Off-Auto” selector switch provided for each pump. Selector switch shall be water-tight/oil tight (NEMA 4/13) Allen Bradley 800T Series, Square D Class 9001, Type K, or Eaton Cutler-Hammer E22 or Cat. No. 10250 Series. Position commands are as follows:

   i. Hand – In this position, the applicable pump shall run without regard for the level sensing commands and will relay on operator discipline to run and stop.

   ii. Off – In this position, the applicable pump will not run under any circumstances.

   iii. Auto – In this position, the pressure transducer, float switches and respective control relays shall control the applicable pump. The pressure transducer will sense the appropriate levels in the wet well and initiate start and stop commands to the pump through the associated
control relays. Floats will act as a backup to the pressure transducer in the event the transducer fails.

g. Legend Plates: Legend plates shall be required for all starters, circuit breakers, pilot lights, control panels, and disconnects. Legend plates shall be provided to identify the equipment controlled and the function of each pushbutton, indicating light, pilot light, selector switch and device. Legend plates shall be weatherproof and abrasion resistant phenolic materials. Lettering shall be black on white background, unless otherwise noted.

h. Condensation Heater: Provide a condensation strip type heater sized as required for the pump control panel enclosure to minimize moisture that may accumulate inside the enclosure. Heater shall be sized to maintain a minimum internal enclosure temperature of approximately 50 degrees F for an outside design temperature of -15 degrees F. Include integral thermostat and circulating fan for condensation heater. Circulating fan shall be 4 in. to 6 in. nominal diameter axial type fan with wire guards, 115 VAC, 60 Hz. Thermostat shall be line voltage thermostat, 120 VAC, 5-Amp minimum current rating, SPST, with adjustable control knob as manufactured by Honeywell, White-Rogers, Hammond, Hoffman, Rittal, or Chromalox.

i. Convenience Duplex Receptacle: Provide a duplex receptacle with ground fault circuit interrupter. Receptacle shall be rated 120 VAC, 60 Hz, and 15 Amps with a trip threshold of 5 ± 1 milliamp. Receptacle shall be a UL Class A GFCI unit complying with and tested in accordance with UL Standard No. 943. GFCI shall be as manufactured by Leviton, Hubbell, Eagle, Arrow-Hart, Bryant, or Pass & Seymour.

j. Pump Motor Thermal Trip: A thermal trip on the motor will cause immediate shutdown and activate the respective thermal trip condition alarm. Pump motor thermal trip shall be wired to provide manual reset and restarting of the pump motor in conformance with the recommendations of the respective submersible pump manufacturer’s representative. Provide interposing relays as required. Verify thermal trip requirements with the respective submersible pump manufacturer.

k. Pump Motor Seal Leak Detection: The seal leak detection on the motor shall shut down the pump and activate the respective seal leak alarm as required/recommended by the respective submersible pump manufacturer’s representative.

i. Provide interposing relays as required. Verify seal leak requirements with the respective submersible pump manufacturer.
l. Motor Monitor Relays: Motor monitor relay shall be provided by the pump vendor or be a model approved by the pump vendor to ensure the pump warranty is maintained.

m. Enclosure Light: Provide a 60-watt incandescent light fixture for the pump control panel enclosure with door activated switch. Light fixture shall be Hoffman Catalog Number A-LTDB1, or approved equal. Include lamps for respective fixture.

n. Construction Standards

i. Wire Numbers – Each wire in the control panel shall be marked with a wire number that corresponds to the page and ladder rung of the schematic diagrams. A unique wire number shall be provided between component contacts and coils. Wire markers shall be Brady Thermal Transfer Self-Laminating Vinyl or equal by Grafoplast or Thomas & Betts.

ii. Color Coding – Wires shall also be color-coded as follows: 120 VAC Line = black; Neutral = white; Ground = green; Switched 120 VAC = red; DC current carrying conductor = blue, DC non-current carrying conductor = white with blue stripe, Foreign voltage = yellow, Intrinsically safe = light blue.

iii. Component Identification – Each component in the system shall be identified by a unique number that corresponds to its coil’s page and ladder rung location on the schematic drawings.

iv. Wire – AC control conductors shall be 600 volt and a minimum of 18 gauge. DC control conductors shall be a 300-volt and a minimum of 18 gauge. Control conductors shall be UL Type MTW rated for 105 degrees C. Analog conductors shall be 22 gauge shielded twisted three conductor rated for 300 volts. Wire shall be Beldon 8771 or equal. Shields shall be grounded at the PLC or panel location. Power conductors shall be sized per UL and NEC standards and rated for 600 volts. Conductors shall be UL Type MTW, THHN or THWN rated for 90 degrees C.

v. Control Terminals – All field control conductors shall be connected to terminal blocks. Terminals shall have machine marked wire numbers. Connection of field control conductors directly to control panel components will not be allowed. Terminal blocks shall be rated for 30 amps at 600 volts. They shall be screw terminal type capable of terminating No. 10 to 26 gauge wire. Terminal bridge bars shall be provided when it is necessary to bridge multiple like terminals together.
Terminals and accessories shall be Phoenix Contact “Clipline” or equal by Allen Bradley or Weidemueller 21.

vi. Provide one (1) box (five (5) minimum quantity) of each type and size of fuse, upon completion of the job, for use as spares.

vii. A schematic diagram (showing wire color) shall be permanently fastened to the inside of the enclosure. An Installation and Service Manual shall also be included with each control panel. The control panel shall be U.L. listed as an assembly.

viii. Ground Bar. Provide ground bar mounted and bonded inside the panel enclosure.

ix. Wiring Duct. Provide wiring duct to route conduits as necessary for a neat and workable installation.

o. Level Controller

i. General
   1. The Lift Station Controller shall be an off-the-shelf, preprogrammed, dedicated to the application, microprocessor based controller capable of monitoring process variable inputs and automatically control up to two constant speed pumps. Systems using a one of a kind, non-standardized, custom programming generic controller represent additional complexity and unproven operation and thus are not in conformance to the intent of the these specifications and will not be acceptable.

   2. Controller shall be configured for the number of pumps to be controlled at this lift stations as per these specifications.

   3. The operator interface shall display the current level in feet and represent the level in bar graph form, which dynamically updates based on the level in the wet well.

   4. An active/dynamic graphical representation of each pump and its status shall be displayed on the same screen along with flow in gallons per minute. Pump graphic shall change state to indicate – “Off”, “Called”, “Running”, and “Failed/Out of Service”.

   5. Touching an active pump on the home screen takes you to the respective pump status screen.

   6. A trend screen showing, a minimum of, the last two (2) hours of wet well level fluctuations shall also be available.
7. The operator interface shall have a display area not less than 3.5 in. with 160 x 128 pixel resolution, Transflex touch screen graphic display viewable in direct sunlight.

8. The operator interface shall be suitable for Type 12, 4 & 4X environment. Additionally, the display shall be manufactured from a UV resistant polyester substrate.

9. To prevent the loss of data during an extended power outage, longer than four (4) hours, the controller shall have a built in replaceable battery system to keep volatile memory active for approximately ten (10) years.

ii. Inputs & Outputs: The controller shall come standard with herein specified inputs and outputs. The controller shall also have the ability to accommodate additional expansion I/O without the need to replace hardware or upgrade the controller.

iii. The controller shall be configured to monitor the following discrete input status signals:
   1. Pump 1, 2 Running (Rose Hill Cove and Chateau Estates)
   2. Pump 1, 2, 3 Running (Denmark Hill)
   3. Pump 1, 2 HOA In Auto (Rose Hill Cove and Chateau Estates)
   4. Pump 1, 2, 3 HOA In Auto (Denmark Hill)
   5. Pump 1, 2 Seal Failure (Rose Hill Cove and Chateau Estates)
   6. Pump 1, 2, 3 Seal Failure (Denmark Hill)
   7. Pump 1, 2 Overtemp (Rose Hill Cove and Chateau Estates)
   8. Pump 1, 2, 3 Overtemp (Denmark Hill)
   9. Pump 1, 2 Overload (Rose Hill Cove and Chateau Estates)
   10. Pump 1, 2, 3 Overload (Denmark Hill)
   11. Backup Active (all stations)
   12. High Level Float (all stations)
   13. Low Level Float (all stations)
   14. Control Power Failure (all stations)
   15. Phase Failure (all stations)
   16. Flow Pulse (all stations)
   17. Temp Alarm High/Low (all stations)

iv. The controller shall provide the following discrete output signals:
   1. Pump 1, 2 Call (Rose Hill Cove and Chateau Estates)
   2. Pump 1, 2, 3, Call (Denmark Hill)
   3. Pump 1, 2 Failure (Rose Hill Cove and Chateau Estates)
   4. Pump 1, 2, 3 Failure (Denmark Hill)
   5. Common Alarm (all stations)
   6. Alarm Horn (all stations)
   7. Alarm Horn Silence (all stations)
8. Backup Reset (all stations)
   v. The controller shall monitor the following (4-20 mA) process signals:
      1. Wet Well Level (all stations)

   vi. A two level security system shall be provided for operators (OPER) and supervisors (SUPER). Without being logged in, screens are view only.

   vii. OPER – Operator Access
      1. Rights to edit set points and acknowledge alarms

   viii. SUPER – Supervisor Access
      1. All privileges as the OPER
      2. Right to change the passwords of both SUPER and OPER users
      3. Right to set lifetime pump runtime and start totals
      4. Right to toggle communication ports between telemetry communications or local programming modes
      5. Right to set the controller time and date
      6. Right to access removable media system screen
      7. Shall be provided with factory default passwords
      8. To prevent unauthorized controller adjustments, an adjustable 0-999 second delay shall be provided to automatically logoff the current user after the adjustable time period, and no operator screen navigation has been detected.

9. The controller shall be capable of operating pumps in an automatic or fixed mode. In automatic mode, a built in alternator shall be available to equalize motor starts, stops and run time. The alternator shall have the capability of being put into fixed sequence mode at any time. Alternation shall also have the capability to alternate cyclically or following an adjustable period of time.

p. Alternation

   i. Alternator shall have pump fail replace logic allowing a failed pump to be detected and the lag pump to be called into service without level increasing to lag start setpoint.

   ii. Auto Alternation Mode
      1. If the running signal input is not received within 60 seconds (adjustable) of the respective pump being called to start, a pump failure alarm shall be displayed in the alarm banner and the next pump in sequence shall be called to start.

   iii. Fixed Alternation Mode
      1. If the running signal input is not received within 60 seconds (adjustable) of the respective pump being called the respective pump shall continue to be called until the level in the wet well reaches the
next level setpoint at which point the next pump in the sequence shall be called to start.

q. Setpoints

i. The following system setpoints shall be provided: (* indicates an associated, user adjustable (0-999) seconds time delay shall also be provided to prevent momentary process fluctuations from impacting alarm or control.)
   a. Rose Hill Wet Well Invert / Rim Elev.  564.89/586.75
   b. Wet Well Level High Level Alarm *  572.59
   c. Start Lead*, Lag 1*  569.59 Lead 571.59 Lag
   d. Stop Lead*, Lag 1*,  566.89 both
   e. Pump 1, 2 Failure To Start Delay  20 sec
   f. Pump 1, 2 Seal Failure Delay  20 sec
   g. Pump 1, 2 Over Temp Delay  20 sec

ii. Chateau
   a. Chateau Wet Well Invert / Rim Elev.  623.45/596.58
   b. Wet Well Level High Level Alarm *  604.6
   c. Start Lead*, Lag 1*  599.61 Lead 601.6 Lag
   d. Stop Lead*, Lag 1*,  598.25 both
   e. Pump 1, 2 Failure To Start Delay  20 sec
   f. Pump 1, 2 Seal Failure Delay  20 sec
   g. Pump 1, 2 Over Temp Delay  20 sec

iii. Denmark Hill
   a. Denmark Hill Wet Well Invert/Rim Elev.  590.10/572.23
   b. Wet Well Level High Level Alarm *  582.62
   c. Start Lead*, Lag 1*  579.23 Lead 581.23 Lag
   d. Stop Lead*, Lag 1*,  598.25 both
   e. Pump 1, 2 Failure To Start Delay  20 sec
   f. Pump 1, 2 Seal Failure Delay  20 sec
   g. Pump 1, 2 Over Temp Delay  20 sec

r. Alarms

i. The controller shall monitor, display and log the following alarms:
   1. High or Low Wet Well Level Alarm (Transducer) (all stations)
   2. Pump 1, 2 Seal Failure (Rose Hill Cove and Chateau Estates)
   3. Pump 1, 2, 3, Seal Failure (Denmark Hill)
   4. Pump 1, 2 Over Temp (Rose Hill Cove and Chateau Estates)
   5. Pump 1, 2, 3 Over Temp (Denmark Hill)
   6. Pump 1, 2 Overload (Rose Hill Cove and Chateau Estates)
   7. Pump 1, 2, 3 Overload) Denmark Hill)
8. Pump 1, 2 Failure (internal to controller, Call No Run) (Rose Hill Cove and Chateau Estates)
9. Pump 1, 2, 3, Failure (internal to controller, Call No Run) (Denmark Hill)
10. Float Backup Active (all stations)
11. Low Level Cutout (from floats) (all stations)
12. High Level Alarm (from floats) (all stations)
13. Control Power Failure (all stations)
14. Phase Failure (all stations)

s. Pump Status

i. The controller shall have Pump Status screens that provide the following information and control options:
1. Pump 1, 2 Status (Off, Called, Running, & Failed) (Rose Hill Cove and Chateau Estates)
2. Pump 1, 2, 3 Status (Off, Called, Running, & Failed) (Denmark Hill)
3. Pump 1, 2 Hard and Soft H-O-A Status (Rose Hill Cove and Chateau Estates)
4. Pump 1, 2, 3 Hard and Soft H-O-A Status (Denmark Hill)
5. Pump 1, 2 Seal Failure Status (Rose Hill Cove and Chateau Estates)
6. Pump 1, 2, 3 Seal Failure Status (Denmark Hill)
7. Pump 1, 2 Over Temp Status (Rose Hill Cove and Chateau Estates)
8. Pump 1, 2, 3, Over Temp Status (Denmark Hill)
9. Pump 1, 2 Overload Status (Rose Hill Cove and Chateau Estates)
10. Pump 1, 2, 3 Overload Status (Denmark Hill)
11. Today: Pump 1, 2 Runtime xx.x Hours (Rose Hill Cove and Chateau Estates)
12. Today: Pump 1, 2, 3 Runtime xx.x Hours (Denmark Hill)
13. Today: Pump 1, 2 Starts xxx (Rose Hill Cove and Chateau Estates)
14. Today: Pump 1, 2, 3 Starts xxx (Denmark Hill)
15. Yesterday: Pump 1, 2 Runtime xx.x Hours (Rose Hill Cove and Chateau Estates)
16. Yesterday: Pump 1, 2, 3 Runtime xx.x Hours (Denmark Hill)
17. Yesterday: Pump 1, 2 Starts xxx (Rose Hill Cove and Chateau Estates)
18. Yesterday: Pump 1, 2, 3 Starts xxx (Denmark Hill)
19. Current (CRNT) Month (MNTH): Pump 1, 2 Runtime xxx.x Hours (Rose Hill Cove and Chateau Estates)
20. Current (CRNT) Month (MNTH): Pump 1, 2, 3 Runtime xxx.x Hours (Denmark Hill)
21. Current (CRNT) Month (MNTH): Pump 1, 2 Starts xxx (Rose Hill Cove and Chateau Estates)
22. Current (CRNT) Month (MNTH): Pump 1, 2, 3 Starts xxx (Denmark Hill)
23. Last Month (MNTH): Pump 1, 2 Runtime xxx.x Hours (Rose Hill Cove and Chateau Estates)
24. Last Month (MNTH): Pump 1, 2, 3 Runtime xxx.x Hours (Denmark Hill)
25. Last Month (MNTH): Pump 1, 2 Starts xxx (Rose Hill Cove and Chateau Estates)
26. Last Month (MNTH): Pump 1, 2, 3 Starts xxx (Denmark Hill)
27. Total: Pump 1, 2 Runtime 999999.9 Hours (Rose Hill Cove and Chateau Estates)
28. Total: Pump 1, 2, 3 Runtime 999999.9 Hours (Denmark Hill)
29. Total: Pump 1, 2 Starts 999999 (Rose Hill Cove and Chateau Estates)
30. Total: Pump 1, 2, 3 Starts 999999 (Denmark Hill)

t. Navigation

i. A menu system shall be provided for the user with proper access to change setpoints, setup pump starts, stops, alarms, alarm delays and setup pump alternation. The following parameters shall be provided:

ii. Level and Level Delay Setpoints

iii. Alternation – Auto or Fixed mode; Timed or Cyclical

iv. The operator shall have a choice of selecting automatic or a fixed sequence.
   1. Pump Failure – call, no run
   2. The user shall be able to enter pump failure time for each pump that is enabled. A failed pump will be replaced with the next available pump.

v. Seal Failure and Over Temp
   1. The user shall be able to enter seal failure and over temp time delays for each respective pump that is enabled.

vi. Miscellaneous Alarms
   1. The user shall be able to enter delays for communications failure, intrusion and high or low temperature.
   2. Transducer Range (wet well level)

vii. A field shall be provided to scale the transducer in feet to setup the vertical scale on the Home screen and an adjustable offset in feet, shall be provided to compensate for the transducer to be raised off the bottom.

u. Historical Data Storage
Controller shall log the pump run time data, alarms and analog data to the removable memory card.

Submersible Level Sensor

General
1. A loop powered submersible level transmitter shall be provided to sense the wet well level. The wet well level transducer shall sense wet well level by measuring the hydrostatic head pressure associated with water levels above the base of the diaphragm. A linear and proportional, to hydrostatic head pressure, 4-20 mA signal shall be produced and input to the pump controller. The transducer shall be installed in accordance with manufacturer's instructions.

2. The pressure transducer shall be certified by FM, UL, and CSA for installation in a Class I, Division 1, Groups A, B, C, and D, Class II, Division 1, Groups E, F, and G, Class III, Division 1 hazardous location when connected to associated apparatus manufactured by PR Electronics, R.G. Stahl and others. The transducer shall be installed in accordance with manufacturer's instructions.

3. The pressure transducer wetted materials shall be 316 SS, Viton®, Polyurethane or Tefzel®.

4. Sensing diaphragm shall be 2.75 in. in diameter and include diaphragm protector allowing the unit to be placed on or near the bottom of the wet well without affecting pressure readings.

5. The transducer shall include circuitry that provides protection from overvoltage, reverse polarity and shorted output.

6. Transducer overall accuracy shall be 0.25 percent full scale or better with a resolution of .0001 percent over the entire range of the wet well.

7. The sensing element shall exhibit non measurable hysteresis, withstand overpressures to 200 percent of rated range without damage.

Warranty
1. Transducer unit shall have a manufacturer’s life time warranty that includes damage from electrical surges.

Construction
1. The pressure transducer shall be mounted in the wet well and furnished with a minimum of 75 ft of cable.
2. The cable shall be 0.3 in. outside diameter Polyurethane or Tefzel® material.

3. Cable shall have non stretch Kevlar reinforcement strands bundled within the wiring cable to provide additional cable strength. Cable strength shall allow up to 200 lbs of pulling strength.

4. A sealed breather tube system shall extend from the top of the cable to the transducer assembly to provide barometric compensation to the transducer.

5. Breather system will be sealed and maintenance free. Systems that use gaps in wire cable and or desiccant filters that require periodic replacement will not be considered.

iv. Installation & Mounting
   1. The transducer shall be suspension mounted in the wet well in an area of the wet well allowing full measurement of the wet well and in such a manner as to not be adversely affected by motor operation or incoming flow streams.

v. The transducer shall be mounted so that it is approximately 3 in. above the floor of the wet well.

vi. The transducer shall be furnished with a suspension mounting kit made out of stainless steel. It shall include a stabilization weight to maintain its position it the wet well.

w. Backup Level Sensing System
   i. Float Switches: Furnish float switches of type and quantity detailed on the Plans. Float switches shall be stainless steel, minimum diameter 5 in., flexibly supported by a multi-conductor neoprene jacketed Type SO, three conductor #14 AWG cable and having a mercury switch inside. Switch rating shall be rated 10 Amps minimum at 120 VAC. The float shall be constructed of Type 316 stainless steel. The cord shall be fine strand made especially for underwater heavy flexing service and shall include a ground wire. Float cables shall be continuous (no splices) from the float to the pump controller cabinet. Floats shall be US Filter Control Systems (Consolidated Electric) Model 9G, Anchor Scientific Model Roto-Floa Type SST, or approved equal. Float switch circuits shall comply with the applicable sections of Articles 500, 501, and 504 of the National Electrical Code (most current issue in force) for Class I, Division 1, Group D hazardous location and Instrument Society of America ANSI/ISA-RP12.6 as well as all local codes, ordinances, laws, and requirements in force.
ii. Float Switch Suspension Mounting Kit: The float switch liquid level sensors shall be mounted to a common stainless steel cable/weight suspension mounting kit. The stainless steel cable shall be multi-stranded and have a minimum 1/8 in. diameter. A plastisol-coated 20 to 25-pound cast iron weight with a cast-in-place stainless steel eyelet (for connection to the stainless steel cable with two stainless steel clamps) shall provide drift free mounting. The kit shall utilize stainless steel float switch cable clamp mounting hardware with two stainless steel screws per clamp to provide easy field adjustment of float switch operating elevations. The stainless steel cable shall have a loop with two cable clamps at the upper end of the assembly for mounting to an eyelet installed by the Contractor in the top slab of the wet well. The float switch mounting kit shall be a US Filter control systems/Consolidated Electric Bulletin B100 Model CBM or approved equal.

FLOAT SCHEDULE

<table>
<thead>
<tr>
<th>Float Location and Function</th>
<th># of Floats</th>
<th>Cable Length**</th>
<th>Float Type*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet Well / Pumps Off</td>
<td>1</td>
<td>45’</td>
<td>N.O.</td>
</tr>
<tr>
<td>Wet Well / Lead Pump On</td>
<td>1</td>
<td>45’</td>
<td>N.O.</td>
</tr>
<tr>
<td>Wet Well / Lag Pump On</td>
<td>1</td>
<td>45’</td>
<td>N.O.</td>
</tr>
<tr>
<td>Wet Well High Water Level Alarm</td>
<td>1</td>
<td>45’</td>
<td>N.C.</td>
</tr>
</tbody>
</table>

* Type NC floats are normally closed contacts, single pole, single throw.

* Type NO floats are normally open contacts, single pole, single throw.

** Lengths shown are FOR INFORMATION ONLY at each lift station. Contractor shall field measure all float cable lengths required prior to ordering floats. A minimum of 5 feet of slack float cable shall be included in the length to allow for adjustments of the float actuation level.

x. Radio Based Communication System: SCADATA
   i. The proposed lift station controllers shall interact with the City’s existing SCADATA SCADA control system. Please see the Remote Telemetry Unit Specification 16950.
3.1 EXAMINATION

A. Examine control panel before installation. Reject control panel if damaged or rusted or has been subjected to water saturation.

B. Examine elements and surfaces to receive control panel for compliance with installation tolerances and other conditions affecting performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Pump Control Panels

1. Control panels shall be installed per manufacturer’s recommendations as detailed on the plans and as specified herein.

2. Seal conduit openings in the panel enclosure with duct seal.

3. Conduits with intrinsically safe wiring, including float switch cables, shall terminate in the control panel at the intrinsically safe wiring section. Non-intrinsically safe wiring including, but not limited to, power feeder conductors, branch circuit conductors, and pump motor cables shall not enter the control panel at the intrinsically safe wiring section and shall maintain a minimum separation distance inside the control panel from the intrinsically safe conductors as required by NEC 504 and ANSI/ISA RP12.6.

4. Install explosion proof conduit seal-off fittings as detailed on the plans and in conformance with Manufacturer's instructions. Contact the respective conduit seal-off manufacturer if assistance is required for direction of installing the packing fiber to form a dam and pouring the sealing compound.

5. Discrete signal transmission between instruments shall be completed with no smaller than 14 AWG THHN wire.

6. Analog signal transmission between instruments shall be 4-20 mA operating at 24 VDC. Ground measurement loops at source or enclosure, as indicated on drawings. No smaller than 16 AWG twisted/shielded stranded cable shall be used for all analog signal wiring. Larger size may be required for longer runs. Cable for 4 - 20 mA shall be Belden 8720 (pair) or 8618 (3-conductor).

7. Prior to start-up, all wires shall be properly terminated in control panel at terminal blocks, and at equipment external to the control panel, as indicated in the drawings.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative for pump control panel to inspect, test, and adjust components, assemblies, and equipment installations, including connections, start-up, instruction of user personnel, and any other required services to provide a complete and operational system.

1. All tests shall be conducted in the presence of the Engineer.

2. Contractor shall provide water as/if required to test pumps under load.
B. Acceptance Testing Preparation:

1. Visual check all components.

C. Tests and Inspections:

1. Inspect control panel for correct terminal connections and tightness, correct and tighten as required.
2. Check float switches and corresponding circuitry for proper operation.
3. Check for proper pump installation and operation.
4. Verify proper operation of pump motor thermal sensors (where applicable).
5. Verify a label is provided on the pump control panel with the name, address, phone number, and emergency phone number of the service representative.
6. Verify proper operation of all pilot lights and alarm lights.
7. Test receptacles for proper operation.
8. Instruct user personnel about the operation of the control panel and components; indicating items for routine maintenance check, operation modes, failure modes, alarm conditions, etc.
9. Conduct any additional tests as required by the manufacturer.
10. Verify tests and requirements are met as specified in Division 16 Section “Basic Electrical Requirements”.

D. Prepare test and inspection reports, including a certified report that identifies control panel included and that describes results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action. Contractor shall furnish 3 copies of test results to Engineer. Contractor shall also furnish 3 copies of Operation and Maintenance Manuals, for operator personnel use, to the Engineer.

3.4 ADJUSTING

A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain control panel and related equipment as specified below. Provide minimum one (1) four (4) hour session.
PART 1  TELEMETRY REQUIREMENTS

1.1 GENERAL
A. Remote Telemetry Units (RTU) for the Supervisory Control and Data Acquisition (SCADA) system shall be relocated to each of the three lift station sites; Chateau Estates, Rose Hill Cove and Denmark Road. The RTUs are City of Danville’s existing SCADADATA system located at the existing Rose Hill Cove, Chateau Estates, and Denmark Road lift stations. Alternatives that cannot communicate with the existing system, do not use the existing infrastructure that is already established will not be allowed. The system shall communicate information from all inputs at all sites as required by the Input/output (I/O) list in at the end of this specification section to a central location.

1.2 SUBMITTAL REQUIREMENTS
A. The contractor shall provide to the engineer complete submittal documentation for the products within this section for engineer’s approval prior to fabrication. The submittal shall include the following items as well as any additional materials required by the general conditions of this project.

1. Provide product data sheets for each of the principal items listed in this specification. Product information to include delineated catalog cut sheets specific to this project as a minimum.

2. Provide wiring and block layout drawings for each RTU showing the wiring diagrams for control circuits and interconnections of all components. Components shall be clearly labeled on the drawing.

3. A technical description of the system monitoring software. Submittal must include samples of:
   a. Proposed text screens and menus
   b. Proposed graphics screens
   c. Proposed report logs and printed graphs
   d. Programming instructions suitable for operators use

4. Provide the radio path study for each specified site herein.

5. Complete input / output list for all connected processes at each RTU location.

1.3 RTU REQUIREMENTS
A. The system integrator shall review the existing RTUs including existing I/O and determine what additional I/O is required to monitor all items identified.

B. Each RTU shall consist of the minimum following quantities and features for the Input/Output (I/O) at each site.

1. Qty. 4 – Digital / Discretionary Inputs
2. Qty. 4 – Analog Inputs
3. Qty. 2 – Digital / Discretionary Outputs
4. Qty. 2 – Analog Outputs
5. RTU to be capable of switching analog inputs to digital inputs in any number combination totaling the total number of inputs per RTU.
6. Digital Inputs shall be normally open dry contacts.
7. Analog inputs shall be capable of receiving either 4 – 20 mA, 0 – 5 VDC, or 1 – 5 VDC inputs.
8. Power failure and low battery must be included on the RTU and will not require the use of any inputs listed above.

C. While analog and digital outputs are not required for this project, the RTU must be supplied with the quantities noted above for future expansion of the system to include remote control of equipment within the system.

D. RTU shall be capable of accepting either 120/1/60 AC or up to 10 – 30 VDC power supply. Within the RTU shall be the capabilities of charging and/or operating off of a stand by battery, in the event of a power outage. The RTU shall also be capable of operating a 12 volt 0.5 amp loop powered device whether on AC, DC, or battery power supply.

E. RTU input board shall be equipped with easily visible light emitting diodes (LED’s) indicating open or closed contact for all digital connections (input and output) for quick immediate detection of circuit status by operator. LED’s shall also be supplied to indicate Communication, Communication Transmit, Communication Receive, and Battery Charge.

F. RTU communication shall be via user selectable Modbus, SCIP, or SCIP/Ethernet. Transmission shall be continuous providing operator with real time information of each site. Each over the air transmission between the RTU shall not exceed 41 Bytes per packet. Each packet sent shall include site specific information related to the status of the remote site. Each RTU shall recognize a busy channel and delay broadcast as required. All RTU’s within the network will complete the transmission of their data in 30 seconds or less. Systems that require more time will not be considered equal. Each transmission shall require a positive acknowledgement from the recipient or the transmission shall be reinitiated.

G. The RTU must have the ability to time and date stamp all collected inputs.

H. Communication shall be (902-928 MHz) and be programmed to Danville’s existing network.

I. Each RTU shall be supplied with the following accessories:
   1. One (1) minimum four (4) hour gel cell battery for connection to RTU battery input. All batteries shall be replaced from the existing RTUs.
   2. Reuse the existing NEMA 4X electrical cabinets. For the Denmark Road lift station, provide a new NEMA 3 enclosure if there is insufficient space in the existing cabinet.

1.4 ANTENNA REQUIREMENTS

A. A Yagi directional type antenna is to be reused for sites as noted in Table 1 for each site. The Minimum gain for this antenna shall be 11dBi. Antenna shall be equipped with a short pigtail cable and N-style jack connector. The Antenna shall be constructed of aluminum and be capable of 120 mph wind loading. Mounting hardware for connection to a 1.25 in. diameter antenna mast shall be included. The Supplier shall provide LMR-400 coaxial cable in sufficient length to connect the surge suppressor within the RTU to the antenna in a single piece, no splicing or joints will be allowed. See Table 1 for specific details regarding the antenna to be supplied for each site. Sites that require total antenna cable lengths greater than 50 ft. are required to substitute the LMR-400 cable specified with LMR-600 for reduced signal loss through the coaxial cable. All other requirements remain the same.
B. Antenna masts shall be provided at each site for mounting the antenna. Refer to the plans for details.

PART 2 EXECUTION & INSTALLATION

2.1 In the installation of an instrument, the various components shall be accessible for efficient maintenance. Care shall be taken in the installation to ensure sufficient space is provided between instruments and other equipment or piping for ease of removal and servicing. All instruments shall be readily accessible from grade, permanent platforms, or fixed ladders.

2.2 The drawings show the operation of panel in a general schematic version. The manufacturer shall submit shop drawings showing the actual methods used to accomplish the control as described herein.

2.3 All instrumentation devices shall be installed in accordance with the manufacturer's installation requirements.

2.4 Installation shall include all details including special brackets and mounting hardware which may be necessary to properly install the instruments. The special brackets and mounting hardware shall be stainless steel, galvanized, or nonferrous non-corrosive metal.

PART 3 STARTUP AND TRAINING

3.1 The manufacturer shall provide the services of an authorized factory representative to inspect the installation, make any necessary adjustments, and place the equipment into operation. The manufacturer’s representative shall instruct the operating personnel in the operation and maintenance of the equipment. The manufacturer’s representative shall note any deficiencies on the startup report and inform the appropriate party at the time of start up to remedy the deficiency or make the necessary repairs or adjustments as needed. The manufacturer shall provide one trip consisting of one day service to perform the above tasks.

3.2 The manufacturer or his representative shall allow time for site check outs and commissioning of the RTU network. It is the installing contractor’s responsibility to go to each site, contact the manufacturer, and perform this commissioning together at a time that is convenient to both parties. The manufacturer or his representative may be present or may log into the operating software remotely to perform this commissioning; owner must provide remote access if requested. As a minimum this work will consist of:
   A. Verifying communication between RTU and CTU
   B. Verifying all I/O listed in the table within these specifications at each site
   C. Adjusting all scales for analog inputs at each device
   D. Verifying output action and scale(analog only) if present

PART 4 WARRANTY

4.1 The equipment contained within this specification shall be free of defective materials and/or workmanship for a period of 1 year from date of installation of each unit individually and/or system installation and verification of working order. The manufacturer shall be obligated to furnish replacement materials at no charge to the owner units proven defective within this warranty period. This warranty shall not be construed to cover lights, fuses, or other items normally consumed in service or those items which have been damaged due to outside forces such as vandalism, lightning, operator error, power surges, unauthorized repair or modifications, etc.
SCADA I/O Monitoring Points

See Section 16900 for a complete list of integration points.

i. The controller shall be configured to monitor the following discrete input status signals:
   1. Pump 1, 2 Running (Rose Hill Cove and Chateau Estates)
   2. Pump 1, 2, 3 Running (Denmark Hill)
   3. Pump 1, 2 HOA In Auto (Rose Hill Cove and Chateau Estates)
   4. Pump 1, 2, 3 HOA In Auto (Denmark Hill)
   5. Pump 1, 2 Seal Failure (Rose Hill Cove and Chateau Estates)
   6. Pump 1, 2, 3 Seal Failure (Denmark Hill)
   7. Pump 1, 2 Overtemp (Rose Hill Cove and Chateau Estates)
   8. Pump 1, 2, 3 Overtemp (Denmark Hill)
   9. Pump 1, 2 Overload (Rose Hill Cove and Chateau Estates)
  10. Pump 1, 2, 3 Overload (Denmark Hill)
  11. Backup Active (all stations)
  12. High Level Float (all stations)
  13. Low Level Float (all stations)
  14. Control Power Failure (all stations)
  15. Phase Failure (all stations)
  16. Flow Pulse (all stations)
  17. Temp Alarm High/Low (all stations)

ii. The controller shall provide the following discrete output signals:
   1. Pump 1, 2 Call (Rose Hill Cove and Chateau Estates)
   2. Pump 1, 2, 3, Call (Denmark Hill)
   3. Pump 1, 2 Failure (Rose Hill Cove and Chateau Estates)
   4. Pump 1, 2, 3 Failure (Denmark Hill)
   5. Common Alarm (all stations)
   6. Alarm Horn (all stations)
   7. Alarm Horn Silence (all stations)
   8. Backup Reset (all stations)

iii. The controller shall monitor the following (4-20 mA) process signals:
   1. Wet Well Level (all stations)
VERMILION DIVISION
DANVILLE, ILLINOIS

STANDARD SPECIFICATIONS FOR THE CONSTRUCTION OF WATER MAIN

REVISED DECEMBER 2016
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PART 1 GENERAL

1.1 DESCRIPTION

A. Work Included:

1. The purpose of these specifications is to provide the main framework for the construction of water main for the Vermilion Division of Aqua America, hereinafter referred to as the “Owner”. The content of this document is therefore by necessity of a general nature which applies to all projects. A Special Provisions section shall accompany these Standard Specifications for each project and shall include the work and pay items which are unique to the particular project. In the event of a conflict between the Special Provisions and these Standard Specifications, the Special Provisions shall rule.

2. The work covered in these specifications may be performed by the Owner, or at the Owner’s option, a competent Contractor skilled in the construction of water main. When the Owner is performing the construction, all requirements of the Contractor shall rule.

1.2 PROVISION OF WORK AND MATERIALS

A. The Owner shall purchase and provide all materials as listed in the Special Provisions, Section 1.2.

1. The Contractor can pick-up the supplied materials at the Owner’s facility, 1300 W. Fairchild St., Danville, IL between the hours of 8:00 AM and 3:00 PM weekdays without cost to the Contractor.

2. The Contractor shall notify the Owner a minimum of 24 hours in advance of procuring any material from the Owner’s facilities. The Contractor shall plan his work accordingly; the contract times will not be adjusted due to any delays caused by the Contractor’s failure to coordinate material pick-up with Owner.

3. The Contractor shall be accompanied by an Owner’s representative while on the Owner’s premises. Upon completing load out of necessary material, the Contractor will be required to review and sign a material procurement ticket detailing the items taken from the Owner’s premises.

4. The materials shall include those items specified in the Description of Pay Items. Materials provided by the Owner may include: pipe, fittings, valves, clamps, gaskets, bolts, polyethylene encasement, and hydrants. All materials to be in contact with the potable water shall be new or only used previously in potable water service.

5. The Engineer shall advise the Contractor when the necessary materials are available. If mutually agreeable, the Contractor shall be issued the NOTICE TO PROCEED prior to complete material availability only if the unavailable materials are not immediately necessary for construction activities. The date of completion shall be increased by the number of days the Contractor’s work is delayed due to material unavailability.
6. The Owner shall provide all laboratory work necessary to test the water main for proper disinfection prior to placing it in service.

B. The Contractor shall purchase and provide all other incidental materials necessary to complete the installation.

1. These materials may include but are not limited to: concrete, thrust rods, stone and bedding, tool and construction equipment, casing, asphalt or other specified paving surface, dust control agents, grass seed, trees, shrubs, fertilizer, top soil, erosion control, traffic control and warning equipment, security, paint, and trench protection. It is the responsibility of the Contractor to determine the materials necessary to complete the work as shown in the contract documents not provided by the Owner and account for such materials in his bid.

2. The Contractor shall be responsible for and provide all chemicals, devices, and test equipment necessary to disinfect and pressure test the water main prior to placing it into service. At the request of the Contractor, chlorine test kits can be provided by the Owner for use during construction. The Contractor shall sign for the kit and be responsible for its maintenance while in his possession.

3. The Contractor shall pay all applicable taxes on materials or services the Contractor provides and shall account for these costs in his bid.

C. The Contractor shall be assisted by the Owner when making connections to the existing distribution system. The Contractor shall notify the Owner a minimum of forty-eight (48) hours in advance of any planned connections to the existing distribution system in order to allow the Owner time to properly notify the customers in the affected area(s) and schedule the work.

D. Only the Owner’s personnel may operate valves on the existing water system unless specific permission is granted to the Contractor by the Owner.

E. It shall be the responsibility of the Contractor to coordinate his work with the work to be performed by the Owner. The Contractor shall not allege additional cost claims against the Owner due to unavailability of materials or delays caused by the Owner in completing Owner’s work.

F. The Contractor shall obtain and pay for all temporary office facilities, utilities, and material or equipment storage areas which the Contractor desires and are not shown on the drawings to be provided by the Owner.

1.3 REFERENCE SPECIFICATIONS

A. These specifications make reference and incorporate other standard specifications. The referenced specifications include the latest versions of:

1. AWWA Standards (AWWA)
2. Standard Specifications for Water and Sewer Main Construction in Illinois (ISPE, CECI, IML, and AGCI)
3. Standard Specifications for Road and Bridge Construction (IDOT)
4. Recommended Standards for Water Works (10 States Standards)

B. All bidding Contractors are advised to obtain a copy of each specification for their review during bidding and construction.

C. In case of conflict between these specifications prepared by the Owner or Owner’s authorized representative and the reference specifications, the Owner’s specifications shall rule.

D. When a reference specification is mentioned within the Owner’s specifications, that specification shall be followed as if it were an integral part of the Owner’s specifications.

1.4 SAFETY

A. For the protection of workers, Owner’s representatives, and the public, the Contractor shall provide health protection, safety measures, and traffic control, in accordance with current Occupational Safety and Health Administration (OSHA), Federal Safety Standards, IDOT Standards, and other regulations including those of local governments having jurisdiction.

1. Owner believes the key to construction safety is the attitude and awareness of the workforce. Owner desires to promote the mindset that safety is personal and that each worker has the right to be safe while working. The Contractor shall demonstrate that the workers have considered the job conditions and the tasks to be performed and have determined how to work safely each day and whenever site conditions change.

   Similarly, the Contractor’s ownership and management must demonstrate that they highly value safety. The Contractor must provide the communication, training, equipment, and supervision to create a safe construction site – protecting workers and the public.

2. The Contractor shall provide a Safety or Construction Supervisor with 10-hour OSHA training that shall oversee all construction activities and shall visit each site prior to excavation or starting new major tasks to assess and communicate risks and develop a safety plan for each site and the tasks to be performed. The Contractor’s personnel shall have safety training required for work they are performing and be knowledgeable of safety plan for each site. Whenever workers are working in an excavation, the Contractor shall provide a trained Competent Person to remain at that site.

   Excavation work shall be in compliance with OSHA’s Subpart P. Soil in excavations deeper that five (5) feet shall be treated as Class C disturbed soil. Therefore, all excavations deeper than five (5) feet shall be sloped, shored, or shielded prior to entry. If conditions of trenches shallower than five (5) feet may lead to collapse of trench walls, Contractor shall install protection measures prior to entry.

3. If at any time the Owner or safety officials request information, the Contractor shall be prepared to submit the Contractor’s Safety Program and demonstrate compliance with safety regulations including training and notifications requirements. The Contractor shall comply with JULIE program and provide dig number(s) and JULIE documentation to Owner’s representative. The Contractor shall keep on site all required safety documentation, such as “Tab” data for shoring materials, equipment inspection records, DOT vehicle records, etc.
4. The Contractor shall be responsible for all costs associated with complying with any and all necessary safety regulations, the costs of which shall be considered incidental to the work and be accounted for in other Pay Items.

5. Prior to being awarded a contract, the Contractor will be required to fill out a “Contractor Safety Evaluation Form” detailing worker’s compensation experience, safety performance, risk management and insurance data, and Contractor’s health and safety program.

1.5 COORDINATION OF WORK

A. The Contractor shall coordinate all subcontractors, affected utilities, and governmental agencies that have an interest or involvement in the construction of the project.

1. Roadways shall remain open to the degree satisfactory with the affected governmental agency. The Contractor shall be responsible for coordinating the necessary traffic control measures with the governing agency.

2. Utility service shall remain in near continuous operation to the satisfaction of the utility. During bidding, the Contractor should determine if nighttime or other off time work will be necessary to maintain the desired level of service and account for such work in his bid.

3. The Contractor shall bear the cost of performing the construction in accordance with necessary utility coordination including any special service costs levied by the utilities.

4. All subcontractors shall coordinate their work and arrangements directly through the Contractor.

1.6 PAYMENT ITEMS

A. Payment items shall be as described in the Special Provisions.

B. Unless specifically identified as a pay item, the cost of all other items are considered incidental and shall be included in the pay items set forth.

1.7 CHANGE ORDERS

A. The Contractor shall immediately notify the Owner of any deviations in the project that could potentially affect the contract times or amounts. Any significant physical deviation from the Specifications and Drawings or any deviation which significantly affects the completion time or cost of the project shall be considered a change and shall be performed only after the proper execution of a change order acknowledged by the Owner and Contractor. The Change Order shall address the reason for the change, the effect on completion time, and the effect on project cost. Any deviation from the Specifications and Drawings performed without an executed Change Order shall be performed at the Contractor’s risk of payment and acceptance by the Owner. The Owner reserves the right to deny payment to the Contractor for work which deviates from the contract documents when performed prior to Change Order execution.
1.8 DBE POLICY

One of Aqua America's goals is to provide businesses that are owned by women, minorities and/or service disabled veterans with efficient, effective and achievable opportunities to provide valuable products and services. A Diverse Business Enterprise ("DBE") is a business in which 51% or more of the ownership interest is held, and 51% of the daily management and control of the business is performed, by one or more women, minorities or service disabled veterans. Aqua America's corporate goal is to award, where possible, at least 25% of its annual contract spending to qualified DBEs. This goal may be achieved by directly or indirectly contracting with verified DBEs. Aqua America strongly encourages direct contractors to utilize DBEs when subcontracting work under primary contracts.

Aqua America expects its direct contractors to agree, when they enter into a contract, to use best efforts to award subcontracts to qualified, competent DBEs where possible. Contractors are required to complete and submit with their bid a copy of the Supplier Diversity Questionnaire. The Contractor shall also submit a Supplier Diversity Questionnaire with their final application for payment.
PART 2 PRODUCTS

2.1 DUCTILE IRON PIPE

A. AWWA C151 materials and details.

B. AWWA C150 pressure Class 350 for 4-inch through 12-inch, and Pressure Class 300 for 16” and greater except if shown differently on the Drawings.

C. AWWA C104 cement lined with asphaltic seal coat interior and AWWA C153 asphaltic coated exterior.

D. AWWA C111 Slip-on (“tyton”) joints with rubber gaskets.

E. Approved Manufacturers:
   1. Clow
   2. U.S. Pipe
   3. Griffin

F. Of the sizes shown on the Drawings.

2.2 POLYETHYLENE PIPE

A. AWWA C906 materials and details.

B. Dimension Ratio shall be 11.0 or smaller and joints shall be joined by means of zero leak-rate heat-fusion, electrofusion or mechanical joints approved by the Owner.

C. Approved Manufacturers:
   1. ISCO Industries
   2. JM Eagle

D. Of the sizes shown on the Drawings.

2.3 CAST AND DUCTILE IRON PIPE FITTINGS

A. AWWA C110 and AWWA C153 for materials and details.

B. AWWA C104 cement lined with asphaltic seal coat interior and AWWA C153 asphaltic exterior coat.
C. Slip (“tyton”) joints with rubber gaskets or special thrust restraining gaskets or mechanical joints as specified in the Drawings or by the Owner.

D. Of the sizes shown on the Drawings.

E. Approved Manufacturers:
   
   1. Clow
   2. U.S. Pipe
   3. Griffin

2.4 JOINT RESTRAINT

A. Grip-Ring by ROMAC

B. M J Field Lok by USP

C. Field Lok Gasket for SJ pipe by USP

2.5 POLYETHYLENE ENCASEMENT

A. AWWA C105 for the encasement of pipe in polyethylene tubes using plastic tape or twine to secure the wrap in place.

B. 8 MIL thick polyethylene sheets for the wrapping of all other metallic fittings, bolts, hydrants, thrust rods, and valves to be buried beneath ground level. Plastic tape or twine to secure the wrap in place.

2.6 BUTTERFLY VALVES

A. AWWA C504 for buried service.

B. Class 150.

C. Cast iron disc.


E. Mechanical or slip on joint.

F. Clockwise direction of opening (open right).

G. With cast iron valve box and lid stamped “Water”.

H. Of the size shown on the Drawings.
I. Approved manufacturers:
   1. Pratt
   2. Dresser
   3. Mueller

2.7 RESILIENT SEAT GATE VALVES

A. AWWA C509 for buried service.
B. Manual operator.
C. Mechanical or slip-on joint.
D. Clockwise direction of opening (open right).
E. With cast iron valve box and lid.
F. Of the size shown on the Drawings.
G. Approved manufacturers:
   1. Mueller
   2. U.S. Pipe

2.8 HYDRANTS

A. AWWA C502 for dry barrel fire hydrants.
B. National standard thread (NST) hose and pumper connections.
C. Mechanical joint.
D. Six (6) inch inlet connection.
E. Five and one quarter (5¼) inch gate opening.
F. Two (2) 2½ inch hose and one (1) 4½ inch pumper nozzles.
G. Five (5) foot depth of bury minimum unless otherwise specified.
H. Break away design.
I. Clockwise opening of main valve (open right).
J. **Only approved manufacturer is Mueller Super Centurion 200 or 250.**

2.9 CASING PIPE

A. New grade B seamless steel unless otherwise specified.

B. Welded connections.

C. One quarter (¼) inch thickness minimum.

D. Or as shown on the Drawings.

2.10 TRACING WIRE

A. Tracing Wire shall be #12 solid insulated copper wire.

B. The #12 solid copper, plastic coated, wire must be laid directly over the water main. To ensure that it is directly over the main, the wire must be attached to the pipe at regular intervals to ensure it stays in place during backfill.

C. At each valve and hydrant, the wire shall be brought to ground level. At hydrants, the wire shall be connected to the loop below the steamer cap. The wire shall be taped to the barrel as it is brought to the ground level. At valves, the wire shall be brought to one (1) foot below ground level on the outside of the riser. A hole ½-inch in diameter is to be cut in the side of the riser and the wire looped and knotted to keep at this elevation. The wire is to have 12-inches (minimum) of loop inside the valve box riser.

D. Where all coupling connections are made in the wire, an overhead loop knot shall be made to prevent the coupling from pulling loose.

E. All connections on the wire are to be made with Lawson 12 Gauge Butt Connector solder connect terminals or equivalent.

F. The connections will be taped with electrical Moisture Sealant Patches.
Part 3 EXECUTION

3.1 SITE PREPARATION

A. Work Included:

1. The Special Provisions shall note any special considerations such as separating top soil or removing trees and shrubs from the project site.

2. The path of the water main shall be cleared of obstructions to the width of equipment used to construct the main to the extent possible and leveled if necessary to facilitate the installation of the pipe. Caution should be exercised when leveling is performed to assure the fire hydrant settings, pipe cover, etc. is consistent with the restored grade.

3. Sites for material and spoil storage should be planned not to interfere with construction activities.

4. Prior to construction, the Contractor shall make video of the proposed trench path for himself and present a copy to the Owner. Existing defects in the sidewalks, driveways, etc. shall be noted on the video.

5. All physical features which will be affected by the construction shall be carefully identified, prior to commencing the construction activity. These items include but are not limited to: sidewalks, driveways, trees, shrubs, etc. Except as noted in the Special Provisions these items shall be restored to as good or better condition in like kind by the Contractor at the end of the project.

3.2 SOIL EXCAVATION

A. Soil excavation shall be performed by back hoe or trencher.

B. Soil shall be excavated to the level necessary to accommodate any special bedding required and achieve a minimum of four (4) feet, six (6) inches and a maximum of six (6) feet, zero (0) inches of cover over the top surface of the pipe barrel unless otherwise specified on the drawings.

C. The variation of trench bottom elevation shall generally conform to the existing ground surface except it shall not change drastically nor more than three (3) feet in one hundred (100) feet of trench length except as shown on the Drawings. Changes in grade which form an upward loop that could trap air shall be avoided.

D. Soil spoil from the trench excavation shall be deposited no closer than two (2) feet from the edge and in such a manner that allows traffic to pass. Spoil that will not be returned to the trench because of unsuitability or displacement due to special bedding or backfill shall be immediately hauled from the site to an approved disposal area.
E. Over excavated areas shall be brought up to grade level with no more than six (6) inch lifts of compacted IDOT CA-6 stone.

F. The trench shall be excavated in accordance with all applicable regulatory and OSHA standards. The maximum trench bottom width measured at the top of the pipe shall not exceed the following:

1. Two (2) feet, six (6) inch wide for pipe from four (4) to twelve (12) inch diameter.
2. Three (3) feet, two (2) inch wide for pipe from fourteen (14) to eighteen (18) inch diameter.
3. Four (4) feet wide for pipe from twenty (20) to twenty four (24) inch diameter.

G. If the above trench widths are exceeded the Owner shall evaluate if additional pipe thickness or special bedding and backfilling procedures are necessary. The cost of the additional thickness, bedding, and backfilling shall be paid by the Contractor at no expense to the Owner.

H. When the trench crosses a previous excavation, clean sand shall be used as bedding and IDOT CA-6, CA-10 crushed limestone or clean sand backfill to the extent necessary to produce a stable trench for the water main and other buried facility.

I. The excavation shall be maintained in a relatively dry and workable condition by the Contractor who shall employ whatever methods necessary to dewater the trench.

3.3 ROCK EXCAVATION

A. For the purposes of this specification and payment, rock shall be classified as hard, non-soil materials in excess of 0.5 cubic yard in size which must be removed from the excavation or continuous materials which, in the sole opinion of the Engineer, cannot be excavated from the trench by back hoe bucket or trencher in good condition. The materials may have to be removed by blasting or hydraulic or pneumatic tools.

B. All other portions of Section 3.2, SOIL EXCAVATION shall apply.

C. Rock material taken from the trench which weighs in excess of five (5) pounds shall be removed from the site and disposed of by the Contractor. Rock materials less than five (5) pounds each may only be used in backfill material in the layer two (2) feet above the top of the pipe and one (1) foot below the final graded surface. In the case the rock materials must be well mixed with soils and can make up no more than 25% of the backfill mixture.

D. Rock materials shall be removed a minimum of six (6) inches all around the pipe and a maximum as shown in Section 3.2. The trench shall then be brought up to grade using IDOT CA-6. The CA-6 shall be placed in lifts no thicker than six (6) inches and shall be well compacted.

3.4 PIPELaying

A. Pipe shall be laid in strict accordance with AWWA C600.
B. Pipe shall be carefully handled to protect the inner and outer coatings. The Contractor shall use slings or special clamps to handle the pipe. Rolling the pipe off of trucks or into the trench is forbidden.

C. The Contractor shall provide pipe plugs for use to protect the pipe from intrusion by trench water or other foreign objects. The pipe plugs shall be immediately installed whenever pipe laying is not in progress.

D. Solid precast concrete thrust blocks shall be used at all appropriate locations for blocking and supporting the water facilities. All fitting and pipe joints shall be installed with approved joint restraint rings sets and gaskets, see 2.4 on page 8 for approved joint restraints. Use of the cast in place concrete blocking and meg-a-lug stile restraints are not allowed.

E. All pipe shall be encased in polyethylene tubes in accordance with AWWA C105. All buried fittings, valves, etc., shall be encased similarly in 8 MIL polyethylene sheets.

3.5 BACKFILLING

A. Backfilling shall be as specified in AWWA C600.

B. For unpaved areas, soft soil crumbles taken from the side of the trench, clean excavated soil free from large pieces, or specified select backfill shall be used to bring the backfill up to the center of the pipe. This material shall be tamped under the haunch of the pipe. The same materials shall then be carefully placed to a point at least six (6) inches above the top of the pipe. At this point, machine backfilling can commence. The trench shall be finished by mounding the excavated soils over the trench.

C. For paved areas, all excavated materials shall be hauled from the site and disposed of by the Contractor. The entire trench shall be filled with granular material and compacted, as specified by IDOT Trench Backfill standard, or filled above the pipe bedding w/ CLSM.

3.6 TRENCH MAINTENANCE

A. In unpaved areas the trench mound shall be maintained by the Contractor for a period of one (1) year following the completion of the backfilling.

B. The mound shall be shaped to allow traffic to pass if applicable and be a round shape if pedestrian traffic is anticipated. The Contractor shall immediately add soil or reshape the mound if more than six (6) inches of settlement below the existing ground surface occurs.

C. If the Special Provisions call for seeding or sodding of the site area, it shall be done in accordance with “Standard Specifications for Water and Sewer Main Construction in Illinois”, section 21-2.05 for Class 1 Seeding mixtures.

D. If the Special Provisions call for tree or shrub replacement, trees or shrubs shall be replaced by the Contractor with units at least as good as those removed.
E. The Contractor shall be responsible for the complete care of all grass, trees, shrubs, and other vegetation disturbed or destroyed during the construction for a period of at least one (1) year after replanting.

3.7 PAVEMENT RESTORATION

A. All backfill to be under pavement including sidewalks, curbs, gutters, and driveways, shall be thoroughly compacted prior to the placement of the permanent surface. Compaction methods shall be approved by the Owner and governing authority and shall be thorough and effective.

B. The pavement shall be restored to original or better condition and comply with applicable governing agency requirements. Upon completion of pavement restoration, the Contractor shall be required to obtain documentation of acceptance of pavement restorations from the governing authority. Details for the restoration are shown on the Drawings.

C. Materials used in the restoration shall be approved in IDOT “Standard Specifications for Road and Bridge Construction.”

D. Roadways may be temporarily repaired to the satisfaction of the Owner and governmental agency controlling the roadway. Such temporary surfacing shall include IDOT CA-6 or CA-10 and cold patch asphalt. The Contractor shall be responsible for the performance of the temporary repair and shall promptly maintain the repair if necessary. All temporary repairs should be replaced with permanent repairs as soon as practical to do so.

3.8 FLUSHING

A. Following completion of the water main, the pipe shall be flushed using water from the existing potable water system by the Contractor and coordinated with the Owner.

B. The flushing shall be at a minimum rate of two (2) feet per second (fps).

C. The water from the flushing operation shall be discharged from a hydrant or hydrants located at the end of the pipe opposite the water addition point to assure all parts of the main are flushed. In addition, hydrants located near or at high elevations of the main shall be opened when initially filling the pipe to expel trapped air.

D. All water from the flushing operation shall be directed to storm, sanitary sewers, or waterways to minimize public inconvenience. The Contractor shall be responsible for preventing erosion during flushing operations.

E. There shall be no charge for the initial water used to flush the mains. However, if repeated flushing is required to obtain passing coliform tests, an estimated water usage will be calculated and the cost of such extra water will be at the Contractors expense.
3.9 PRESSURE AND LEAK TESTING

A. Following the installation of water main, the main and appurtenances shall be subjected to a hydro-static test pressure of 125 psi or 1.5 times the static pressure of the area, whichever is greater, for at least 2 hours without any pressure drops. The pressure and leakage test shall be otherwise carried out as described in “Standard Specifications for Water and Sewer Main Construction in Illinois”, Section 4-2.13 and AWWA C600 by the Contractor.

B. The Contractor shall notify the Owner a minimum of 24 hours in advance of performing any pressure testing so as to allow the Owner to observe, document and verify the results. Testing performed without a representative of the Owner present will be invalid and the Contractor will be required to retest the main.

C. All work and repairs necessary to obtain satisfactory tests shall be borne by the Contractor.

D. The maximum length of water main to be pressure tested at any one time is 1000 linear feet.

3.10 DISINFECTION

A. Following the pressure and leak testing, the main shall be disinfected in accordance with “Standard Specifications for Water and Sewer Main Construction in Illinois”, section 41-2.14 and AWWA C601 by the Contractor.

B. Following the 24 hour detention time, the system shall be flushed until a normal chlorine residual (approximately 1 mg/l) is achieved. Two (2) samples shall be taken at 24 hour intervals. Should either sample fail coliform testing, a check sample shall be taken. If the check sample fails, the disinfection procedure shall be repeated again, and so on until the main passes two (2) consecutive coliform tests.

C. All samples shall be collected in the presence of the Owner and all tests shall be completed by the Owner. It is the Contractors responsibility to notify the Owner when a sample is to be collected. There shall be no charge for the initial set of sample tests. The cost of each test thereafter shall be the responsibility of the Contractor.

D. The disinfection shall be accomplished using the continuous or tablet method. If the tablet method is employed, the main shall be lightly flushed prior to the disinfection procedure and vigorously flushed following the disinfection procedure. The Contractor shall place the tablets in the pipe as work progresses and take great care to avoid water and trench material from entering the pipe at anytime.

3.11 HORIZONTAL AND VERTICAL SEPARATION - WATER AND SEWERS

A. Horizontal

1. Water mains shall be located at least ten (10) feet horizontally from any existing or proposed drain, storm sewer, sanitary sewer, combined sewer or sewer service connection.

2. Water mains may be located closer than ten (10) feet to any of the sewer lines above when:
a. Local conditions prevent a lateral separation, and;

b. The water main invert is at least 18 inches above the crown of the sewer, and;

c. The water main is either in a separate trench or in the same trench on an undisturbed earth shelf located to one side of the sewer.

3. When it is impossible to meet either items 1. or 2. above, both the water main and drain or sewer shall be constructed of slip-on or mechanical joint ductile iron, pre-stressed concrete, or PVC equivalent to water main standards of construction. The drain or sewer shall be pressure tested to the maximum expected surcharge head before backfilling.

B. Vertical

1. A water main shall be separated from a sewer so that its invert is a minimum of 18 inches above the crown of the drain or sewer whenever water mains cross storm sewers, sanitary sewers, or sewer service connections. The vertical separation shall be maintained for that portion of the water main located within ten (10) feet horizontally of any sewer or drain crossed. A length of water main pipe shall be centered over the sewer to be crossed with joints equidistant from the sewer or drain.

2. Both the water main and sewer shall be slip-on or mechanical joint ductile iron, pre-stressed concrete, or PVC equivalent to water main standards of construction when:

   a. It is impossible to obtain the proper vertical separation as described in B.1. above; or

   b. The water main passes under a sewer or drain.

3. A vertical separation of 18 inches between the invert of the sewer or drain and the crown of the water main shall be maintained where a water main crosses under a sewer. Support the sewer or drain lines to prevent settling and breaking the water main, as shown on the Drawings or as approved by the Owner.

4. Construction shall extend on each side of the crossing until the perpendicular distance from the water main to the sewer or drain line is at least ten (10) feet.

3.12 FLOW TESTING AND HYDRANT PAINTING

A. Upon completion of pressure testing and disinfection and prior to acceptance by the Owner the Contractor shall:

   1. Conduct at all newly installed hydrants static and residual pressure tests as well as flow testing of same. Test will be conducted in a manner acceptable to the Owner and recorded on forms provided by the Owner.

   2. Paint each newly installed hydrant:

      a. Scrape or sand to bare metal all surfaces where by virtue of shipment or installation the factory coat of paint is missing, rusted or blistered.
b. Apply one (1) coat of white primer to all bare surfaces.

   (i) Bruning Silathane Gloss Enamel for Wood, Metal and Masonry or approved equal.

c. Apply at least two (2) coats of factory coat matching yellow rust preventive enamel.

   (i) DAP Derusto Rust Preventative Enamel with built-in primer, Gloss Golden Yellow #083 or approved equal.

3.13 FINAL ACCEPTANCE

A. Prior to final acceptance, the Contractor shall operate all valves and hydrants in the presence of the Owner.

B. The Contractor shall submit to the Owner, a copy of the As-Built plans, prior to the final acceptance.

C. The Owner will complete a final inspection, in the presence of the Contractor, and will submit to the Contractor a list of all items to be completed prior to final acceptance.

D. Upon final acceptance of the water main, the final 10% of the awarded contract price will be paid to the Contractor.

E. Prior to final acceptance, all hydrants shall be adjusted by the contractor to the proper elevation based upon final grade.
## AIR RELEASE VALVES

(GPS COORDINATES)

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