MISSOURI

HIGHWAYS and TRANSPORTATION

COMMISSION

JEFFERSON CITY, MISSOURI

BID FORMS

AND

SPECIFICATIONS

FOR

CONSTRUCTING OR IMPROVING

DISTRICT – 10

SEWER EXTENSION

CHARLESTON, MISSOURI

IFB 9-110318

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Shafer, Kline and Warren, Inc. Technical Specifications for the Charleston Maintenance Facility Sewer Extension
Annual Wage Order #17 – Mississippi County
Drawings

"EXCESSIVE UNEMPLOYMENT IS IN EFFECT"

During times of high unemployment, state law permits the Department's Division of Labor Standards to declare that excessive unemployment is in effect, allowing only workers from certain states to work on the Missouri's public works projects. Public works projects are construction projects funded wholly or partially from public funds, or are projects that benefit the public such as but not limited to schools, parks, fire houses, and government buildings. The excessive unemployment law does not apply to projects funded in part by Federal Funds.

Restrictive states have laws in place restricting Missouri workers to work on their public works projects. Workers from these states are also not allowed to work on Missouri's public works projects.

Only Missouri laborers and laborers from nonrestrictive states are allowed by law to be employed on Missouri's public works projects when the unemployment rate exceeds **5 percent** for two consecutive months. **(See Sections 290.550 through 290.580 RSMo)**. To file a complaint against a contractor for employing a worker from one of the restrictive states below on a Missouri public works project, submit the **complaint form** online for the Division to investigate.

Restrictive states- workers from these states are **NOT** allowed to be employed on Missouri public works projects: Alaska, Arizona, California, Colorado, Connecticut, Delaware, District of Columbia, Florida, Idaho, Illinois, Iowa, Maine, Massachusetts, Mississippi, Montana, Nevada, New Jersey, North Dakota, South Dakota, and the U.S. Virgin Islands, West Virginia and Wyoming.

Non-Restrictive States- workers from these states are allowed to be employed on Missouri public works projects: Alabama, Arkansas, Georgia, Hawaii, Indiana, Kansas, Kentucky, Louisianna, Maryland, Michigan, Minnesota, Nebraska, New Hampshire, New Mexico, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Tennessee, Texas, Utah, Vermont, Virginia, Washington and Wisconsin.

FINAL CHECKLIST BEFORE SUBMITTING PROPOSAL

_____1. Complete the Bid Form by filling in the total dollar amount of the bid; listing any addenda which may have been issued; filling in the dollar amount of the bidder's check or Bid Bond, sign the proper signature line, and supply the required information in connection with the signature for the individual bidder, joint adventurer, or corporation.

_____2. Submit Bid Bond executed by the bidder and surety. Bidders are required to use the Bid Bond furnished by the Commission or attach cashier's check to Bid Bond form. Personal checks are not accepted.

_____3. Complete Subcontractor section by listing major subcontractor(s) and general supervisor(s), sign as required.

_____4. Complete Certification Regarding Missouri Domestic Products Procurement Act section, if applicable.

_____5. Complete Missouri Service-Disabled Veteran Business Preference, if applicable.

_____6. If addenda(s) are issued attach to the back of the bid package. Copy addenda and add to the appropriate section of the orange bound Request for Proposal and retain for your records.

NEWSPAPER ADVERTISEMENT

Notice to Contractors

MoDOT will receive bids at its General Services-Facilities section, 830 MoDOT Drive, Jefferson City, MO until March 18, 2011 at 3:00 PM local time for constructing a Sanitary Sewer Extension for the Regional Maintenance Facility, Charleston, MO. Contact Lynn Ferguson at 573-751-4879 or Lynn.Ferguson@modot.mo.gov to obtain plans, forms, and information or download them at no charge from http://www.modot.org/gsbidding. A pre-bid conference is scheduled for March 10, 2011 at I-57 SOR, 0.2 Mi. S of Rt. 60, Charleston, MO at 10:00 AM.

00020

INVITATION TO BID

Notice is given hereby that the Missouri Department of Transportation will accept bids for construction of the project marked **"District 10, Sewer Extension – Charleston**", according to Drawings and Specifications, and described in general as:

SCOPE OF WORK:

Work under this contract will include the construction of a new pump station, a force main, and to serve the Charleston Maintenance Facility. Work shall include all materials and labor associated with the contract as specified and indicated on the drawings.

Sealed bids will be received by the Missouri Department of Transportation at its Central Office, 830 MoDOT Drive, PO Box 270, Jefferson City, MO 65102-0270 until 3:00 P.M. March 18, 2011.

Bids will be opened and read aloud at that time and that place. Bids received after that time will not be accepted.

Contact Lynn Ferguson at 573-751-4879 or Lynn.Ferguson@modot.mo.gov to obtain plans, forms, and information or download them at no charge from http://www.modot.mo.gov/gsbidding/.

Prevailing wages as established by the Missouri Department of Labor and Industrial Relations, for **Mississippi County**, as shown herein will apply.

Bid securities in the amount of 5% of the bid will be required to accompany bids.

Bids must be made on forms provided by the Commission. The Commission reserves the right to reject any or all bids and to waive irregularity in the bids and the bidding. **No bid may be amended or withdrawn after the bid is opened**.

A pre-bid conference is scheduled for March 10, 2011 at I-57 SOR, 0.2 Mi. S of Rt. 60, Charleston, MO at 10:00 AM.

Project Location: I-57 SOR, 0.2 Mi. S of Rt. 60, Charleston, MO.

00100

BIDDER REQUIREMENTS

1. SCOPE OF WORK

Construction of a sewer extension and pumping station.

2. BID INSTRUCTIONS

In order to receive consideration, bids must be made in strict accordance with the following.

A. Make bids, upon the forms provided herein, properly signed and with all items filled out. Do not change the wording of the bid form and do not add words to the bid form. Unauthorized conditions, limitations or provisions attached to the bid will be cause for rejection of the bid.

B. No telegraphic bid or telegraphic modification of a bid will be considered. No bids received after the time fixed for receiving them will be considered. Late bids will be returned to the bidder unopened.

C. Address bids to the Missouri Department of Transportation, and deliver to the address given in the Invitation for Bid, on or before the day and hour set for opening the bids. Enclose each bid in a sealed envelope bearing the title of the Work, the name of the bidder, and the date and hour of the bid opening. Submit only the original signed copy of the bid. It is the sole responsibility of the bidder to see that the bid is received on time.

3. BONDS

A. Each proposal shall be accompanied by a Bid Bond, Certified Check, Cashier's Check or Bank Money Order payable to the Director of Revenue – Credit State Road Fund for an amount equal to Five Percent (5%) of the amount of the BID submitted. This is to act as a guarantee that the bidder, if awarded the contract, will furnish an acceptable performance and payment bond (Contract Bond) or a cashier's check, a bank money order or a certified check made payable to "Director of Revenue – Credit State Road Fund" in an amount equal to One Hundred (100%) of the contract price.

B. If a BID BOND is used (in lieu of a certified check, cashier's check, or bank money order), it must be in the form provided and executed by the bidder as principal and by a surety company authorized to do business in the State of Missouri as surety. The agent executing the same on behalf of the surety company must attach a current Power of Attorney setting forth his authority to execute the bond involved.

C. Certified Checks, Cashier's Checks or Bank Money Orders of unsuccessful bidders will be returned as soon as the award is made. The checks or bank money orders of the successful bidder(s) will be retained until the contract is executed and a satisfactory Performance and Payment (Contract Bond) is furnished. Bid Bonds will not be returned except on specific request of the bidder.

4. INVOICING AND PAYMENT

A. MoDOT is exempt from paying Missouri Sales Tax, Missouri Use Tax and Federal Excise Tax. However, the successful bidder to whom the contract is awarded, (hereinafter, "contractor") may themselves be responsible for the payment of taxes on materials they purchase to fulfill the contract. A Project Tax Exemption Certificate will be furnished to the successful bidder upon request if applicable.

B. Each invoice should be itemized in accordance with items listed on the contract in accordance with Section 01019, Contract Considerations, Applications for Payment provisions. Failure to comply with this requirement may delay processing of invoices for payment.

C. Unless otherwise provided for in the solicitation documents, payment for all equipment, supplies, and/or services required herein shall be made in arrears. The Commission shall not make any advance deposits.

D. The Commission assumes no obligation for equipment, supplies, and/or services shipped or provided in excess of the quantity ordered. Any authorized quantity is subject to the Commission’s rejection and shall be returned at the Contractor's expense.

E. The Commission reserves the right to purchase goods and services using the state-purchasing card.

5. EXAMINATION OF DOCUMENTS AND SITE OF WORK

A. Before submitting a bid, each bidder shall examine the Drawings carefully, read the Specifications and all other proposed Contract Documents, and visit the site of the work. Each bidder shall fully inform themselves, prior to bidding, as to existing conditions and limitations under which the Work is to be performed and shall include in his bid a sum to cover the cost of items necessary to perform the Work, as set forth in the proposed Contract Documents. No allowance will be made to a bidder because of lack of such examination or knowledge. The submission of a bid will be considered conclusive evidence that the bidder has made such examination.

B. The contract price shall include any necessary permits and licenses required by law incidental to the work. Local ordinances requiring building permits are not applicable to the state. Contractor will comply with local laws involving safety in the prosecution of the work.

6. INTERPRETATION

No oral interpretations will be made to any bidder as to the meaning of the plans and specifications or the acceptability of alternate products, materials, form or type of construction. Every request for interpretation shall be made in writing and submitted with all supporting documents not less than ten (10) days before opening of bids. The request shall be sent directly to the Senior Facilities Designer. Every interpretation made to a bidder will be in the form of an addendum and will be sent as promptly as is practicable to all persons to whom plans and specifications have been issued. All such addenda shall become part of the contract documents.

7. PROOF OF COMPETENCY OF BIDDER

A bidder may be required to furnish evidence, satisfactory to the Commission, that he and his proposed subcontractor(s) have sufficient means and experience in the types of work called for to assure completion of the Contract in a satisfactory manner.

8. WITHDRAWAL OF BIDS

After the bid/proposal opening, a vendor may be permitted to withdraw a bid/proposal prior to award at the sole discretion of the division if there is a verifiable error in the bid/proposal and enforcement of the bid would impose an unconscionable hardship on the vendor. This withdrawal will be considered only after receipt of a written request and supporting documentation from the vendor. Withdrawal shall be the vendor's sole remedy for an error other than an obvious clerical error. Withdrawal of a bid/proposal may result in forfeiture of the bid/proposal bond.

9. AWARD OR REJECTION OF BIDS

A. The Contract, if awarded, will be made on an "**All or None" basis using the "lowest and best" principle of award**, subject to the Commission's right to reject any or all bids and to waive informality and irregularity in the bids and in the bidding.

10. CONTRACT DOCUMENTS

A. By submitting a bid, the bidder agrees to furnish any and all equipment, supplies and/or construction services specified in the solicitation documents, at the price(s) stated in their bid, pursuant to all requirements and specifications contained therein.

B. A binding contract, contract documents ,shall consist of: (1) the solicitation documents with any drawings and/or attachment/exhibits, amendments thereto, and/or Best and Final Offer (BAFO) request(s) with any changes/additions, (2) the Contractor's submitted pricing, and (3) the Commission's acceptance of the bid by purchase order or post-award contract.

C. A notice of award does not constitute an authorization for shipment of equipment or supplies or a directive to proceed with services. Before providing equipment, supplies and/or services, the Contractor must receive a properly authorized purchase order and/or notice to proceed.

D. The contract expresses the complete agreement of the parties and performance shall be governed solely by the specifications and requirements contained therein. Any change, whether by modification and/or supplementation, must be accomplished by a formal contract amendment signed and approved by and between the duly authorized representative of the Contractor and the duly authorized representative of the Commission, by a modified purchase order prior to the effective date of such modification. The Contractor expressly and explicitly understands and agrees that no other method and/or no other document, including correspondence, acts, and oral communications by or from any person, shall be used or construed as an amendment or modification.

E. Failure to execute the contract and file acceptable performance payment (Contract Bond) or cashier's check, bank money order or certified check within after the contract has been mailed to the bidder shall be just cause for the cancellation of the award and the forfeiture of the proposal guaranty. Award may then be made to the next lowest responsible bidder, or the work may be re-advertised and performed under contract or otherwise, as the Commission may decide. No contract shall be considered effective until it has been executed by all parties thereto.

11. NONDISCRIMINATION

A. The successful bidder understands that this project involves state funds and the successful bidder awarded the contract will be required to comply with the Executive Order 05-30 of the Governor of the State of Missouri dated September 8, 2005. This order stipulates that there shall be no discriminatory employment practices by the Contractor or his subcontractors, if any, based on race, sex, religion, national origin, age, color, disability, or veteran status. The undersigned Contractor or his subcontractors, if any, shall give written notice of their commitments under this clause to any labor union with which they have bargaining or other agreements.

B. The Contractor shall comply with the Regulations relative to nondiscrimination in federally-assisted programs of the Department of Transportation, Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, (hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this contract.

C. All solicitations either by competitive bidding or negotiation made by the Contractor for work to be performed under a subcontract, including procurements of materials or leases of the Contractor's obligations under this contract and the Regulations, will be relative to nondiscrimination on the grounds of race, color, or national origin.

D. Sanctions for Noncompliance: In the event of the Contractor's noncompliance with the nondiscrimination provisions of this contract, MoDOT shall impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including, but not limited to: (i) withholding of payments to the Contractor under the contract until the Contractor complies, and/or, (ii) cancellation, termination or suspension of the contract, in whole or in part.

12. SUBMITTALS

Review of Submittals. The Architect/Engineer/Designer review of submittals is only for the limited purpose of checking for conformance with information given and seeing if they conform to design intent. The General Services Facilities Manager is not responsible for determining the accuracy of measurements and completeness of details, for verifying quantities, or for checking fabrication or installation procedures. The General Services Facilities Manager’s review does not relieve the contractor of his or her responsibilities under the contract documents. The submittal process shall be carried out as outlined in Section 01300, Submittals.

13. WORK QUALITY

A. Inspection of Work. The General Services Facility Operations Supervisor or designated representative shall be permitted to inspect all work, materials, payrolls, records of personnel, invoices of materials, and other data and records relating to the work. If requested by the General Services-Facility Operations Supervisor or designated representative, the contractor shall at any time before final acceptance of the work uncovers any portion of the finished work as directed for inspection. After examination, the contractor shall restore said portions of the work to the standards required by the contract. Should the work thus exposed and examined prove acceptable, the actual cost of uncovering, removing and replacing shall be paid by the Commission. Should the work so exposed and examined prove unacceptable, the uncovering, removing and replacing shall be at the expense of the contractor.

B. Defective Work. All work which has been rejected shall be remedied, or if necessary, removed and replaced in an acceptable manner by the contractor at its expense. If the contractor fails to remedy or replace such defective work immediately after receiving written notice from the General Services-Facility Operations Supervisor or designated representative, the Commission may employ labor to correct the defective work, and the cost incurred in making such corrections shall be deducted from the payment due or to become due the contractor under this contract.

C. Contractor will provide a one-year warranty for parts and labor on all building material, and equipment or a standard manufacturer's warranty which ever is greater. All warranties, including extended service agreements shall begin on the date of Final Acceptance of this project.

D. Contractor's Responsibility for Work. Until the General Services-Facility Operations Supervisor or designated representative, accepts the work, it shall be in the custody and under the charge and care of the contractor. Contractor

shall rebuild, repair, restore or make good at its own expense any lost or stolen Commission-owned material and all injuries or damages to any portion of the work caused by action of the elements or from any other reason before its completion and final acceptance. Issuance of a payment estimate on any part of the work done will not be considered as final acceptance of any work completed up to that time.

E. Preservation of Utilities and Monuments. The contractor shall be responsible for the preservation of all public and private utilities, wires, lines, pipes, poles, cables, and conduit at the site of the work and shall use every precaution necessary to prevent damage or injury thereto. The contractor shall not disturb or damage any land monument or property landmark until an authorized agent has witnessed or otherwise referenced, their location and shall not remove them until directed by General Services Facilities Manager.

F. Cooperation with Other Contractors. The contractor shall arrange its work so as not to interfere with the operations of other contractors of the Commission which might be engaged in performing adjacent or nearby work. Whenever work being done by other contractors is contiguous or related to the work involved in this contract, the respective rights of the various contractors will be determined by the General Services-Facility Operations Supervisor or designated representative in order to secure the completion of the work under all contracts in general harmony.

G. The contractor will be required to remove from the Commission's property all debris.

H. Temporary Suspension of Work. The General Services-Facility Operations Supervisor or designated representative shall have authority to suspend work, wholly or in part, for such period or periods of time as he may deem necessary when weather or other conditions are such that in the opinion of the General Services-Facility Operations Supervisor or designated representative the work may be done at a later time with advantage to the Commission or for failure on the part of the contractor to comply with any of the provisions of the contract. The contractor may suspend work for reasonable cause with written approval of the General Services-Facility Operations Supervisor or designated representative. Liquidated damages shall not accrue during the period in which work is suspended with the approval of the General Services-Facility Operations Supervisor or designated representative, however, if the suspension is because of the contractor's failure to comply to any of the provisions of the contract, the contractor shall not be entitled to an extension of completion time nor to a waiver of liquidated damages. In the event work is suspended, the contractor shall store all materials in a manner that will protect them from damage, and shall take every precaution to prevent damage or deterioration of, the portions of the work completed. If work has been discontinued for any reason, the contractor shall give the General Services-Facility Operations Supervisor or designated representative written notice at least forty-eight (48) hours before resuming operations.

14. CHANGE ORDERS

A. General. All departures from the plans and specifications will be considered unauthorized unless, before proceeding with the work, the contractor has had delivered to it a change order, signed by the General Services-Facility Operations Supervisor or designated representative, authorizing and directing such changes or departures. All unauthorized work shall be at the contractor's expense and the General Services-Facility Operations Supervisor or designated representative may order such unauthorized work removed and replaced at the contractor's expense.

B. Overhead and Profit on Change Orders. The percentages for overhead and profit charged on Change Orders and Field Work Authorizations shall be negotiated and may vary according to the nature, extent and complexity of the work involved. However, the overhead and profit for the contractor or subcontractor actually performing the work shall not exceed 15%. When one or more tiers of subcontractors are used, in no event shall any contractor or subcontractor receive as overhead and profit more than 7% of the cost of the work performed by any of his subcontractors. In no case shall the total overhead and profit paid by the owner on any change order exceed twenty five percent (25%) of the cost of materials, labor and equipment necessary to put the change order work in place.

C. Contractor's Procedure for Claims. If the contractor considers additional compensation may be due for work or material not clearly covered in the contract or ordered in writing by the General Services-Facility Operations Supervisor or designated representative as extra work, or if additional compensation may be requested beyond the scope of such provisions, the contractor shall notify the General Services-Facility Operations Supervisor or designated representative in writing of the intention to make a claim before beginning the work in question. If notification is not given and the General Services-Facility Operations Supervisor or designated representative is not afforded proper facilities by contractor to provide necessary inspection and for keeping strict account of actual cost, the contractor agrees to waive any claims for additional compensation. Notice by the contractor, and the fact that the General Services-Facility Operations Supervisor or designated representative has kept account of the cost shall not be construed as substantiating the validity of the claim. The contractor shall file a written notice of claim for additional compensation in triplicate

within 60 days after completing the work in question.

a. If the claim is against the Commission, the notice of claim shall be personally delivered, or sent by certified mail to the office of the Secretary of the Commission in Jefferson City, Missouri. All notices of claims shall contain an itemized statement showing completely and fully the items and amounts forming the basis of the claim.

b. Any claim or an item of any claim, not included in the notice and statement, or any claim included but not clearly defined and specifically set out and itemized or any claim not filed within the time and in the manner provided, shall be forever waived and shall neither constitute the basis of nor be included in any legal action, counterclaim, set-off, or arbitration.

c. All claims filed with Missouri Highway and Transportation Commission's Secretary will be forwarded to the Missouri Department of Transportation's Claims Committee.

15. INSURANCE

A. The Contractor shall maintain or cause to be maintained at Contractor's own expense commercial general liability, automobile liability, and worker's compensation insurance against negligent acts, errors or omissions of the Contractor, or its subcontractors and anyone directly or indirectly employed by any of them. Any insurance policy required as specified in this Section shall be written by a company that is licensed and authorized to issue such insurance in the state of Missouri and shall provide insurance coverage for not less than the following limits of liability:

a. General Liability: Not less than $500,000 for any one person in a single accident or occurrence, and not less than $3,000,000 for all claims arising out of a single occurrence;

b. Automobile Liability: Not less than $500,000 for any one person in a single accident or occurrence, and not less than $3,000,000 for all claims arising out of a single occurrence;

c. Missouri State Workmen's Compensation policy or equivalent in accordance with state law.

d. Upon request from the Commission, the Contractor shall provide the Commission with certificates of insurance evidencing the required coverage and that such insurance is in effect.

16. CONSTRUCTION TIME AND LIQUIDATED DAMAGES

A. Time of Completion - If this bid is accepted, it is hereby agreed that work will begin not later than the date specified in the "Notice to Proceed" and will diligently be prosecuted in order to complete the work and billing within 90 working days from the date specified. Completion of work will be based on FINAL ACCEPTANCE of the building; "SUBSTANTIAL COMPLETION" will not be accepted as basis for completion.

B. Liquidated Damages - In the event the successful Contractor fails to deliver the material within the time specified, the Department and the public will sustain damages because of such delay in delivery, the exact extent of which would be difficult to ascertain, and in order to liquidate such damage in advance it is agreed that the sum of three-hundred dollars ($300.00) per day, per item, for each assessable calendar day on which the delivery has not been completed, is reasonable and the best estimate which the parties can arrive at as liquidated damages, and it is therefore agreed that said amount will be withheld from payments due the Contractor or otherwise collected from the Contractor as liquidated damages. Saturdays, Sundays, holidays and days whereas the Department has suspended work shall not be assessable days.

C. A working day. Is defined as any day when, soil and weather conditions would permit the major operation of the project for six hours or more unless other unavoidable conditions prevent the contractor's operation. If conditions require the contractor to stop work in less than six hours, the day will not be counted as a working day. Working days will begin as soon as notice to proceed is issued. In order for MoDOT not to change a workday due to unavoidable conditions, the contractor must have enough forces, equipment, and materials on site to begin the project. The contractor must notify MoDOT inspector before 12:00 noon of said working day if forces will not be present.

17. EXECUTIVE ORDER

A. The Contractor shall comply with all the provisions of Executive Order 07-13, issued by the Honorable Matt Blunt, Governor of Missouri, on the sixth (6th) day of March, 2007. This Executive Order, which promulgates the State of Missouri's position to not tolerate persons who contract with the state engaging in or supporting illegal activities of employing individuals who are not eligible to work in the United States, is incorporated herein by reference and made a part of this Agreement.

B. "By signing this Agreement, the Contractor hereby certifies that any employee of the Contractor assigned to perform services under the contract is eligible and authorized to work in the United States in compliance with federal law."

C. In the event the Contractor fails to comply with the provisions of the Executive Order 07-13, or in the event the Commission has reasonable cause to believe that the contractor has knowingly employed individuals who are not eligible to work in the United States in violation of federal law, the Commission reserves the right to impose such contract sanctions as it may determine to be appropriate, including but not limited to contract cancellation, termination or suspension in whole or in part or both.

D. The Contractor shall include the provisions of this paragraph in every subcontract. The Contractor shall take such action with respect to any subcontract as the Commission may direct as a means of enforcing such provisions, including sanctions for noncompliance.

18. Missouri law, 292.675 RSMo, requires the Contractor and its subcontractor(s) to provide a ten-hour occupational safety and health administration (OSHA) construction safety program (or a similar program approved by the Missouri Department of Labor and Industrial Relations as a qualified substitute) for their on-site employees (laborers, workmen, drivers, equipment operators, and craftsmen) who have not previously completed such a program and are directly engaged in actual construction of the improvement (or working at a nearby or adjacent facility used for construction of the improvement). The Contractor and its subcontractor(s) shall require all such employees to complete this ten-hour program, pursuant to 292.675 RSMo, unless they hold documentation on their prior completion of said program. Penalties for non-compliance include Contractor forfeiture to the Commission in the amount of $2,500, plus $100 per contractor and subcontractor employee for each calendar day such employee is employed beyond the elapsed time period for required program completion under 292.675 RSMo.

19. EMPLOYMENT OF UNAUTHORIZED ALIENS

A. Pursuant to RSMo 285.530 (1), no business entity or employer shall knowingly employ, hire for employment, or continue to employ an unauthorized alien to perform work within the state of Missouri. As a condition for the award of any contract or grant in excess of five thousand dollars by the state or by any political subdivision of the state to a business entity, or for any business entity receiving a state-administered or subsidized tax credit, tax abatement, or loan from the state, the business entity shall, by sworn affidavit and provision of documentation, affirm its enrollment and participation in a federal work authorization program with respect to the employees working in connection with the contracted services. Every such business entity shall sign an affidavit affirming that it does not knowingly employ any person who is unauthorized alien in connection with the contracted services. [RSMO 285.530 (2)] A copy of the affidavit referenced above is provided within this document.

B. E-Verify is an example of a federal work authorization program. Acceptable enrollment and participation documentation consists of **completed** copy of the E-Verify Memorandum of Understanding (MOU). For vendors that are not already enrolled and participating in a federal work authorization program, E-Verify is available at http://www.dhs.gov/xprevprot/programs/gc_1185221678150.shtm.

20. PREFERENCES

A. In the evaluation of bids, preferences shall be applied in accordance with Chapter 34 RSMo. Contractors should apply the same preferences in selecting subcontractors.

B. By virtue of statutory authority, RSMo. 34.076 and 34.350 to 34.359, a preference will be given to materials, products, supplies, provisions and all other articles produced, manufactured, made or grown within the State of Missouri. Such preference shall be given when quality is equal or better and delivered price is the same or less.

1) If attached, the document entitled "PREFERENCE IN PURCHASING PRODUCTS" should be completed and returned with the solicitation documents.

2) If attached, the document entitled "MISSOURI DOMESTIC PRODUCTS PROCUREMENT ACT" should be completed and returned with the solicitation documents. Applies if bid is Twenty-Five Thousand Dollars ($25,000.00) or more.

C. By virtue of statutory authority, RSMo 34.074, a preference will be given all contracts for the performance of any job or service to service-disabled veteran business either doing business as Missouri firms, corporations, or individuals; or which maintain Missouri offices or places of business, when the quality of performance promised is equal or better and the price quoted is the same or less or whenever competing bids, in their entirety, are comparable.

1) If attached, the document entitled "MISSOURI SERVICE-DISABLED VETERAN PREFERENCE" should be completed and returned with the solicitation documents.

D. In the event of a tie of low bids, the MHTC reserves the right to establish the method to be used in determining the award.

21. GENERAL PREFORMANCE

A. Bidders are encouraged to obtain minority business enterprise (MBE) and women business enterprise (WBE) participation in this work through the use of subcontractors, suppliers, joint ventures, or other arrangements that afford meaningful participation for M/WBEs. Bidders are encouraged to obtain 10% MBE and 5% WBE participation.

B. This work is to be performed under the general supervision and direction of the Missouri Department of Transportation (MoDOT) and, if awarded any portion of the work, the Contractor agrees to furnish at his own expense all labor and equipment required to complete the work, it being expressly understood that this solicitation is for completed work based upon the price(s) specified and is not a solicitation for rental of equipment or employment of labor by MoDOT, and MoDOT is to have no direction or control over the employees used by the Contractor in performance of the work.

22. APPLICABLE LAWS AND REGULATIONS

A. The contract shall be construed according to the laws of the State of Missouri. The Contractor shall comply with all local, state, and federal laws and regulations related to the performance of the contract.

B. The Contractor must be registered and maintain good standing with the Secretary of State of the State of Missouri and other regulatory agencies, as may be required by law or regulations. Prior to the issuance of a purchase order and/or notice to proceed, the Contractor may be required to submit to MoDOT a copy of their current Authority Certificate from the Secretary of State of the State of Missouri.

1) Prior to the issuance of a purchase order and/or notice to proceed, all out-of-state Contractors providing services within the state of Missouri must submit to MoDOT a copy of their current Transient Employer Certificate from the Department of Revenue, in addition to a copy of their current Authority Certificate from the Secretary of State of the State of Missouri.

C. The exclusive venue for any legal proceeding relating to or arising, out of the contract shall be in the Circuit Court of Cole County, Missouri.

23. PREVAILING WAGE

A. The work to be performed under this solicitation is governed by the provisions of Chapter 290 RSMo, as amended, related to prevailing wages to be paid on public works.

B. If the bid is accepted, the vendor will be required to comply with the prevailing wages as fixed by the Missouri Department of Labor and Industrial Relations, in effect as of the date of the issuance of the solicitation, for each affected craft and type of workmen in Mississippi County. The Annual Wage Order #17 is attached to the bid documents.

C. Pursuant to the requirements of the Chapter 290 RSMo., not less than the prevailing hourly rate of wages, as set out in the wage order attached to and made part of the specification for work under the contract, must be paid to all workers performing work under the contract.

D. The Contractor shall provide all information, reports and other documentation as required by MHTC to ensure compliance with Chapter 290 RSMo., as amended, relating to prevailing wages to be paid on public works.

24. REMEDIES AND RIGHTS

A. No provision in the contract shall be construed, expressly or implied, as a waiver by the MHTC of any existing or future right and/or remedy available by law in the event of any claim by the MHTC of the Contractor's default or breach of contract.

B. The Contractor agrees and understands that the contract shall constitute an assignment by the Contractor to the MHTC of all rights, title and interest in and to all causes of action that the Contractor may have under the antitrust laws of the United States or State of Missouri for which causes of action have accrued or will accrue as the result of or in relation to the particular equipment, supplies, and/or services purchased or produced by the Contractor in the fulfillment of the contract with the MHTC.

C. In the event a Contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the Contractor may request MoDOT to enter into such litigation to protect the interests of the MHTC, and, in addition, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

25. CANCELLATION OF CONTRACT

The MHTC may cancel the contract at any time for a material breach of contractual obligations or for convenience by providing the Contractor with written notice of cancellation. Should the MHTC exercise its right to cancel the contract for such reasons, cancellation will become effective upon the date specified in the notice of cancellation sent to the Contractor.

26. BANKRUPTCY OR INSOLVENCY

Upon filing for any bankruptcy or insolvency proceeding by or against the Contractor, whether voluntary or involuntary, or upon the appointment of a receiver, trustee, or assigned the benefit or creditors, the Contractor must notify MoDOT immediately. Upon learning of any such actions, the MHTC reserves the right, at its sole discretion, to either cancel the contract or affirm the contract and hold the contractor responsible for damages. Inventions, Patents, and Copyrights

27. INVENTIONS, PATENTS, AND COPYRIGHTS

The Contractor shall defend, protect, and hold harmless the MHTC, its officers, agents, and employees against all suits of law or in equity resulting from patent and copyright infringement concerning the Contractor's performance or products produced under the terms of the contract.

28. INSPECTION AND ACCEPTANCE

A. No equipment, supplies, and/or services received by MoDOT pursuant to a contract shall be deemed accepted until MoDOT has had reasonable opportunity to inspect said equipment, supplies, and/or services.

B. All equipment, supplies, and/or services which do not comply with the specifications and/or requirements or which are otherwise unacceptable or defective may be rejected. In addition, all equipment, supplies, and/or services which are discovered to be defective or which do not conform to any warranty of the Contractor upon inspection (or at any later time if the defects contained were not reasonably ascertainable upon the initial inspection) may be rejected.

C. The MHTC reserves the right to return any such rejected shipment at the Contractor's expense for full credit or replacement and to specify a reasonable date by which replacements must be received.

D. The MHTC’s right to reject any unacceptable equipment, supplies, and/or services shall not exclude any other legal, equitable or contractual remedies the MHTC may have.

29. STATUS OF INDEPENDENT CONTRACTOR

The Contractor represents itself to be an independent Contractor offering such services to the general public and shall not represent itself or its employees to be an employee of the MHTC. Therefore, the Contractor shall assume all legal and financial responsibility for taxes, FICA, employee fringe benefits, workers’ compensation, employee insurance, minimum wage

requirements, overtime, etc., and agrees to indemnify, save and hold the MHTC, its officers, agents and employees harmless from and against any and all losses (including attorney fees) and damage of any kind related to such matters.

30. INDEMNIFICATION

The Offeror shall defend, indemnify and hold harmless the Commission, including its members and department employees, from any claim or liability whether based on a claim for damages to real or personal property or to a person for any matter relating to or arising out of the Offeror's performance of its obligations under this Agreement.

31. DEFINITIONS

Architect/Engineer/Designer: When the term "Architect or Engineer or Designer" is used herein, it shall refer to Michael M. Hall, P.E.,[Shafer, Kline and Warren, Inc.], (573) 234-2610 or Doug Record [General Services Manager - Facilities] Missouri Department of Transportation, General Services (573) 526-7937, FAX (573) 526-6948. MoDOT Inspector or Facility Operations Supervisor: When the term "MoDOT Inspector or Facility Operations Supervisor" is used herein, it shall refer to those MoDOT individuals authorized to perform site inspections by Paul Husky, [Facility Operations Supervisor] District 10, General Services Division, (573)472-5216, FAX (573)472-5220 Owner: When the term “Owner” is used herein, it shall refer to Missouri Department of Transportation (MoDOT).

PREFERENCES IN PURCHASING PRODUCTS

DATE: _____

The bidders attention is directed to Section 34.076 RSMo 2000 which gives preference to Missouri corporations, firms, and individuals when letting contracts or purchasing products.

Bids/Quotations received will be evaluated on the basis of this legislation.

All vendors submitting a bid/quotation must furnish ALL information requested below.

FOR CORPORATIONS:

State in which incorporated: _____

FOR OTHERS:

State of domicile: _____

FOR ALL VENDORS:

List address of Missouri offices or places of business:

_____

_____

_____

_____

_____

_____

_____

THIS SECTION MUST BE COMPLETED AND SIGNED:

FIRM NAME: _____

ADDRESS: _____

CITY: _____ STATE: _____ ZIP: _____

BY (signature required): _____

Federal Tax I.D. #: _____ if no Federal Tax I.D. # - list Social Security #: _____

NOTE: For bid/quotation to be considered, the "Preference in Purchasing Products" form must be on file in the General Services (Procurement) Division and must be dated in the current calendar year.

MISSOURI DOMESTIC PRODUCTS PROCUREMENT ACT

The bidder's attention is directed to the Missouri Domestic Products Procurement Act, Sections 34.350 to 34/359, RsMO, which requires all manufactured goods or commodities used or supplied in the performance of this contract or any subcontract to be manufactured or produced in the United States.

Section 34.355, RsMO, requires the vendor or contractor to certify his compliance with Section 34.353 and, if applicable, Section 34.359, RsMO, at the time of bidding and prior to payment. Failure to comply with Section 34.353, RsMO, during the performance of the contract and to provide certification of compliance prior to payment will result in nonpayment for those goods or commodities.

Section 34.353.2, RsMO, specifies that it does not apply where the total contract is less than Twenty-Five Thousand Dollars ($25,000.00). If your total bid is Twenty-Five Thousand Dollars ($25,000.00) or more, you must complete this form as directed below.

Failure to complete and return this document with this bid will cause the State to presume the manufactured goods or products listed in the bid are not manufactured or produced in the United States, and the bid will be evaluated on that basis. Please read the certification appearing below on this form.

[ ] If all the goods or products specified in the attached bid which the bidder proposes to supply to the State shall be manufactured or produced in the "United States" as defined in Section 34.350, RsMO, check the box at left.

[ ] If only one item of any particular goods or products specified in the attached bid is manufactured or produced in the "United States" as defined in Section 34.350, RsMO, check the box at left and list the items (or item number) here:
_____
_____

[ ] If any or all of the goods or products specified in the attached bid which the bidder proposes to supply to the State are not manufactured or produced in the "United States" as defined in Section 34.350, RsMO, then: (a) check the box at left; (b) list below, by item (or item number), the country other than the United States where each good or product is manufactured or produced; and (c) check the boxes to the left of the paragraphs below if applicable and list the corresponding items (or item numbers) in the spaces provided.

Item (or item number)	Location Where Item Manufactured or Produced

(attach an additional sheet if necessary)

[ ] The following specified goods or products cannot be manufactured or produced in the United States in sufficient quantities or in time to me the contract specifications. Items (or item numbers): _____
_____

[ ] The following specified goods or products must be treated as manufactured or produced in the United States, in accordance with an existing treaty, law, agreement, or regulation of the United States, including a treaty between the United States and any foreign country regarding export-import restrictions or international trade. Items (or item numbers): _____
_____

CERTIFICATION

By submitting this document, completed as directed above, with a bid, the bidder certifies under penalty of making false declaration (Section 575.060, RsMO) that the information contained in this document if true, correct and complete, and may be relied upon by the State in determining the bidders qualifications under and in compliance with the Missouri Domestic Products Procurement Act.

The bidder's failure to complete and return this document with the bid as directed above will cause the State to presume the manufactured goods or products listed in the bid are not manufactured or produced in the United States, and the bid will be evaluated on that basis pursuant to Section 34.353.3(2), RsMO.

MISSOURI SERVICE-DISABLED VETERAN BUSINESS PREFERENCE

By virtue of statutory authority, RSMo 34.074, a preference will be given all contracts for the performance of any job or service to service-disabled veteran business either doing business as Missouri firms, corporations, or individuals; or which maintain Missouri offices or places of business, when the quality of performance promised is equal or better and the price quoted is the same or less or whenever competing bids, in their entirety, are comparable.

Definitions:

Service-Disabled Veteran is defined as any individual who is disabled as certified by the appropriate federal agency responsible for the administration of veterans' affairs.

Service-Disabled Veteran Business is defined as a business concern:

a. Not less than fifty-one (51) percent of which is owned by one or more service-disabled veterans or, in the case of any publicly owned business, not less than fifty-one (51) percent of the stock of which is owned by one or more service-disabled veterans; and
b. The management and daily business operations of which are controlled by one or more service-disabled veterans.

If an bidder meets the definitions of a service-disabled veteran and a service-disabled veteran business as defined in 34.074 RSMo and is either doing business as a Missouri firm, corporation, or individual; or maintains a Missouri office or place of business, the bidder must provide the following with the proposal in order to receive the Missouri service-disabled veteran business preference over a non-Missouri service-disabled veteran business when the quality of performance promised is equal or better and the price quoted is the same or less or whenever competing proposals, in their entirety, are comparable:

a. A copy of a letter from the Department of Veterans Affairs (VA), or a copy of the bidder's discharge paper (DD Form 214, Certificate of Release or Discharge from Active Duty) from the branch of service the bidder was in, stating that the bidder has a service-connected disability rating ranging from 0 to 100% disability; and
b. A completed copy of this exhibit

(NOTE: For ease of evaluation, please attach copy of the above-referenced letter from the VA or a copy of the bidder's discharge paper to this Exhibit.)

By signing below, I certify that I meet the definitions of a service-disabled veteran and a service-disabled veteran business as defined in 34.074 RSMo and that I am either doing business as a Missouri firm, corporation, or individual; or maintain Missouri offices or places of business at the location(s) listed below.

Veteran Information	Business Information
Service-Disabled Veteran's Name, (Please Print)	Service-Disabled Veteran Business Name
Service-Disabled Veteran's Signature	Missouri Address of Service-Disabled Veteran Business

00301

BID FORM

To: The Missouri Highway and Transportation Commission
PO Box 270
Jefferson City, Missouri 65102

1. The undersigned, having examined the proposed Contract Documents titled: **"D10 Sewer Extension – Charleston"** and having visited the site and examined the conditions affecting the work, hereby proposes and agrees to furnish all labor, materials, equipment and everything which may be necessary or incidental thereto, as proposed by said Contract Documents, all to the satisfaction of the General Services-Facility Operations Supervisor or designated representative of the Missouri Department of Transportation and the Missouri Highway and Transportation Commission, for the stipulated sum of:

   _____DOLLARS ($_____)

2. The undersigned, acknowledges having examined and being familiar with the contract documents including the drawings, the Instructions to Bidders, General Conditions, Supplementary Conditions and the body of technical specifications.

3. The undersigned acknowledges receipt of Addenda number _____ through _____ inclusive.

4. Enclosed with this bid is bid security in the amount of not less than 5% of the bidder's proposed Contract Sum, the amount being _____ DOLLARS ($_____).

IF AN INDIVIDUAL

_____

_____ Name of individual

_____ Residence address

_____ Social Security Number

_____ Telephone Number

_____ Firm Name, If Any

_____

_____ Address for communications

_____ Signature

IF A PARTNERSHIP

_____
Name of Partnership

_____
Partner

_____
Partner

_____

_____
Address for Communications

_____
Telephone Number

(State Name and Residence Address of All Partners)

_____

_____
Residence Address

_____

_____
Residence Address

_____
Federal Tax I.D. Number

_____
Signature of Either Partner

IF A CORPORATION

_____
Name of Corporation

_____
Name and Title of Officer

_____
Signature of officer

_____

_____
Address for Communications

_____
Telephone Number

Incorporated under the laws of the
State of_____

Corporate License No. _____
(If a corporation organized in a state other than Missouri, attach Certificate of Authority to do business in the State of Missouri.)

_____
Federal Tax I.D. Number

(ATTEST)

_____
(SEAL) Secretary

(Each bidder must complete the Bid Form by signing in the proper signature line above and by supplying the required information called for in connection with the signature. The information called for is necessary in the proper preparation of the contract and performance bond.)

ANNUAL WORKER ELIGIBILITY VERIFICATION AFFIDAVIT
(for joint ventures, a separate affidavit is required for each business entity)

STATE OF _____)
) ss
COUNTY OF _____)

On the _____ day of _____, 20____, before me appeared _____, personally known
Affiant name
to me or proved to me on the basis of satisfactory evidence to be a person whose name is subscribed to this affidavit, who being by me duly sworn, stated as follows:

- I, the Affiant, am of sound mind, capable of making this affidavit, and personally certify the facts herein stated, as required by Section 285.530, RSMo, to enter into any contract agreement with the state to perform any job, task, employment, labor, personal services, or any other activity for which compensation is provided, expected, or due, including but not limited to all activities conducted by business entities.
- I, the Affiant, am the _____ of _____, and I am duly authorized, directed, and/or empowered to act officially and properly on behalf of this business entity.
  title business name
- I, the Affiant, hereby affirm and warrant that the aforementioned business entity is enrolled in a federal work authorization program operated by the United States Department of Homeland Security, and the aforementioned business entity shall participate in said program to verify the employment eligibility of newly hired employees working in connection with any services contracted by the Missouri Highways and Transportation Commission (MHTC). I have attached documentation to this affidavit to evidence enrollment/participation by the aforementioned business entity in a federal work authorization program, as required by Section 285.530, RSMo.
- I, the Affiant, also hereby affirm and warrant that the aforementioned business entity does not and shall not knowingly employ, in connection with any services contracted by MHTC, any alien who does not have the legal right or authorization under federal law to work in the United States, as defined in 8 U.S.C. § 1324a(h)(3).
- I, the Affiant, am aware and recognize that, unless certain contract and affidavit conditions are satisfied pursuant to Section 285.530, RSMo, the aforementioned business entity may be held liable under Sections 285.525 though 285.550, RSMo, for subcontractors that knowingly employ or continue to employ any unauthorized alien to work within the state of Missouri.
- I, the Affiant, acknowledge that I am signing this affidavit as a free act and deed of the aforementioned business entity and not under duress.

_____
Affiant Signature

Subscribed and sworn to before me in _____, _____, the day and year first above-written.
city (or county) state

_____
Notary Public

My commission expires:

[documentation of enrollment/participation in a federal work authorization program attached]

00430

SUBCONTRACTOR LISTING

1. For portions of Work equaling or exceeding 1% of the total proposed Contract Sum, the undersigned proposes to use the following subcontractors. Except as otherwise approved by the Owner, the undersigned proposes to perform all other portions of the Work with his own forces.

2.

Portion of the Work:	Subcontractor name and address:
_____	_____
	_____
	_____
_____	_____
	_____
	_____
_____	_____
	_____
	_____

USE ADDITIONAL SHEETS IF REQUIRED

PROVIDE SIGNATURE IDENTICAL TO THAT SHOWN ON THE BID FORM

BIDDER:

_____

by_____

00600

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we _____,
as Principal, and _____ ,
as Surety, are held firmly bound unto the State of Missouri (acting by and through the Missouri Highway and Transportation Commission) in the penal sum of
_____ Dollars
($_____), to be paid to the State of Missouri, or the Missouri Highway and Transportation Commission, to be credited to the State Road Fund and Principal and Surety binding themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Sealed with our seals and dated this _____ day of _____, 20_____

THE CONDITION OF THIS OBLIGATION is such that:
WHEREAS, the Principal is submitting herewith a bid to the Missouri Highway and Transportation Commission on
Route(s) _____,
in _____ County(ies), Project(s) _____,
for construction or improvement as set out in said proposal.

NOW THEREFORE, if the Missouri Highway and Transportation Commission shall accept the bid of the Principal, and if said Principal shall properly execute and deliver to the Missouri Highway and Transportation Commission the Contract, Contract Bond, Specifications and evidence of insurance coverage in compliance with the requirements of the Proposal, to the satisfaction of the Missouri Highway and Transportation Commission, then this obligation shall be void and of no effect, otherwise to remain in full force and effect.

In the event the said Principal shall, in the judgment of the Missouri Highway and Transportation Commission, fail to comply with any requirement as set forth in the preceding paragraph, then the Stat of Missouri, acting through the Missouri Highway and Transportation Commission, shall immediately and forthwith be entitled to recover the fees, and any other expense of recovery.

_____ _____
Principal Surety

By_____ _____
Attorney in Fact (SEAL)

Attest: (CORPORATE SEAL)

_____
Corporate Secretary

Note: This bond must be executed by the Principal and by a Corporate Surety authorized to conduct surety business in the State of Missouri.

END OF SECTION

01019

CONTRACT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Schedule of values.
B. Application for payment.
C. Change procedures.
D. Alternatives.

1.2 RELATED SECTIONS

A. Section 01600 - Material and Equipment: Product substitutions.

1.3 SCHEDULE OF VALUES

A. Submit a printed schedule on Contractor's standard form. Electronic media printout will be considered.

B. Submit Schedule of Values in duplicate within 20 days after date of Owner-Contractor Agreement.

C. Revise schedule to list approved Change Orders, with each Application For Payment.

1.4 APPLICATIONS FOR PAYMENT

A. Submit four copies of each application on Contractor's electronic media driven form.
B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
C. Payment Period: 30 days.
D. Submit waiver of liens from vendors.
E. Include an updated construction progress schedule.
F. Certified payroll records.

1.5 CHANGE PROCEDURES

A. The Architect/Engineer/Designer may issue a Notice of Change that includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required.

B. The Contractor may propose changes by submitting a request for change to the Architect/Engineer/Designer describing the proposed change and its full effect on the Work. Include a statement describing the reason for the change, the effect on the Contract Sum/Price and Contract Time, and a statement describing the effect on Work by the MoDOT District or other Contractors.

C. Stipulated Sum/Price Change Order: Based on Notice of Change and Contractor's fixed price quotation or Contractor's request for a Change Order as approved by Architect/Engineer/Designer.

D. Construction Change Directive: Architect/Engineer/Designer may issue a directive instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute the change.

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

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

G. Execution of Change Orders: Architect/Engineer/Designer will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

1.6 DEFECT ASSESSMENT

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

B. If, in the opinion of the Architect/Engineer/Designer, it is not practical to remove and replace the Work, the Architect/Engineer/Designer will direct an appropriate remedy or adjust payment.

1.7 ALTERNATIVES

A. Accepted Alternatives will be identified in Owner-Contractor Agreement.

END OF SECTION

01039

COORDINATION AND MEETING REQUIREMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Coordination and project conditions.
B. Field engineering.
C. Preconstruction meeting.
D. Site mobilization meeting.
E. Progress meetings.
F. Preinstallation meetings.
G. Equipment electrical characteristics and components.
H. Examination.
I. Preparation.
J. Cutting and Patching.
K. Alteration project procedures.

1.2 COORDINATION AND PROJECT CONDITIONS

A. Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements.

B. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to and placing in service, such equipment.

C. Coordinate space requirements, supports, and installation of mechanical and electrical Work, which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. In finished areas, except as otherwise indicated, conceal pipes, ducts and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

E. Coordinate completion and clean up of Work of separate sections in preparation for Substantial Completion.

F. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.3 FIELD ENGINEERING

A. Employ a Land Surveyor registered in the State of Missouri and acceptable to Architect/Engineer/Designer.
B. Owner will locate and protect survey control and reference points.
C. Control datum for survey is that established by Owner provided survey.
D. Verify setbacks and easements; confirm drawing dimensions and elevations.
E. Provide field engineering services. Establish elevations, lines and levels, utilizing recognized engineering survey practices.

1.4 PRECONSTRUCTION MEETING

A. Architect/Engineer/Designer will schedule a meeting after Notice of Award.

B. Attendance Required: District engineer or representative, Architect/Engineer/Designer and Contractor.

C. Record minutes and distribute copies within 5 days after meeting to participants, with two copies to District Engineer, Architect/Engineer/Designer, participants and those affected by decisions made.

1.5 SITE MOBILIZATION MEETING

A. Architect/Engineer/Designer will schedule a meeting at the Project site prior to Contractor occupancy.

B. Architect/Engineer/Designer will record minutes and distributes copies within 5 days after meeting to participants, with two copies to Architect/Engineer/Designer, participants and those affected by decisions made.

1.6 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at when arranged by Architect/Engineer/Designer.

B. Architect/Engineer/Designer will make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings.

C. Attendance Required: Job superintendent, major Subcontractors and suppliers, District engineer representative, Architect/Engineer/Designer, as appropriate to agenda topics for each meeting.

D. Agenda:
1. Review of Work progress.
2. Field observations, problems, and decisions.
3. Identification of problems, which impede planned progress.
4. Maintenance of progress schedule.
5. Corrective measures to regain projected schedules.
6. Coordination of projected progress.
7. Effect of proposed changes on progress schedule and coordination.

E. Record minutes and distributes copies within 5 days after meeting to participants and those affected by decisions made.

1.7 PREINSTALLATION MEETING

A. When required in individual specification sections, convene a pre-installation meeting at the site prior to commencing work of the section.

B. Notify Architect/Engineer/Designer seven days in advance of meeting date.

C. Prepare agenda and preside at meeting:
1. Review conditions of installation, preparation and installation procedures.
2. Review coordination with related work.

D. Record minutes and distributes copies within 5 days after meeting to participants and those affected by decisions made.

PART 2 PRODUCTS

Not used

PART 3 EXECUTION

Note used

END OF SECTION

TECHNICAL SPECIFICATIONS
FOR

CHARLESTON MAINTENANCE FACILITY SEWER EXTENSION

ENGINEER: SHAFER, KLINE AND WARREN, INC.
3200 Penn Terrace, Suite 100
Columbia, MO 65202
573-234-2610

END OF DOCUMENT 00001

DOCUMENT 00005
CERTIFICATIONS PAGE

STATE OF MISSOURI MICHAEL MELVIN HALL NUMBER E-30044 REGISTERED PROFESSIONAL ENGINEER 2-15-11	I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Missouri. Signature: _____ Date: 2-15-11 Name: Michael M. Hall Missouri License No.: 30044 My license renewal date is December 31, 2011. Pages, Sheets, or Divisions covered by this seal: All

END OF DOCUMENT 00005

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00015 LIST OF DRAWINGS

TECHNICAL SPECIFICATIONS

DIVISION 1 – GENERAL REQUIREMENTS

01012 SUMMARY OF WORK
01300 SUBMITTALS
01400 QUALITY CONTROL
01500 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS
01600 MATERIAL AND EQUIPMENT
01650 STARTING OF SYSTEMS
01700 CONTRACT CLOSEOUT

DIVISION 02 – SITE WORK

02220 EARTHWORK
02732 SANITARY SEWER SYSTEM
02837 CHAIN LINK FENCING

DIVISION 03 - CONCRETE

03300 MISCELLANEOUS CONCRETE

DIVISION 11 – EQUIPMENT

11307 SUBMERSIBLE GRINDER PUMP STATION

DIVISION 14 – CONVEYING EQUIPMENT

14600 HOISTS AND CRANES

DIVISION 16 – ELECTRICAL

16050 BASIC ELECTRICAL MATERIALS AND METHODS
16905 LIFT STATION CONTROLS AND EQUIPMENT

END OF DOCUMENT

DOCUMENT 00015
LIST OF DRAWINGS

Drawings are not bound in this book.

Sheet	Drawings	Date
1	Cover Sheet	2/15/11
2	Lift Station Plan	2/15/11
3	Plan & Profile Sta. 0+00 to Sta. 13+50	2/15/11
4	Plan & Profile Sta. 13+50 to Sta. 27+50	2/15/11
5	Pump Station Details	2/15/11
6	Electrical Details	2/15/11
9	Misc. Details	2/15/11
8	Misc. Details	2/15/11
9	Erosion Control Details	2/15/11

END OF DOCUMENT 00015

SECTION 01012

SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Contract Description.

B. Contractor use of site and work area.

C. Existing Utilities and Improvements.

D. Protection of existing property and existing improvements.

1.2 CONTRACT DESCRIPTION

A. Contract Type: Unit Price.

B. Work under this contract will include the construction of new a pump station, a forcemain, and to serve the MODOT Charleston Maintenance Facility. Work shall include all materials and labor associated with the contract as specified and indicated on the Drawings.

1.3 CONTRACTOR USE OF SITE AND WORK AREA

A. Limit use of site and work area to maintain traffic on streets and allow property owners access to their property.

B. Owner has obtained or is in the process of obtaining permanent and temporary easements as is necessary to construct the project. Contractor shall confine construction activities to the apparent public rights-of-way and easements provided. Should Contractor desire temporary easements for construction, access in addition to that obtained by Owner, he shall obtain them at no additional cost to Owner.

C. Contractor is responsible to make repairs to any property damaged during construction. All materials and workmanship used shall be of equal or better quality to the materials and workmanship used in the original construction of the surface and shall be subject to the approval of the Engineer.

1.4 EXISTING UTILITIES

A. The size, type and location of all known obstacles in the right-of-way of the proposed construction are shown on the Drawings. Owner does not guarantee the number, type, size or location of the obstacles and they are given only as a guide to the Contractor in their location ahead of excavation. No additional compensation will be allowed for delays or costs caused by existing obstacles being incorrectly located or inadvertently omitted from the Drawings.

1.5 CONTRACTOR USE OF SITE AND PREMISES

A. Limit use of site and premises to allow:
   1. Owner occupancy, operations, and maintenance.
   2. Work by Owner.

B. Construction Operations:
   1. Limited to areas within general limits shown on the Drawings, inside Owners properties and , easements, except where specifically noted on the Drawings.
   2. Contractor may use the areas noted on the Drawings for storage and staging.

C. Time Restrictions: No work shall be done on Saturday, Sunday, legal holidays, or at night, without the approval of Owner in each case, except such work as may be necessary for the proper care, maintenance and protection of work already done or of equipment and public property covered by the Contract., or to meet demanding time limitations on specific work activities called for under this contract. Approval of Owner shall be sought at least forty-eight (48) hours in advance of such work whenever practicable.
   1. Before Contractor requests work to take place on Saturday, Sundays, or legal holidays on repeated basis to expedite the Work or make up for lost progress, Contractor shall first q schedule and work five 10-hour weekdays for at least three weeks prior.

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

E. Utility Outages and Shutdown: Brief shutdown of utilities, other than described herein, will be acceptable to Owner provided that the duration does not exceed one-half hour, and at least 48 hours prior notice has been given by Contractor.

1.6 WORK SEQUENCE

A. The construction sequence specified herein has been developed to serve as a basis to Contractor for development of a complete and comprehensive construction schedule in accordance with Section 01300 - Submittals. The Contractor shall expand the construction schedule from the sequence of construction presented herein. Contractor shall address in his construction schedule, the sequence of construction to be followed for each of the elements of Work identified herein and any other construction activities required for completion of the Work required by the Contract Documents. Alternatives to the sequence of construction below will be considered only if they offer advantages of fewer disruptions to treatment facility operation or the collection system, fewer or shorter duration shutdowns for facility tie-ins, or reduced risk of discharge permit violations. The suggested sequence of construction shall not relieve Contractor from any Work required by the Contract Documents nor from meeting the Contract Times specified in the Agreement.

B. Sequence of Construction
   1. Set pump station wetwell.
   2. Lay forcemain and gravity sewer connection.
   3. Set concrete lid for pump station.
   4. Install equipment and plumbing for pump station.
   5. Perform testing for sewers and forcemain
   6. Perform testing for pump station.
   7. Complete construction and restoration.

1.7 LINES AND GRADES

A. All Work shall be done to the lines, grades, and elevations indicated on the Drawings.

B. All construction staking is the responsibility of the Contractor.

1.8 CONNECTIONS TO EXISTING FACILITIES

A. Unless otherwise specified or indicated, Contractor shall make all necessary connections to existing facilities, including structures, drain lines, and utilities such as water, sewer, telephone, and electric. In each case, Contractor shall receive permission from Owner or the owing utility prior to undertaking connections. Contractor shall protect facilities against deleterious substances and damage.

B. Connections to existing facilities which are in service shall be thoroughly planned in advance, and all required equipment, materials, and labor shall be on hand at the time of undertaking the connections. Work shall proceed continuously (around the clock) if necessary to complete connections in the minimum time. Overtime work shall be scheduled with and approved by Owner in advance, as required within.

C. Operation of valves or other appurtenances on existing utilities, when required, shall be by or under the direct supervision of the owning utility.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittal procedures.

B. Construction progress schedules.

C. Proposed Products list.

D. Product Data.

E. Shop Drawings.

F. Samples.

G. Design data.

H. Test reports.

I. Certificates.

J. Manufacturer's instructions.

K. Manufacturer's field reports.

L. Erection drawings.

M. Photographic Record

1.2 RELATED SECTIONS

A. Section 01300 - Submittals

B. Section 01400 - Quality Control: Manufacturers' field services and reports.

C. Section 01700 - Contract Closeout: Contract warranties, bonds, manufacturers' certificates and closeout submittals.

1.3 REFERENCES

A. AGC Associated General Contractors of America publication "The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry".

1.4 SUBMITTAL PROCEDURES

A. Transmit each submittal with Architect/Engineer accepted form.

B. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number and specification section number, as appropriate.

C. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work and coordination of information is in accordance with the requirements of the Work and Contract Documents.

D. Schedule submittals to expedite the Project, and deliver to Architect/Engineer at business address. Coordinate submission of related items.

E. For each submittal for review, allow 15 days excluding delivery time to and from the contractor.

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

G. Submittals not requested will not be recognized or processed.

1.5 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial schedule in duplicate within 15 days after date established in Notice to Proceed.

B. Revise and resubmit as required.

C. Submit revised schedules with each Application for Payment, identifying changes since previous version.

D. Submit a horizontal bar chart with separate line for each major portion of Work or operation, identifying first workday of each week.

1.6 PROPOSED PRODUCTS LIST

A. Within 15 days after date of Notice to Proceed, submit list of major products proposed for use, with name of manufacturer, trade name and model number of each product.

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

1.7 PRODUCT DATA

A. Product Data For Review:
1. Submitted to Architect/Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
2. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - CONTRACT CLOSEOUT.

B. Product Data For Information:
1. Submitted for the Architect/Engineer's knowledge as contract administrator or for the Owner.

C. Product Data For Project Close-out:
1. Submitted for the Owner's benefit during and after project completion.

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

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

F. After review distribute in accordance with the Submittal Procedures article above and provide copies for record documents described in Section 01700 - CONTRACT CLOSEOUT.

1.8 SHOP DRAWINGS

A. Shop Drawings For Review:
1. Submitted to Architect/Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
2. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - CONTRACT CLOSEOUT.

B. Shop Drawings For Information:
1. Submitted for the Architect/Engineer's knowledge as contract administrator or for the Owner.

C. Shop Drawings For Project Close-out:
1. Submitted for the Owner's benefit during and after project completion.

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

E. Submit in the form of one reproducible transparency and one opaque reproduction.

1.9 SAMPLES

A. Samples For Review:
1. Submitted to Architect/Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
2. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - CONTRACT CLOSEOUT.

B. Samples For Information:
1. Submitted for the Architect/Engineer's knowledge as contract administrator or for the Owner.

C. Samples For Selection:
1. Submitted to Architect/Engineer for aesthetic, color, or finish selection.
2. Submit samples of finishes for Architect/Engineer selection.
3. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above and for record documents purposes described in Section 01700 - CONTRACT CLOSEOUT.

1.10 DESIGN DATA

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

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

1.11 TEST REPORTS

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

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

1.12 CERTIFICATES

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

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

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

1.13 MANUFACTURER'S INSTRUCTIONS

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

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

C. Refer to Section 01400 - Quality Control, Manufacturers' Field Services article.

1.14 MANUFACTURER'S FIELD REPORTS

A. Submit reports for the Architect/Engineer's benefit as contract administrator or for the Owner.

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

1.15 ERECTION DRAWINGS

A. Submit drawings for the Architect/Engineer's benefit as contract administrator or for the Owner.

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

C. Data indicating inappropriate or unacceptable Work may be subject to action by the Architect/Engineer or Owner.

PHOTOGRAPHIC RECORD

A. Prior to commencement of construction, the Contractor shall make a photographic record of all sites. The photographs shall be of sufficient detail to reveal the character of existing surfaces, including the condition of such features as curbs, sidewalks, driveways and inlets which may be affected by construction operations. All photographs shall be marked for identification, showing location by site number and station number. All photographs shall be 4x6 color prints. One set of bound photographs shall be submitted to the Owner for approval prior to commencement of construction operations. Direct compensation will not be paid for this requirement which shall be subsidiary to other items of the contract.

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quality assurance - control of installation.

B. Tolerances

C. References and standards.

D. Mock-up.

E. Inspecting and testing laboratory services.

F. Manufacturers' field services.

1.2 RELATED SECTIONS

A. Section 01300 - Submittals: Submission of manufacturers' instructions and certificates.

B. Section 01600 - Material and Equipment: Requirements for material and product quality.

C. Section 01650 - Starting of Systems.

1.3 QUALITY ASSURANCE - CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes or specified requirements indicate higher standards or more precise workmanship.

E. Perform Work by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.4 TOLERANCES

A. Monitor fabrication and installation tolerance control of Products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract

Documents, request clarification from Architect/Engineer before proceeding.

C. Adjust Products to appropriate dimensions; position before securing Products in place.

1.5 REFERENCES AND STANDARDS

A. For Products or workmanship specified by association, trade or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date for receiving bids or date specified in the individual specification sections, except where a specific date is established by code.

C. Neither the contractual relationships, duties or responsibilities of the parties in Contract nor those of the Architect/Engineer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.6 TESTING SERVICES

A. Contractor to provide all testing services as called out in these specifications.

B. Testing and source quality control may occur on or off the project site. Perform off-site testing as required by the Architect/Engineer or the Owner.

C. Testing does not relieve Contractor to perform Work to contract requirements.

D. Re-testing required because of non-conformance to specified requirements shall be performed by the same MoDOT personnel on instructions by the Architect/Engineer.

1.7 INSPECTION SERVICES

A. Owner will employ MoDOT Personnel to perform inspection.

B. Inspecting may occur on or off the project site. Perform off-site inspecting as required by the Architect/Engineer or the Owner.

C. Inspecting does not relieve Contractor to perform Work to contract requirements.

1.8 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and the balancing of equipment as applicable and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

C. Refer to Section 01300 - SUBMITTALS, MANUFACTURERS' FIELD REPORTS article.

PART 2 EXECUTION

2.1 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work.

Beginning new Work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.

2.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer or conditioner prior to applying any new material or substance in contact or bond.

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities: Electricity, telephone service, facsimile service and sanitary facilities.

B. Temporary Controls: enclosures and fencing, protection of the Work and water control.

1.2 TEMPORARY ELECTRICITY

A. Coordinate with MoDOT personnel.

1.3 TELEPHONE SERVICE

A. NOT APPLICABLE

1.4 FACSIMILE SERVICE

A. NOT APPLICABLE.

1.5 TEMPORARY WATER SERVICE

A. Connect to existing water source as directed for construction operations at time of project mobilization.

B. Contractor will reimburse Owner for water used in construction as agreed upon at time of project mobilization.

1.6 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

1.7 FENCING

A. Construction: Use plastic mesh safety fencing or better.

1.8 WATER CONTROL

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

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

1.9 EXTERIOR ENCLOSURES

A. NOT APPLICABLE

1.10 PROTECTION OF INSTALLED WORK

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

sections.

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

1.11 SECURITY

A. Provide security and facilities to protect Work and existing facilities and Owner's operations from unauthorized entry, vandalism or theft.

B. Coordinate with Owner's security program.

1.12 ACCESS ROADS

A. Provide and maintain access to fire hydrants, free of obstructions.
B. Provide means of removing mud from vehicle wheels before entering streets.
C. Designated existing on-site roads may be used for construction traffic.

1.13 PROGRESS CLEANING AND WASTE REMOVAL

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

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris and rubbish from site periodically and dispose off-site.

E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.14 FIELD OFFICES AND SHEDS

A. NOT APPLICABLE

1.15 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities and materials prior to Final Application for Payment inspection.

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

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

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT APPLICABLE

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Products.

B. Transportation and handling.

C. Storage and protection.

D. Product options.

E. Substitutions.

1.2 RELATED SECTIONS

A. Instructions to Bidders: Product options and substitution procedures.

B. Section 01400 - Quality Control: Product quality monitoring.

1.3 PRODUCTS

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

B. Provide interchangeable components of the same manufacture for components being replaced.

1.4 TRANSPORTATION AND HANDLING

A. Transport and handle Products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to ensure that Products comply with requirements, quantities are correct and products are undamaged.

C. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement or damage.

1.5 STORAGE AND PROTECTION

A. Store and protect Products in accordance with manufacturers' instructions.

B. Store with seals and labels intact and legible.

C. Store sensitive Products in weather tight, climate controlled, enclosures in an environment favorable to Product.

D. For exterior storage of fabricated Products, place on sloped supports above ground.

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

F. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of Products.

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

H. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement or damage.

I. Arrange storage of Products to permit access for inspection. Periodically inspect to verify Products are undamaged and are maintained in acceptable condition.

1.6 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description is acceptable.

B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with the following article.

1.7 SUBSTITUTIONS

A. Architect/Engineer will consider requests for Substitutions only within 15 days after date established in Notice to Proceed.

B. Substitutions may be considered when a Product becomes unavailable through no fault of the Contractor.

C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

D. A request constitutes a representation that the Contractor:
1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
2. Will provide the same warranty for the Substitution as for the specified Product.
3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension that may subsequently become apparent.
5. Will reimburse Owner for review or redesign services associated with re-approval by authorities.

E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request or when acceptance will require revision to the Contract Documents.

F. Substitution Submittal Procedure:
1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
2. Submit shop drawings, product data and certified test results attesting to the proposed Product equivalence. Burden of proof is on proposer.

3. The Architect/Engineer will notify Contractor in writing of decision to accept or reject request.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01650

STARTING OF SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Starting systems.

B. Demonstration and instructions.

1.2 RELATED SECTIONS

A. Section 01400 - Quality Control: Manufacturers field reports.

B. Section 01700 - Contract Closeout: System operation and maintenance data and extra materials.

1.3 STARTING SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Architect/Engineer seven days prior to start-up of each item.

C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence and for conditions that may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

E. Verify that wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable manufacturer's representative or Contractors' personnel in accordance with manufacturers' instructions.

G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check and approve equipment or system installation prior to start-up and to supervise placing equipment or system in operation.

H. Submit a written report in accordance with Section 01300 that equipment or system has been properly installed and is functioning correctly.

1.4 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Products to Owner's personnel two weeks prior to date of Final Completion.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owners' personnel in detail to explain all aspects of operation and maintenance.

D. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance and

shutdown of each item of equipment at agreed time, at equipment location.

E. Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instruction.

F. The amount of time required for instruction on each item of equipment and system that's specified in individual sections.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Closeout procedures.

B. Final cleaning.

C. Adjusting.

D. Project record documents.

E. Operation and maintenance data.

F. Spare parts and maintenance Products.

G. Warranties.

1.2 RELATED SECTIONS

A. Section 01500 - Construction Facilities and Temporary Controls: Progress cleaning.

B. Section 01650 - Starting of Systems: System start-up, testing, adjusting and balancing.

1.3 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Architect/Engineer's review.

B. Provide submittals to Owner that is required by governing or other authorities.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments and sum remaining due.

1.4 FINAL CLEANING

A. Execute final cleaning prior to final project assessment. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

B. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

C. Clean or replace filters of operating equipment used during construction and/or adjustment.

D. Clean debris from roofs, gutters, downspouts and drainage systems.

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

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

1.5 ADJUSTING

A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.6 PROJECT RECORD DOCUMENTS

A. Store record documents separate from documents used for construction.

B. Record information concurrent with construction progress.

C. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:
1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and modifications.

D. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
1. Measured depths of foundations in relation to finish main floor datum.
2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
4. Field changes of dimension and detail.
5. Details not on original Contract drawings.

E. Submit documents to Architect/Engineer with claim for final Application for Payment.

1.7 OPERATION AND MAINTENANCE DATA

A. Submit data bound in 8-1/2 x 11 inch (A4) text pages, three D side ring binders with durable plastic covers.

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

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

D. Submit 1 draft copy of completed volumes 15 days prior to final inspection. This copy will be reviewed and returned with Architect/Engineer comments. Revise content of all document sets as required prior to final submission.

E. Submit two sets of revised final volumes, within 10 days after final inspection.

1.8 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Provide spare parts, maintenance, and extra Products in quantities specified individual specification sections.

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

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or Subcontractor without prior written consent of the Owner.

1.9 WARRANTIES

A. Execute and assemble transferable warranty documents from Subcontractors, suppliers and manufacturers.

B. Submit prior to final Application for Payment.

C. For items of Work delayed beyond date of Final Completion, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of the warranty period.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 02220

EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

This section applies to open cut and trenchless sewer installation, as indicated on the Drawings. The Contractor shall perform all excavation, embankment, trenching, backfilling, cushioning, surface dressing, dewatering, shoring, and disposal of waste as required for site grading, structures, piping and appurtenances as shown on the Drawings.

1.2 SECTION INCLUDES

A. Disposal of materials

B. Tree removal

C. Site preparation

D. Excavation and trenching

E. Backfill

F. Tracer Wire

G. Earthfills and Embankments

H. Impervious Trench Check

I. Soil Testing

1.3 RELATED SECTIONS

A. Section 02732 - Sanitary Sewer System

B. Section 11307 - Submersible Grinder Pump Station.

1.4 REFERENCES

A. The following publications form a part of these specifications to the extent indicated by references thereto. Only the most recent revisions of these publications shall be used.
   1. ASTM D-698 Moisture-Density Relations Of Soils, Using 5.5 Pound (2.5 kg) Rammer And 12-Inch (304.8 mm) Drop
   2. ASTM D-1140 Test Method for Amount of Material in Soils Finer Than the No. 200 (75Fm) Sieve.
   3. ASTM D-2922 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
   4. ASTM D-3017 Standard Test Methods for Water Content of Soil and Rock by Nuclear Methods.

1.5 SUBMITTALS

A. The Contractor shall submit the following items, in accordance with Section 01300 - Submittals:
   1. Product data for review: Soil test results as specified herein for soil testing.

1.6 DEFINITIONS

A. Earth excavation: Earth excavation is defined as the removal of all material whose removal is not defined as rock excavation.

B. Pipe embedment: Pipe embedment is defined as trench backfill material placed under, around, and in some cases over the pipe. The material type and extent of embedment is specified in the respective pipe section.

C. Trench backfill: Trench backfill is defined as soil or stone aggregate material placed in a pipe or utility trench, above the pipe embedment and up to the existing ground surface, finished grade, or the bottom of pavement.

D. Structural backfill: Structural backfill is defined as soil or stone aggregate material placed around or above subsurface structures, such as manholes, vaults, foundations, and wetwells.

1.7 DISPOSAL OF MATERIALS

A. All unused excess excavated material, together with all debris, removed pipe, stones, stumps, roots, and other unsuitable materials shall be removed from the site and disposed of by the Contractor, at the expense of Contractor.

B. Material to be disposed of, including excess material, shall be promptly removed from the site by Contractor. If Contractor desires to set aside excess excavated material free from contamination by sewage or other hazardous substances, he shall do so only in an area approved by the Owner.

1.8 TREE REMOVAL

A. It is the intent of these specifications to minimize tree removal.

B. No trees outside of established permanent easements are to be damaged or removed without the express approval of the Owner. Contractor shall make every effort to minimize tree damage and removal, whether inside or outside easements. Contractor shall endeavor to work around and between trees.

C. All trees, brush, etc., shall be disposed of by the Contractor as specified herein.

D. Trees shall be removed in such a manner that will prevent damage to trees left standing, to existing structures, utilities, paved roadways, curbs and walkways, and with due regard to the safety of employees and others.

E. Surfaces of trees that are cut or scarred by the Contractor's operations shall be painted with an approved asphaltum base paint prepared especially for tree surgery.

1.9 SITE PREPARATION

A. All stumps, roots, buried logs, foundations, drainage structures, or other miscellaneous debris occurring within the limits of the excavation and site grading shall be removed as part of the grubbing operations and disposed of by, and at the expense of, the Contractor.

B. Stumps and roots in excavated or fill areas where depth of fill does not exceed 3 feet shall be removed to a depth of 18 inches below subgrade. In fill areas where more than 3 feet of fill is required, roots and stumps shall be cut off at the face of the excavation.

C. All abandoned pipe conduit within the limits of grading shall be removed by the Contractor.

D. New pipe conduits shall be stockpiled at a location designated by the Owner.

1.10 NOT USED

PART 2 PRODUCTS

2.1 GENERAL

A. Materials shall conform to the respective references listed above and other requirements specified herein.

B. Topsoil, and material required for structural backfill and trench backfill in excess of suitable material excavated from trenching and structural excavation shall be furnished by the Contractor at no additional cost to the Owner.

2.2 TRENCH BACKFILL MATERIALS

A. Pipe embedment materials shall be as specified for the particular pipe material.

B. Random Backfill Material
1. Random backfill material shall be trench excavated soil material which is free from organic material, debris, and rocks or lumps larger than 6 inches in their greatest dimension.

C. Select Backfill Material
1. Select backfill material shall be a sorted, job-excavated soil material as specified for random backfill material, except no rocks, stones, or lumps larger than one inch in largest dimension shall be present.

D. Granular Backfill Material
1. Granular backfill material shall be a graded gravel or crushed stone of the following gradation:

Sieve Size (square opening)	Percent Passing (by weight)
1 inch	100
3/4 inch	85 - 100
3/8 inch	50 - 80
No. 4	35 - 60
No. 40	15 -25
No. 200	5 - 15

2. Granular backfill material shall be free from clay lumps or organic matter. The fraction passing the No. 40 sieve shall have a liquid limit not greater than 25 and a plasticity index not greater than 5.

2.3 EARTHFILL AND EMBANKMENT MATERIALS

A. Random Fill Material: Random fill material for earthfills, embankments and other uses, shall be a soil material which is free from: rocks or stones larger than 6 inches in greatest dimension, brush, stumps, logs, roots, debris, top soil, and organic or harmful materials. The portion of fill material passing the No. 40 sieve shall have a liquid limit not exceeding 40 and a plastic limit not exceeding 25, when tested in accordance with ASTM D-4318. To the extent possible, site excavated material may be used. Random fill material shall be imported if suitable soil material is not available on site.

B. Select Fill Material: Select fill material shall be a sorted, job-excavated or imported soil material as specified for random backfill material, except no rocks, stones, or lumps larger than one inch in largest dimension shall be present.

2.4 TRACER WIRE: 12 gauge TW copper.

2.5 IMPERVIOUS TRENCH CHECK MATERIAL

A. Material for impervious trench checks shall be naturally occurring clay or a soil and sodium bentonite mixture with the permeability of the material to be no greater than 10x10-6 cm/sec.

B. Material shall be free of any stones, bricks, concrete, etc., except gravel or crushed rock of 3/4 inch size or less.

PART 3 EXECUTION

3.1 SITE PREPARATION

A. Clearing and stripping: All vegetation and other unsuitable material within the grading limits shall be stripped or otherwise removed before excavating. Likewise, six inches of topsoil shall be stripped from the disturbed construction areas and stockpiled for later use in final grading.

B. Existing fences: Fences within the construction grading area shall be removed and reconstructed to equal or better quality than that of the fence removed. It shall be the sole responsibility of the Contractor to maintain all gates, fences, cattle guards and the like encountered during construction, as required to prevent the straying of pets and livestock.

C. Adjustment Maintenance: The Contractor shall be responsible for the satisfactory compaction and maintenance of all completed excavation, embankment, and backfill. If, prior to the expiration of the General Guaranty period stipulated in the Supplemental General Conditions, any grades or subgrades are found to have settled or eroded, they shall be reworked immediately by the Contractor and restored to the specified grades, and the surface restored.

3.2 EXCAVATION AND TRENCHING

A. Sheeting and bracing
1. Where necessary, satisfactory sheeting and bracing shall be used to hold the sides of the excavation at all points where damage might result from slides.
2. All sheeting and bracing shall be removed as the backfill is placed, unless otherwise directed in writing by the Owner or shown on the drawings. All voids left or caused by the withdrawal of sheeting shall be filled immediately with suitable material and tamped.

B. Trenching

1. The Contractor shall not open more trench in advance of the pipe laying than is necessary to expedite the Work. The length of open trenches shall be limited depending on the nature of the soil and safety considerations. The length from one manhole to the next or 375 feet, whichever is the shorter, shall be the maximum allowable length of open trench ahead of pipe laying. All open trenches shall be adequately protected using fencing, barricades, etc. as required.
2. No classification of excavated materials, regardless of type or condition, will be made for purposes of payment. All excavation shall be unclassified. Excavation and trenching work shall include the handling and removal of all materials, regardless of its nature, excavated or removed from the site in performance of the Work. No separate payment will be made for rock.
3. Trenches shall be excavated within the limits of public right-of-way in conformance with the requirements herein. Trenches shall be excavated to the width and depth necessary to install sewer pipe to the lines, grades and elevations shown on the drawings.
4. In those areas designated to be landscaped, seeded or sodded, the top soil shall be excavated, stockpiled and replaced as specified herein.
5. Trenches shall be drained so that workmen may work efficiently. The discharge of pumps used for draining the trenches shall be led to natural drainage courses or drains.
6. Limiting trench widths: Trenches shall be excavated to a width which will provide adequate working space and pipe clearances for proper pipe installation, jointing, and embedment. However, the limiting trench widths below an elevation 12 inches above the top of the installed pipe shall be as follows.

Pipe Size (inches)	Minimum Trench Width in Earth (inches)*	Maximum Trench Width in Earth (inches)	Minimum Trench Width in Rock (inches)*
<4	20	26	20
4-6	24	30	24
8	26	32	24
10	30	34	24
12	32	36	26

*Note: Minimum trench width given is for gravity sewer construction.

Minimum trench width for sewage force mains and other conduits which do not flow by gravity shall be (for open-cut construction methods):

a. For very small pipes (3-inch diameter and smaller): Pipe diameter plus 6 inches. For pipes installed by mechanical trenchers, smaller trench widths will be allowed.
b. For small pipes (6-inch diameter and smaller): Pipe diameter plus 8 inches.
c. For large pipes (8-inch diameter and larger): Pipe diameter plus 12 inches.

For forcemains installed by mechanical trenching devices shall have a trench width as narrow as possible.

7. Unauthorized trench widths: Where, for any reason, the width of the lower portion of the trench as excavated at any point exceeds the maximum permitted in the foregoing tables, either pipe of adequate strength, special pipe embedment, or arch concrete encasement, as required by loading conditions and as determined by the Engineer, shall be furnished and installed by and at the expense of the Contractor.
8. Excavation below trench subgrade:
   a. Over excavation due to Contractor's oversight shall be backfilled with granular

embedment material as required at no additional cost to the Owner.

b. When unstable or unsuitable material is encountered in the trench subgrade, such material shall be removed, backfilled with granular pipe embedment material and compacted to the density equal to or greater than required for subsequent backfill material. Such excavation and backfill shall be done at no additional cost to Owner.

c. When the trench bottom is soft and in the opinion of the Engineer cannot support the pipe, a further depth and/or width shall be excavated and refilled to the desired pipe foundation grade with granular embedment material as required by the Engineer to assure a firm foundation for the pipe. Such excavation and backfill shall be done at no additional cost to Owner.

d. Where granular embedment material is not available, and in locations directed by the Engineer, granular backfill material shall be used to stabilize or raise the trench subgrade.

9. The Contractor shall sort and stockpile excavated material so that suitable material is available for backfill. Excavated material shall be deposited on the side of the trenches and beyond the reach of slides. Excavated material not suitable for backfill shall be promptly removed from the site.

10. Where necessary to reduce earth load on trench banks to prevent sliding and caving, banks may be cut back on slopes, but sloping trench walls shall not extend lower than 1 foot above the top of the pipe.

11. Trench bottom in earth: The trench in earth shall have a flat bottom the full width of the trench and shall be excavated to the grade to which the embedment is to be laid. The surface shall be graded to provide a uniform bearing and continuous support. No part of the bell shall be in contact with the trench bottom.

3.3 BACKFILLING

A. General

1. All trenches and excavations around structures shall be backfilled to finish grade according to the drawings. Backfill with material as specified herein and according to the trenching and bedding details on the Drawings.

2. Embedment: Pipe embedment shall be placed as specified for the pipe to be laid. Backfill placed on pipe embedment within one foot above the top of the pipe bell or coupling shall contain no excavated rock, rocks greater than 2 inches in largest dimension, or debris.

3. Large compaction equipment, including self propelled compaction equipment, bulldozers, loaders, and boom-mounted vibratory plates, shall not be used within 3 feet above the top of pipe, or within 3 feet of new or existing structure.

4. If backfilling operations do not meet the specifications, the material shall be removed, replaced and recompacted at the Contractor's expense.

5. Backfill shall not be placed when material is frozen, contains frost, snow, waste material, trees, organic matter and rubbish or when the surface to receive backfill is snow covered or frozen.

6. No backfill shall be placed over or around any structure until the concrete or mortar has attained a minimum compressive strength of 2000 psi and can support the loads imposed by backfilling and traffic.

B. Trench backfill: Backfill for all pipeline trench excavation shall be placed by the end of each working day around all pipe laid that day, leaving only the working end of the pipe uncovered. Any trenches excavated in advance of pipe laying shall also be backfilled at the end of each working day.

1. For all bore pits, trenches in graveled areas, or other vehicle traveled ways which are either paved or surfaced with chip-and-seal material or gravelled:

a. Select backfill material shall be placed on the compacted pipe embedment, in

layers not to exceed 12 inches in compacted thickness.

b. Random backfill material shall be compacted to a minimum of 95 percent of maximum density as determined by ASTM D-698. Backfill shall be placed and compacted at a moisture content within plus 3 or minus 3 percent of optimum. Random backfill may be compacted by vibratory plates, tracks or wheels of graders, tractors, high loaders or similar equipment, subject to the restrictions above. Extreme care shall be used in compaction operations to prevent compacting equipment from contacting the pipe.

3. For trenches in other areas, including grassed areas and parkways which are not in vehicle traveled ways

a. Random backfill material shall be placed on the compacted pipe embedment, in layers not to exceed 18 inches in compacted thickness.

b. Random backfill material shall be compacted to a minimum of 85 percent of maximum density as determined by ASTM D-698. Backfill shall be placed and compacted at a moisture content within plus 3 or minus 3 percent of optimum. Random backfill may be compacted by vibratory plates, tracks or wheels of graders, tractors, high loaders or similar equipment, subject to the restrictions above. Extreme care shall be used in compaction operations to prevent compacting equipment from contacting the pipe. Contractor shall refill these areas as needed to finish grade throughout warranty period.

c. Small pipelines installed by mechanical trenching devices may use dumped backfill, in which case the backfill shall be mounded to compensate for settlement.

C. Structure backfill

1. All structures shall be backfilled to the lines and grades shown on the drawings. In no instance shall backfill be dumped, bull-dozed or otherwise deposited in bulk upon the structure. Backfill shall be kept at approximately the same elevation on all sides of the structure as backfilling proceeds.

2. Structure backfill shall be select backfill material, placed in lifts not to exceed 12 inches in compacted thickness, and compacted in place to 90% of maximum density as determined by ASTM D-698, at a moisture content within plus 3 or minus 3 percent of optimum.

3.4 TRACER WIRE AND WARNING TAPE:

A. Tracer wire and warning tape shall be placed in the trench for all plastic sewage force mains. Tracer wire shall be # 12 THHN copper, insulated wire. Refer to the trench details on the Drawings.

3.5 EARTHFILLS AND EMBANKMENTS

A. Material and Compaction Requirements

1. Fill areas which are below structures, roadways, or concrete slabs, and within 5 horizontal feet of a structure, roadway, or concrete slab shall be filled with select fill material, as specified herein, unless otherwise indicated on the Drawings. The select fill material shall be placed in lifts not exceeding 12 inches in compacted thickness, and shall be compacted to a minimum 95 percent of maximum density as determined by ASTM D-698. Fill shall be placed and compacted at a moisture content within plus 2 or minus 2 percent of optimum.

2. Fill areas which are outside the envelope described above shall be filled with random fill material, as specified herein, unless otherwise indicated on the Drawings. The random fill material shall be placed in lifts not exceeding 12 inches in compacted thickness, and shall be compacted to a minimum 90 percent of maximum density as determined by ASTM D-698. Fill shall be placed and compacted at a moisture content within plus 3 or

minus 3 percent of optimum.

a. For areas which will be surfaced with gravel, the top two feet of random fill shall be compacted to a minimum of 95 percent of maximum density as determined by ASTM D-698. Fill shall be placed and compacted at a moisture content within plus 2 or minus 2 percent of optimum.

B. All vegetation and topsoil, and any loose, unstable or unsuitable material shall be removed from the existing surface to receive fill material. After stripping, the area shall be proofrolled with a loaded tandem axel dump truck, or other equipment acceptable to Engineer. Unstable materials located by proofrolling, shall be removed and replaced with suitable compacted fill material.

C. Before placing any fill the existing surface shall be scarified, moisture conditioned as required and the top 6 inches compacted to 90 percent of the maximum density for that material in accordance with ASTM D-698.

D. When embankments, regardless of height, are placed against hillsides or existing embankments having a slope steeper than 1 vertical to 4 horizontal, the existing slope shall be benched or stepped in approximately 24 inch rises. The material shall be bladed out and the bottom area cut to form benches and the embankment material being placed shall be compacted to the specified density. Formation and compaction of benches shall not be measured and paid for directly but will be considered incidental work.

E. Where embankments of two feet or less are placed over existing pavement, the existing pavement shall be removed and the cleared surface compacted to the specified density. Where embankments greater than two feet are placed over existing pavement, the pavement shall be broken into pieces with a maximum dimension of 24 inches and the pieces left in place.

F. Do not place fill material over porous, wet, frozen or spongy surfaces Embankment construction shall not be performed when fill material is frozen or contains frost or snow.

G. Placement: Place earth embankments in successive horizontal lifts uniformly distributed over the full width of the fill area. Each lift shall not exceed the specified thickness and shall be compacted to the specified density prior to placing any additional lifts. As compaction of each layer progresses, continuous blading and dozing will be required to level the surface and insure uniform compaction.

H. No rocks or stones shall be placed in the upper 18 inches of any fill or embankment. Rocks or stones within the size limit may be incorporated in the remainder of fills and embankments, provided they are distributed so they do not interfere with proper compaction, as determined by the Engineer.

END OF SECTION

SECTION 02732

SANITARY SEWER SYSTEM

PART1 GENERAL

1.1 The Contractor shall furnish and install all required sewer piping, fittings, embedment materials, and all accessories for a complete sanitary sewer as shown on the Drawings and specified herein and tested for approval by the Engineer.

1.2 SECTION INCLUDES

A. Sanitary gravity sewer piping, fittings, and accessories.

B. Steel Casing.

C. Pipe embedment.

D. New sanitary sewer manholes and appurtenances

E. Gravity sewer acceptance testing.

F. Manhole testing

1.3 RELATED SECTIONS

A. Section 02220 - Earthwork.

B. Section 11307 - Submersible Grinder Pump Station.

1.4 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Refer to Section 01025 - Measurement and Payment.

B. Payment: Payment will be made at the respective unit or lump sum price listed in the Bid Form.

1.5 REFERENCES

A. Midwest Concrete Industry Board (MCIB) Standard Specification for Concrete Work.

B. ASTM A-48 Gray Iron Castings

C. ASTM A-139 Specifications for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)

D. ASTM A-615 Deformed And Plain Billet-Steel Bars For Concrete Reinforcement

E. ASTM C-32 Sewer And Manhole Brick (Made From Clay Or Shale)

F. ASTM C-270 Mortar For Unit Masonry

G. ASTM C-478 Precast Reinforced Concrete Manhole Sections

H. ASTM C-923 Specification For Resilient Connectors Between Reinforced Concrete Manhole Structures And Pipes

I. ASTM D-698 Test Methods for Moisture Density Relations of Soils and Soil Aggregate Mixtures

J. ASTM D-1784 Rigid Poly (Vinyl Chloride) Compounds And Chlorinated Poly (Vinyl Chloride) Compounds

K. ASTM D2241 Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)

L. ASTM D-2321 Recommended Practice For Underground Installation Of Flexible Thermoplastic Sewer Pipe

M. ASTM D-2729 Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings.

N. ASTM D-2837 Obtaining Hydrostatic Design Basis For Thermoplastic Pipe Materials.

O. ASTM D-3034 Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings.

P. ASTM D-3139 Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

Q. ASTM D-3212 Joints for Drain and Sewer Plastic Pipe Using Flexible Elastomeric Seals.

R. ASTM F-477 Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

S. ASTM F-1417 Standard Test Method for Installation Acceptance of Plastic Sewer Lines Using Low-Pressure Air.

T. ANSI/AWWA C-206 Standard for Field Welding of Steel Water Pipe.

U. AWWA C-900 Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. Through 12 in. for Water Distribution

1.6 DEFINITIONS

A. Embedment: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

1.7 SUBMITTALS

A. Submit under provisions of Section 01300 - Submittals.

B. Product Data for Review:
Pipe, pipe accessories, fittings,
Manholes, castings, manhole appurtenances.
Pressure gauge certification and calibration data.

C. Manufacturer's Installation Instructions: Indicate special procedures required to install products specified.

D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.8 PROJECT RECORD DOCUMENTS

A. Submit documents under provisions of Section 01700 - Contract Closeout.

B. Record location of pipe runs, connections, and invert elevations.

C. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.9 REGULATORY REQUIREMENTS

A. Conform to applicable codes and ordinances for disposal of debris and burning of debris on site.

B. Contractor shall notify utility companies prior to commencement of construction and coordinate work with utilities as required.

1.10 FIELD MEASUREMENTS

A. Verify that field measurements and elevations are as indicated on the Drawings.

1.11 COORDINATION

A. Coordinate sanitary sewer construction with other work.

PART 2 PRODUCTS

2.1 PIPE MATERIALS

A. Gravity sewer mains and service laterals: Shall meet the requirements of ASTM D-1784 cell classification 12454-B for PVC compounds, and ASTM D-3034 for polyvinyl chloride (PVC) sewer pipe. Minimum wall thickness shall conform to Standard Dimension Ratio 26 (SDR 26). The Contractor shall install the maximum pipe lengths manufactured by the supplier.

Joints: Flexible gasketed joints for PVC pipe and fittings shall be compression type joints with the gasket confined in either the spigot or the bell end of the pipe. Rubber gasket rings shall be neoprene or other synthetic material and conform to ASTM D-3212 and ASTM F-477. Natural rubber gaskets will not be acceptable.

Fittings: Shall meet the requirements of ASTM D-1784 cell classification 12454-B for PVC compounds, and ASTM D-3034 for polyvinyl chloride (PVC) sewer fittings. Fitting joints shall be bell and spigot with elastomeric gaskets, unless indicated on the Drawings to be solvent cemented joints, in which case the joint shall conform to ASTM D-2855. Fittings shall not be used unless directed by the Engineer or indicated on the Drawings.

B. Polyvinyl Chloride Plastic Pressure Pipe and Fittings (SCH 80 PVC): PVC pressure piping shall meet the requirements of ASTM D-1784 cell classification 12454-B for PVC compounds, and ASTM D-1785 for Schedule 80 PVC pipe.

1. Fittings shall be solvent welded socket-type, in accordance with ASTM D-2467. Threaded fittings in accordance with ASTM D-2464, shall be used only where indicated on the Drawings or specifically allowed by the Engineer.
2. Primer and solvent cement shall conform to ASTM F656 and ASTM D2564, respectively.
3. Flange adapters shall be socket-type solvent welded, with diameter and drilling conforming to ANSI/ASME B16.5, Class 150. Flange gaskets shall be full face, chemical resistant elastomeric material. Flange bolts shall be ASTM Grade B, galvanized or stainless steel.

C. Polyvinyl Chloride Plastic Pressure Rated Pipe and Fittings (ASTM D-2241): Shall meet the

requirements of ASTM D-1784 cell classification 12454-A or 12454-B for PVC compounds, and ASTM D-2241 for poly vinyl chloride (PVC) plastic pipe (SDR-PR).

1. Minimum wall thickness shall conform to Dimension Ratio 21, for Class 200.
2. The Contractor shall install the maximum pipe lengths manufactured by the supplier.
3. Joints: Joints shall be push-on type with integral bell and spigot and elastomeric gaskets meeting the requirements of ASTM D-2122. An integral wall-thickened bell end or an integral sleeve-reinforced bell end will be acceptable. Rubber gasket rings shall be neoprene or other synthetic material and conform to ASTM F-477. Natural rubber gaskets will not be acceptable.
4. Fittings: Fittings shall be PVC with same DR rating, cell classification, and gasket design as pipe.
5. Fitting Restraint: Shall be concrete thrust blocks as indicated on the Drawings.

D. Steel casing: Steel casings for bored, jacked or open trench construction shall be steel pipe conforming to ASTM A 139 with a minimum diameter as shown on the Drawings.

1. Minimum wall thickness shall be in accordance with the following table:

	Nominal Wall Thickness - Inches	
Casing - Inches	Under Railroads	All Other Uses
8-16	0.312	0.188
18	0.312	0.250
20	0.375	0.250

2. Steel shall be Grade B under railroads and Grade A on all other uses.
3. Steel pipe shall be have welded joints in accordance with AWWA C 206

E. Casing Spacers: Casing spacers shall be used with all casing. Casing spacers shall have a minimum of 4 runners and shall hold the carrier pipe in the center of the casing. Casing spacers shall have lined stainless steel sleeve and UHMW plastic runners, and shall be Cascade Waterworks Mfg. “Model CCS” or Advance Products & Systems, Inc. “Model SSI”, or equal.

F. Casing End Seals: Ends shall be sealed with synthetic rubber, wrap-around end seals with stainless steel bands, Cascade Waterworks Mfg. “Model CCES” or Advance Products & Systems, Inc. “Model AW”, or equal.

G. Restrained Joint PVC (for directional bore): Products delivered under this specification shall be manufactured only from water distribution pipe and couplings conforming to ASTM D2241. The restrained joint pipe system shall also meet all short and long term pressure test requirements of ASTM D2241. Pipe, couplings, and locking splines shall be completely non-metallic to eliminate corrosion problems.

Pipe and couplings shall be made from unplasticized PVC compounds having a minimum cell classification of 12454, as defined in ASTM D1784. The compound shall qualify for a Hydrostatic Design Basis (HDB) of 4000 psi for water at 73.4ºF, in accordance with the requirements of ASTM D2837

Restrained joint PVC pipe products shall have been tested and approved by NSF International. 2” through 16” PVC pipe and coupling systems up to Class 250 shall be listed in NSF14. All products intended for contact with potable water shall be evaluated, tested, and certified for conformance with NSF 61 by an acceptable certifying organization.. Copies of agency approval reports or product listings shall be provided to the Engineer.

Pipe shall be joined using non-metallic couplings to form an integral system for maximum reliability and interchangeability. High-strength, flexible thermoplastic splines shall be inserted

into mating, precision-machined grooves in the pipe and coupling to provide full 360º restraint with evenly distributed loading.
Couplings shall be designed for use at or above the rated pressures of the pipe with which they are utilized, and shall incorporate twin elastomeric sealing gaskets meeting the requirements of ASTM F477. Joints shall be designed to meet the leakage test requirements of ASTM D3139.
Pipe shall be joined utilizing an integral bell system that does not require couplings. A high-strength, flexible thermoplastic spline shall be inserted into mating, precision-machined grooves in the pipe and integral-bell to provide full 360º restraint with evenly distributed loading. Integral bell shall incorporate an elastomeric sealing gasket meeting the requirements of ASTM F477. Joints shall be designed to meet the leakage test requirements of ASTM D3139.

H. HDPE pipe (for directional bore): Minimum HDPE SDR 11 for pipe 2” to 24” and SDR 9 for pipe sizes 1” and ¾” meeting the requirements of AWWA C906, ASTM F714 and ASTM D3035. HDPE pipe shall have a co-extruded green cover or extruded green stripes designating use for sanitary sewer. All fittings shall be molded, Butt heat fusion or electro-fusion fittings.

2.2 PIPE ACCESSORIES

A. Banded Couplings: Banded couplings for gravity sewer piping shall be synthetic rubber repair couplings with stainless steel clamping ring bands, BANDSEAL by Dickey, Fernco coupling or approved equal. Banded couplings shall be provided to transition between different materials and sizes as required.

B. Pipe grouting rings: Pipe grouting rings shall be synthetic rubber, with stainless steel take-up clamps. Ring and clamps shall meet or exceed the requirements of ASTM C-923. Grouting rings shall be matched to the outside diameter of the carrier pipe. Grouting rings shall be Press-Seal Gasket Corporation “WS Series WaterSTOP Grouting Rings” or approved equal.

C. Connection saddles: Connection saddles for connection of sewer laterals and service connections to PVC sewer pipe shall be rigid, banded, saddle type fittings of PVC plastic with a neoprene or synthetic rubber gasket.

D. Flange Adapters: Flange adapters shall be the cast iron slip-on type retained by set screws. Flange body shall be ductile iron, ASTM A-536, Grade 65-45-12. Set screws shall be manufactured form AISI 4140 steel, heat treated to Rockwell C 42-50 and zinc plated. Set screws shall have break away torque heads. Flange adaptors shall conform to ANSI B16.1 for machining and drilling. Gaskets shall be standard mechanical joint gaskets, EPDM or Buna-N. All non-plated ferrous metal parts shall be shop primed with an epoxy primer, for finish painting in the field. Flange adaptors shall be Ford Meter Box Corporation “UNI-Flange Series 200" or equal.

E. Mechanical couplings: Mechanical couplings shall be gasketed, sleeve-type, sized to properly fit the pipes to joined, with steel or ductile iron middle ring, steel or ductile iron follower rings, and synthetic rubber gaskets. Gaskets shall be SBR, Buna-N, or EPDM. All ferrous metal surfaces shall be shop coated with an epoxy coating for corrosion resistance. All hardware shall be 300 series stainless steel. Mechanical couplings shall be Ford Meter Box “Style FC1, Style FC2A, Style FC3, or Style FC23”, Dresser “Style 38 or Style 162", Rockwell “441 or 411”.

2.3 EMBEDMENT

A. Embedment material for Forcemain construction shall be Select Backfill as approved by Engineer.

B. Concrete Encasement: Where indicated on the Drawings, concrete encasement shall be provided instead of the pipe embedment classes specified herein. Requirements for concrete encasement are detailed on the Drawings. Concrete and reinforcement shall be as specified in Section 03300, for 3000 psi concrete.

2.4 BACKFILL MATERIALS

A. Backfill materials shall be as specified in Section 02220 - Earthwork.

2.5 MANHOLE MATERIALS: Manhole materials shall conform to the details on the Drawings, and to the following:

A. Precast manholes: New manholes shall be constructed of precast concrete with developed base (DB) or precast concrete with cast-in-place (CIP) base.

1. Precast concrete manholes with CIP base: The precast concrete manholes shall conform to ASTM C-478. All concrete shall be 4000 psi with Type II cement. Joints between the riser sections shall be a double gasketed joint of joint sealant material. Where possible, pipe openings for pipe connections shall be furnished with cast-in-place flexible entrance seals. Otherwise, pipe connections for pipes grouted in place shall be made using pipe grouting rings. Boxouts for grouting shall have surfaces grooved or roughened to improve grout bond.
2. Precast concrete manholes with developed base: The precast concrete manhole shall conform to ASTM C-478. All concrete shall be 4000 psi with Type II cement. The developed base shall be poured monolithic with the bottom riser section. The base reinforcement shall be continuous with the reinforcement of the bottom riser section. Joints between the riser sections shall be a double gasketed joint of joint sealant material. Pipe openings shall be furnished with cast-in-place flexible entrance seals.

B. Adjusting rings: Adjusting rings shall be precast concrete, with circumferential reinforcement per ASTM C-478.

C. Lifting notches: Precast sections may be provided with lifting notches on the inside faces of walls to facilitate handling, Lifting notches shall be not more than 3 inches deep. Holes extending through a wall will not be acceptable.

D. Flexible entrance seals: Cast-in-place flexible entrance seals shall be “A-LOK” flexible seals manufactured by A LOK Products Incorporated, “Press Wedge II” manufactured by Press-Seal Gasket Corporation or equal.

E. Castings: Manhole rings and lids shall be constructed of gray cast iron conforming to ASTM A-48. Castings for standard manholes shall be Clay and Bailey Model No. 2007 or approved equal with "Sewer" cast on the lid. Castings for shallow manholes shall be Clay and Bailey Model No. 2002 or approved equal with “Sewer” cast on lid.

F. Protective coating: The protective coating for the exterior of manholes shall be Koppers Company, Inc. Bitumastic No. 50, Tnemec Company, Inc. asphalt base foundation coat or equal. Precast manholes shall be shop coated. Manholes used for pump station wetwells shall be coated on the inside and outside.

G. Joint sealant: Joint sealant material used for sealing the joint between the manhole frame and chimney or corbel/cone section, shall be preformed butyl rubber mastic joint sealant, BIDCO C-56 or Press Seal Gasket Corporation (EZ-STIK) or equal.

H. Crushed stone: Crushed stone material used as a foundation and for leveling of manholes shall be as specified for granular pipe embedment material.

I. Concrete brick: Concrete brick shall conform to the requirements for ASTM C-55, Grade N-I, moisture controlled for linear shrinkage of 0.03 percent or less.

J. Repair Mortar: Repair mortar for grouting pipes, brick work, and making structural repairs to manholes shall be a one-component, shrinkage-compensated, cement based product. Repair mortar shall have a low permeability and be freeze/thaw durable and resistant to chlorides and sulfates. Repair mortar shall be a single-component product requiring only the addition of potable water for mixing. Repair mortar shall have a minimum compressive strength of 3,800 psi at 1 day and 11,000 psi at 28 days.

1. For hand application: Master Builders “Emaco S88-CI” or approved equal.
2. Pourable or pumpable: Master Builders “Emaco S77-CR” or approved equal.

K. Manhole Steps: Shall be Grade 60 1/2" diameter steel reinforcing rod which is fully encapsulated in black polypropylene, with serrated tread surfaces and tall end lugs to prevent slippage, and conforming to ASTM C-478 Manhole steps shall be driven into the manhole wall and anchored using a press fit. Steps shall be approximately 15 inches wide with a stand-off of 6 inches. Manhole steps shall be M.A. Industries “PS2-PF Manhole Step”, or equal.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that the sewer pipeline lines and grades are as shown on the Drawings.

3.2 PREPARATION

A. The Contractor shall verify the location and depth of all utilities a minimum of 24 hours prior to construction. The Contractor may utilize the toll free number for the "Missouri One Call System, Inc" 1-800-DIG-RITE. This number is applicable anywhere within the state of Missouri. Prior to commencement of work the Contractor shall notify all those companies which have facilities in the vicinity of the construction.

3.3 PROTECTION

A. Locate, identify, and protect utilities that remain, from damage. The Contractor shall make every reasonable effort to protect all existing utilities from damage. If any utility is damaged through the carelessness or neglectful actions of the Contractor, the utility shall be repaired by its owner at the Contractor's expense.

B. Relocation of an existing utility which is within the public right-of-way shall be performed by the respective utility owner at no cost to the Contractor. Relocation and protection of an existing utility which is within a utility easement shall be the responsibility of the Contractor.

C. Any private facilities damaged or disturbed by the Contractor's work shall be repaired by the Contractor prior to close of the working day. Repairs shall be made in a manner sufficient to restore utility service to that property.

D. Protect trees, plant growth, and features designated to remain as final landscaping.

E. Protect all property or lot corner pins, right of way markers and stakes from damage or displacement during construction. Any property or lot corner pins, right of way monuments, and/or public land corner monuments that must be temporarily removed shall be properly referenced by a Missouri registered professional land surveyor prior to removal, and reset by the professional land surveyor upon completion of the project. The Contractor is responsible for surveying costs for these services.

F. Protect from damage or displacement all project benchmarks and existing structures within or adjacent to the construction limits that are not to be removed or demolished.

3.4 SEPARATION OF WATER AND SEWER UTILITIES

A. GRAVITY SANITARY SEWERS - When potable water pipes and gravity sanitary sewers are laid parallel to each other, the horizontal distance between them shall be not less than 10 ft (3.0 m). The distance shall be measured from edge to edge. The laying of water pipes and sanitary sewers shall be in separate trenches with undisturbed earth between them. In cases where it is not practical to maintain a 10 ft. (3.0 m) separation, the Engineer will consult with MDNR to consider equivalent protection by other methods.

1. When a water pipe and a sanitary sewer cross and the sewer is 2 ft (0.6 m) or more (clear space) below the water pipe, no special requirements or limitations are provided herein. At all other crossings, the Engineer will consult with MDNR to consider equivalent protection by other methods.

B. SEWER CONNECTIONS - There are to be no physical connections between any parts of the potable water system with building sewers, sanitary sewers, or wastewater treatment facilities by means of which it would be possible for sewage, even under exceptional circumstances, to reach the wells, storage reservoirs, or distribution systems.

C. SEWER MANHOLES - No water pipe shall pass through or come in contact with any part of a sewer manhole.

D. STORM SEWERS - The separation distance between a storm sewer (which is not a combined storm/sanitary sewer) and a water main, if encountered, shall be determined by the Engineer based on geotechnical considerations. Required separation distances between water mains and combined storm/sanitary sewers are equivalent to those for water mains and gravity sanitary sewers.

E. DRAINS - Underground drains from fire hydrants or valve pits should not be directly connected to sanitary or storm drains.

3.5 EMBEDMENT

A. Trenching and backfill for pipe trenches shall be according to Section 02220 - Earthwork, and the details on the Drawings.

B. Embedment for PVC pipe shall extend 4 inches below the pipe to 6 inches above the top of pipe, and shall be the full width of the trench. Embedment over rock shall be include an additional 2 inches below the pipe.

C. Place embedment material at the trench bottom with proper allowance for bell joints. Level materials in continuous layers not exceeding 4 inches in compacted depth. Shovel slicing of embedment shall be performed along the sides of the pipe as embedment is placed, to consolidate the bedding and haunching below the pipe.

D. Where granular embedment is required, consolidate granular embedment by rodding, spading and compacting as necessary to provide uniform pipe support.

E. Where granular embedment is required, each lift of granular embedment material shall be compacted to a minimum 90% of maximum density as determined by ASTM D-698.

F. Where shown on the Drawings, concrete encasement shall be provided instead of pipe embedment.

3.6 PIPE INSTALLATION

A. All pipe shall be protected during transport, storage and installation from shock and free fall. Pipes shall be installed without cracking, chipping, breaking, bending or damaging the materials. Damaged pipe shall be replaced with new materials except when repairs are permitted by the Engineer. Use slings, lifting lugs, hooks and other protection devices during handling. A double sling shall be required when handling plastic pipe 10 feet or longer.

B. Install pipe of the size, material, strength class, and joint type as specified or indicated on the Drawings.

C. Install gravity pipelines beginning with the lowest point of the pipeline and install pipe with the spigot or tongue end down stream. Install pressure pipelines with the bell ends facing the direction of laying, except when reverse laying is specifically authorized by the Engineer.

D. Install pipe to the line and grades indicated on the Drawings. Maximum slope variation from true slope shall be one inch between structures for gravity sewers. The maximum variation from alignment between structures shall be three inches. Joint deflection shall not exceed the maximum allowable deflection per joint according to ASTM C-425, D-2321 & ANSI/AWWA C600 as applicable. Only one correction for alignment and/or grade shall be made between structures. The Contractor shall establish such grade control devices necessary to maintain the specified tolerance. All pipe shall have a continuous slope free of depressions.

E. Pipe installation shall be in accordance with applicable standards, such as ASTM C-12, D-2321 and ANSI/AWWA C600, except where conflicts with this section occur, in which case this section shall govern.

F. Clean the interior of all pipe fittings and joints prior to installation. Protect pipe against the entrance of debris and foreign matter during discontinuance of installation and at the close of the working day by installing a close fitting plug at the open end. Plugs shall be water tight against heads up to 20 feet of water.

G. The Contractor shall take whatever means necessary to keep the trenches free of water and as dry as possible during pipe installation, bedding and jointing operations.

H. After each pipe has been brought to grade, aligned and placed in final position, place sufficient embedment material under the haunches and on each side of the pipe to hold the pipe in proper position during subsequent pipe jointing, bedding and backfilling operations. Compact embedment material to 90 percent maximum density by rodding, spading, or using suitable compaction equipment. Place embedment material uniformly and simultaneously on each side of the pipe to prevent lateral displacement.

I. Pipe Jointing: Locate joints to provide for differential movement at changes in type of embedment, concrete collars and encasement and structures. Sewer main jointing shall be according to the following specifications:
   1. Clean and lubricate all joint and gasket surfaces as recommended by the manufacturer.
   2. Examine all materials prior to installation for soundness and compliance with specifications.
   3. Check joint position and condition after assembly prior to installing additional pipe sections.
   4. Check joint opening and deflection for specification limits.

J. Pipe cutting shall be performed in a neat and workmanlike manner without damage to the pipe. Main taps for service saddle tees shall be made with a tapping tool specifically designed for that purpose. Cut edges shall be smoothed by power grinding to remove burrs and shape edges.

K. Pipe connection to structures:

1. Pipe connection to new structures shall be as shown on the Drawings. Where not shown on the Drawings, pipes shall be connected to new structures using flexible entrance seals.
2. Pipe connection to existing structures shall be made with two inches clearance surrounding the pipe or fitting. PVC pipe shall be fitted with a grouting ring. The opening between the pipe and structure shall be filled with patching material to form a water tight seal.
3. Pipe connections to existing manholes shall be made in such manner that the finish work will conform to the essential applicable requirements specified for new manholes, including all necessary concrete work, cutting and shaping. When new sewer piping is connected to an existing manhole, manhole benches and invert shall be repaired using patching material, as specified herein.

3.7 REQUIREMENTS FOR PIPE JOINTS:

Pipe joints shall be carefully and neatly made, in accordance with the requirements which follow.

A. Threaded: Pipe threads shall conform to ANSI/ASME B1.20.1, NPT, and shall be full and cleanly cut with sharp dies. Not more than three threads at each pipe connection shall remain exposed after installation. Ends of pipe shall be reamed, after threading and before assembly, to remove all burrs.

1. Threaded joints, in plastic piping, shall be made up with Teflon thread tape applied to all male threads. Threaded joints, in stainless steel piping, shall be made up with Teflon thread tape applied to all male threads. At the option of the Contractor, threaded joints in other piping may be made up with Teflon thread tape, thread sealer or a suitable joint compound.

B. Flared: Ends of annealed copper tubing shall be cut square, and all burrs shall be removed prior to flaring. Ends shall be uniformly flared without scratches or grooves. Fittings shall be tightened as required, to produce leak-tight connections.

C. Solvent Welded: All joint preparation, cutting and jointing operations shall comply with the pipe manufacturer's recommendations and ASTM D-2855. Pipe ends shall be beveled or chamfered to the dimensions recommended by the manufacturer. Pressure testing, of solvent welded piping systems, shall not be performed until the applicable curing time, set forth in Table X2.1 of ASTM D-2855, has elapsed.

D. Flanged: Flange bolts shall be tightened sufficiently to slightly compress the gasket and effect a seal, but not so tight as to fracture or distort the flanges. A plain washer shall be installed under the head and nut of bolts connecting plastic pipe flanges. Anti-seize thread lubricant shall be applied to the threaded portion of all stainless steel bolts during assembly. Connecting flanges shall have similar facings, i.e., flat or raised face.

E. Welded: Welding shall conform to the specifications and recommendations contained in the "Code for Pressure Piping", ANSI B31.1. The following requirements shall also apply for stainless steel piping:

1. High purity inert welding gases and cover gases shall be used. Weld surfaces shall be sliver, light gold or straw color at worst, after welding. Black welds are not acceptable.
2. Prior to welding, all surfaces shall be clean and free of all organic materials, moisture and dirt.
3. Welds shall be dressed using aluminum oxide grinding wheels. Silicon carbide is not acceptable.

F. Push-on: Gasket installation and other jointing operations shall be in accordance with the

recommendations on the manufacturer. Each spigot end shall be suitable beveled to facilitate assembly. All joint surfaces shall be lubricated with a heavy vegetable soap solution immediately before the joint is completed. Lubricant shall be suitable for use in potable water, shall be stored in closed containers, and shall be kept clean.

3.8 PIPE ACCESSORIES

A. Mechanical couplings: Mechanical couplings shall be carefully installed in accordance with the manufacturer's recommendations. Pipe ends shall be separated by a space of at least 1/4 inch but not more than 1 inch. Pipe and coupling surfaces which contact gaskets shall be clean and free from dirt during assembly. Following installation of the coupling, damaged areas of shop coatings on the pipe and couplings shall be repaired.

B. Wall Pipes: Where wall pipes with flanged or mechanical joint ends are installed, the bolt holes in the bell of the wall pipe shall straddle the top centerline of the casting. The top centerline shall be marked on the wall pipe at the foundry.

3.9 STEEL-CASINGS FOR BORED OR JACKED CROSSINGS

A. Installation of steel casing shall be performed by a person experienced in such work. Casing shall be installed by a combination of augering and jacking. Alignment and gradient shall be such that the carrier conduit can be installed to the line and grade shown on the Drawings.

B. Welding shall be performed by a person experienced with the type of welding necessary. All welds shall conform to AWWA C 206.

C. After completion of the installation of the casing, the carrier conduit shall be carefully pushed or pulled through the casing in a manner that will maintain proper jointing of the pipe joints and provide the required gradient and alignment. Casing spacers shall be provided.

D. Casing Spacers: Casing spacers shall be installed per approved manufacturer's printed recommendations, or at 10 foot spacing, whichever provides greater support. Casing spacers are required at each end of casing. Spacers shall have runners attached to the shell and be designed to provide a minimum of 0.75 inches clearance between the carrier pipe's greatest outside diameter and the casing pipe's inside diameter.

C. Air Testing: Casing pipes shall be air pressure tested APWA Standard Specifications Section 2509.4.2.c, prior to the placing of the end seals.

3.10 JOINT RESTRAINT FOR PRESSURE PIPING:

Joint restraint shall be provided for portions of buried piping which will serve in a pressure flow application, including: force mains, water lines, and pump discharge lines.

A. Joint restraint for SDR-PR piping shall be accomplished using concrete thrust blocks as indicated on the drawings. Thrust blocks shall be poured against undisturbed earth. Where possible, joints and pipe should be deflected to eliminate the need for fittings.

3.11 MANHOLES: Manholes shall be constructed of precast concrete sections, with cast iron frames and covers in accordance with the Drawings and as specified herein.

A. Handling: Precast concrete sections shall be handled carefully and shall be protected during transport, storage and installation from shock and free fall. Hooks shall not be permitted to come into contact with joint surfaces. Damaged sections shall be replaced with new sections, except

when repairs are permitted by the Engineer.

B. Inspection: Precast concrete sections shall be inspected when delivered and all cracked or otherwise visibly defective units rejected.

C. Manhole construction

1. Precast concrete manholes with CIP base: Construct manhole with precast concrete section on a cast-in-place concrete foundation slab as shown on the drawings. Pipe connection to the manholes shall be made with cast-in-place flexible entrance seals as specified herein or by placing a tight fitting rubber gasket around the outside of the pipe where the pipe enters the manhole and then filling the void between the gasketed pipe and the manhole wall with patching material. Joint seals between each riser section shall be installed in strict conformance with manufacturer's recommendations. Damaged exterior coating shall be field touched up prior to backfilling.
2. Precast concrete manholes with a developed base: Precast manholes with a developed base shall be placed on a base of crushed stone as detailed on the drawings. Crushed stone shall be granular embedment material as specified herein. The crushed stone base shall be graded smooth, level and to the correct grade. The bottom riser section shall be placed upon the crushed rock base and checked for alignment, elevation and plumbness. If not correct, the bottom riser section shall be completely removed from the excavation and the crushed stone base reshaped. Pipe connections to the manholes shall be in strict conformance with manufacturer's instructions for installation of the flexible entrance seals. Joint seals between each riser section shall be installed in strict conformance to manufacturer's recommendations. Damage to exterior coating shall be touched up in the field prior to backfilling.

D. Inverts: The invert channels shall be smooth and semicircular in shape conforming to the inside of the adjacent sewer section.

1. Changes in direction of flow shall be made with a smooth curve of as large a radius as the size of the manhole will permit. Changes in size and grade of the channels shall be made gradually and evenly.
2. The floor of the manhole outside the channels (the bench) shall be smooth and shall slope toward the channels not less than 1 inch per foot nor more than 2 inches per foot.
3. Invert channels shall be formed in the field using either concrete mix as specified in Section 03300 - Miscellaneous Concrete, or concrete brick and mortar as specified herein. Where concrete brick and repair mortar used, repair mortar shall be placed completely around each brick to a minimum thickness of 3/8 inch. Manhole inverts formed directly in the concrete of the manhole base of developed-base manholes will not be acceptable.

E. Flexible entrance seals: Where cast-in-place flexible entrance seals are used to seal pipe connections to new manholes, the concrete or mortar of the field-installed invert shall extend exactly half-way up the pipe, to the springline. No concrete or mortar shall be placed around the pipe on the exterior of the manhole.

F. Frames and covers: Unless shown otherwise on the drawings, all castings shall be set flush with finish grade.

3.12 GRAVITY SEWER ACCEPTANCE TESTING

A. All new sewer segments which extend from manhole to manhole will be subject to acceptance testing under this subpart. Partial sewer main segment replacements and point repairs will not be tested under this subpart.

B. Visual Inspection:

1. Clean pipe of excess mortar, joint sealant, dirt and debris prior to inspection.
2. Inspect the sewer by lamping the pipeline between manholes to determine the location of any misaligned, displaced or broken pipe and any visible infiltration or defects. In large pipes where space permits, the visual inspection may be made by physical passage.
3. Correct defects as required prior to conducting leakage tests.

C. Air Leakage Test:

1. Contractor shall perform air leakage tests for all pipe sizes.
2. Notification: Contractor shall notify Engineer at least 48 hours in advance the scheduled time for testing. Resident Project Representative shall be present for acceptance testing and approval.
3. Contractor shall provide all necessary equipment for performance of the air leakage test, including but not limited to piping connections, pipe plugs with taps, test pumping equipment, pressure gauges, bulkheads and regulators to avoid over pressurization. The equipment and gauges shall meet the minimum specifications set forth in ASTM F-1417: "Standard Test Method for Installation Acceptance of Plastic Sewer Lines Using Low-Pressure Air". The air equipment shall consist of necessary valves and pressure gauges to control ans oil-free air source and the rate at which air flows into the test section to enable monitoring of the air pressure within the test section.
4. Gauge certification from the manufacturer and calibration data shall be required for all pressure test gauges, a copy of which will be made available to the Engineer at the time the air tests are performed.
5. Test each reach of pipe between manholes after completion of pipe and appurtenance installation and trench backfill.
6. Plug ends of sewer line at manholes and cap or plug all lateral connections to withstand internal pressure. One plug shall have two taps for connecting equipment. After connecting air control equipment to the air hose, begin increasing the air supply within the pipe section, monitoring the air pressure so that the internal pressure does not exceed 6.0 psig.
7. After the internal pressure reaches 4.0 psig, throttle the air supply to maintain between 4.0 and 3.5 psig for at least two minutes in order to reach equilibrium between air temperature and pipe walls. During this time, check all plugs for leaks. If leaks are found, bleed off air, tighten plugs and begin increasing the air supply again.
8. Air testing shall take place by the Time-Pressure Drop Method. Decrease the pressure to 3.5 psig and begin timing to determine the time required to achieve a pressure drop from 3.5 to 2.5 psig. If the time, in seconds, to achieve the 1.0 psig pressure drop is greater than that shown in the following table, the line is presumed free of defects. For pipe sizes and lengths other than those shown in the table below, refer to ASTM F 1417.

Required Time for Length up to Length Indicated, min:sec							
Pipe	up to 100 ft.	200 ft.	250 ft.	300 ft.	350 ft.	400 ft.	450 ft.
6" &	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10"	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12"	11:20	11:24	14:15	17:05	19:56	22:47	25:38

If the air test fails to meet the requirements, repair the defects and retest the line. All constructed sewer lines shall pass the low pressure air test prior to acceptance.
In areas where ground water is known to exist, a ½ inch diameter , 10 inch long, capped pipe nipple shall be installed at the top of the pipe through the manhole wall during installation. Immediately prior to performing the acceptance test, the ground water level shall be determined by connecting a clear plastic tube into the nipple and holding vertically until the water level stops rising. The height in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to the test readings.

D. Deflection Test for Flexible Sewer Pipe:

1. Prior to final acceptance, the Contractor shall perform a diametrical deflection test on all flexible and semi-flexible pipe (such as PVC and HDPE plastic pipe), for both open cut and trenchless construction. Tests shall be conducted between manholes or structures. Deflection testing of a segment of sewer shall occur at least thirty (30) days after the pipe has been installed and completely backfilled.
2. A mandrel with a diameter equal to 95 percent of the inside diameter of the pipe to be tested shall be used. The mandrel shall be cylindrical in shape and constructed with nine evenly spaced arms or prongs. Mandrels with fewer arms will be rejected as not sufficiently accurate. The mandrel shall be approved by the Engineer prior to testing pipe of each given size. The Contractor shall furnish proving rings for verifying the mandrel diameter. Contact length between points of contact on the mandrel arm shall be as follows:

Nominal Pipe Diameter, inches	Mandrel length, inches
6 and 8	8
10	10
12	10
15	12
18	15

3. The maximum allowable deflection shall be five (5) percent of the inside pipe diameter. Allowances for pipe wall thickness tolerances or ovality (from heat, shipping, poor production, etc.) shall not be deducted from the maximum allowable dimension of the mandrel, but shall be counted as part of the five (5) percent or lesser deflection allowance.
4. The mandrel shall be hand-pulled by the Contractor through all flexible sewer lines. Any section of sewer failing the diametrical deflection test shall be repaired or replaced by the Contractor at no cost to the Owner, and retested.

3.13 PRESSURE PIPING ACCEPTANCE TESTING

A. All new sewer force mains and pressure process piping will be subject to hydrostatic pressure testing under this subpart. Force mains and pressure sewers shall be tested from the point of discharge to the isolation valves in the corresponding lift station(s). New segments of pipelines which will be connected to existing lines shall be pressure tested prior to connection.

B. Notification: Contractor shall notify Engineer at least 48 hours in advance of the scheduled time for testing. Resident Project Representative shall be present for acceptance testing and approval.

C. Test Conditions:
1. Test procedure shall be according to AWWA C 600 Section 4.1
2. Test pressure shall be 100 psi (gauge). This pressure will not exceed the thrust-restraint design pressure.
3. The hydrostatic test shall be of at least a 2-hour duration. Test pressure shall not vary by more than +5 psi for the duration of the test.

D. Test materials: Contractor shall supply all of the necessary plugs, hose, riser pipe, pumps, gauges, and other equipment as required for the testing. The Contractor shall obtain permission from the Owner for use of City water supply from an existing fire hydrant.

E. Pressurization: After the pipe has been laid and backfilled, the section of pipe shall be isolated. The pipe shall be slowly filled with water. Before applying the specified test pressure, air shall be expelled completely from the section of piping under test. If permanent air vents are not located at all high points, corporation cocks shall be installed at such points so that the air can be expelled as the line if filled with water. After all the air has been expelled, the corporation cocks shall be closed and the test pressure applied. At the conclusion of the pressure test, the corporation cocks shall be removed and plugged or left in place as directed by the Engineer. The specified test pressure (based on the elevation of the lowest point of the line or section under test and corrected to the elevation of the test gauge) shall be applied by means of a pump connected to the pipe. Valves shall not be operated in either the opening or closing direction at differential pressures above the rated pressure. The system will be allowed to stabilize at the test pressure before the leakage test is conducted.

F. Examination: All exposed pipe, fittings, valves, and joints shall be examined carefully during the test. Any damage or defective pipe, fittings, valves, hydrants, or joints that are discovered following the pressure test shall be repaired or replaced with sound material, and the test shall be repeated until satisfactory results are obtained.

G. Leakage: Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of the specified test pressure after the pipe has been filled with water and the air has been expelled. Leakage shall not be measured by a drop in pressure in a test section over a period of time. Allowable leakage shall be as follows, per AWWA C 600.

Pipe Size (inches)	Allowable Loss (@ 100 psig) (gallons per hour per 1000 feet)
3	.23
4	.30
6	.45
8	.60
10	.75
12	.90
14	1.05

16	1.20
18	1.35

H. Acceptance of Installation: Acceptance shall be determined on the basis of allowable leakage. If any test of pipe discloses leakage greater than that specified above, repairs or replacements shall be accomplished in accordance with the specifications. All visible leaks shall be repaired regardless of the amount of leakage.

3.14 MANHOLE TESTING

A. Manhole leakage test: All new manholes shall pass a vacuum leakage test.

B. Notification: Contractor shall notify Engineer at least 48 hours in advance the scheduled time for testing. Resident Project Representative shall be present for acceptance testing and approval.

C. Pre-Test Inspection: All precast concrete manholes shall be visually inspected to determine the presence of misaligned, displaced, broken manhole sections or other physical defects. All defects shall be satisfactorily corrected prior to conducting vacuum leakage tests.

D. Each manhole shall be tested immediately after assembly and prior to backfilling. All lifting holes shall be plugged with patching material. No standing water shall be allowed in the excavation during testing.

E. Vacuum testing procedure: All pipes entering the manhole shall be plugged, taking care to securely brace the plugs from being drawn into the manhole. The test head shall be placed at the inside of the top of the cone section and the seal inflated in accordance with the manufacturer's recommendation. A vacuum of 10 inches of mercury shall be drawn and the vacuum pump shut off. With the valves closed, the time shall be measured for the vacuum to drop to nine inches. The manhole shall pass if the time is greater than 60 seconds for a 48-inch diameter manhole, 75 seconds for 60 inches, and 90 seconds for 72 inches. If the manhole fails the initial test, necessary repairs shall be made with patching material, as specified herein, while the vacuum is still being drawn. Retesting shall proceed until a satisfactory test is obtained. If the joint mastic or gasket is displaced during the vacuum testing, the manhole shall be disassembled, the seal replaced and the manhole retested.

3.15 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01400 - Quality Control.

B. Compaction and soil testing will be performed in accordance with Section 02220 - Earthwork.

END OF SECTION

SECTION 02831

CHAIN LINK FENCING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fence framework, fabric and accessories.

B. Excavation for post bases; concrete foundation for posts and center drop for gates.

C. Manual gates and related hardware.

1.2 RELATED SECTIONS

A. Section 02220 - Earthwork and Trenching

1.3 REFERENCES

The following publications form a part of these specifications to the extent indicated by references thereto. The revision in effect at the time of the Bid Opening shall be applicable. If these publications conflict with the requirements of this section, the section requirements shall govern.

American Society for Testing Materials (ASTM):

1. A-120 - Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses.
2. A-121 - Zinc-Coated (Galvanized) Steel Barbed Wire.
3. A-392 - Zinc-Coated Steel Chain-Link Fence Fabric.
4. A-491 - Aluminum-Coated Steel Chain-Link Fence Fabric.
5. A-500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
6. A-569 - Steel, Carbon, Hot-Rolled Sheet and Strip Commercial Quality.
7. A-501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
8. A-585 - Aluminum-Coated Steel Barbed Wire.

1.4 SYSTEM DESCRIPTION

A. Fencing: Fencing shall conform to the requirements indicated on the Drawings and as specified herein.

1. Fencing shall generally consist of galvanized or aluminum-coated steel fabric, with a top rail, bottom tension wire and three strands of barbed wire mounted on 45-degree extension arms.

B. Fabric Height: 6 feet nominal.

C. Barbed Wire: The upper strand of barbed wire shall be approximately 12 inches out from the fence and 12 inches above the top of the fabric.

D. Line Posts: Posts shall be set in concrete. Unless otherwise indicated on the Drawings, posts shall be spaced approximately 10 feet apart.

1.5 SUBMITTALS

A. Product Data for Review: Complete detail drawings and specifications, for the fence and accessories, shall be submitted in accordance with Section 01300 - Submittals.

B. Manufacturer's Installation Instructions: Indicate installation requirements.

1.6 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Section 01700 - Contract Closeout.

B. Accurately record actual locations of property perimeter posts relative to property lines and easements.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with manufacturer's instructions.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years documented experience.

1.9 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

PART 2 PRODUCTS

2.1 MATERIALS: Fence components shall be as follows:

A. Framing (Steel): ASTM A-569; hot-rolled steel strip, cold-formed to pipe configuration, longitudinally welded construction, minimum yield strength of 50 ksi (345 MPA).

B. Fabric Wire (Steel): 9-gauge, 2-inch mesh; galvanized ASTM A-392 Class 2, or aluminum-coated ASTM A-491; knuckled selvage on top, barbed selvage on bottom.

C. Barbed Wire: Galvanized, ASTM A-121, Class 2 or aluminum-coated ASTM A-585, Type I; two 12½-gauge steel wires, with 4-point barbs.

D. Posts: Steel pipe, ASTM A-120, standard weight (Schedule 40).

2.2 COMPONENTS

A. Line Posts: 2d-inch OD pipe, 3.65 lb. per ft.; or 2-inch square, 3.85 lb. per ft.

B. Corner and Terminal Posts: 2f-inch OD pipe, 5.79 lb. per ft.

C. Gate Posts and Guide Posts: Furnish posts for supporting single-gate leaf, or one leaf of a double-gate installation, for nominal gate widths as follows:

Leaf Width	Gate Post	lbs/lin. ft.
Up to 6'	2.875" od pipe	5.79
Over 6' to 13'	4.000" od pipe	9.11
Over 13' to 18'	6.625" od pipe	18.97
Over 18'	8.625" od pipe	28.55

D. Top Rail: 1e-inch OD steel tubing, 1.40 lb. per ft.

E. Bracing: Pipe brace same as top rail, with d-inch diameter steel rod truss and tightener.

F. Tension Wire: Galvanized or aluminum-coated coil spring wire, 7 gauge.

G. Fabric Ties: Aluminum bands or wires.

H. Barbed-wire Supporting Arms:
1. One for each post.
2. Single arm at 45E with vertical, sloping to outside of fence.
3. Constructed for attaching three rows of barbed wire to each arm and designed as a weather-tight closure cap where tubular posts are used.
4. Designed for 300-pound minimum pull-down load.
5. Attached to steel posts or integral with post top.
6. Malleable iron or pressed steel.

2.3 ACCESSORIES

A. Post Tops: Pressed steel, malleable iron with pressed steel extension arm, or one-piece aluminum casting; with hole for top rail, designed to fit over the outside of the posts and to prevent entry of moisture into tubular posts.

B. Rail Couplings: Sleeve type, 6 inches long.

C. Stretcher Bars: Steel, 3/16-inch by ¾-inch or equivalent area.

2.4 GATES

A. Manual-swing:
1. Framing:
a. Fabricate perimeter frames of gates from metal and finish to match fence framework.
b. Provide intermediate horizontal and vertical members for proper gate operation and for attachment of fabric, hardware, and accessories. Space so that frame members are not more than 8 feet apart, unless otherwise indicated.
c. Frames assembled by welding or watertight galvanized steel rigid fittings.
d. Provide with same fabric as for fence. Install fabric with stretcher bars at vertical and top and bottom edges.
e. Diagonal cross-bracing of 3/8-inch diameter adjustable truss rods to ensure frame rigidity without sag or twist.
f. Where barbed wire is indicated or specified, extend gate-end members 1 foot above top members to receive barbed wire.

2. Hardware:
   a. Hinges of pressed or forged steel, or malleable iron, nonlift-off type, offset to permit 180 degree gate opening, 1 ½ pair per leaf.
   b. Latches and Gate Stops: Double-leaf.
      i. Plunger-bar type latch, full gate height, designed to engage gate stop flush-plate type, with anchors.
      ii. Locking device and padlock eyes an integral part of latch.
      iii. Keeper to automatically engage gate leaf and secure free end of gate in open position.
      iv. Provide heavy duty padlock for securing gate. Provide 3 keys to Owner. Lock shall have a plastic keyhole cover for weather protection.

2.5 FINISHES

A. Steel Fencing and Gates: All steel or malleable iron parts and accessories shall be hot-dip galvanized or aluminum-coated after fabrication.

B. Surfaces: All surfaces of aluminum which will be in contact with concrete, mortar or dissimilar metals, shall be given a heavy coat of coal tar paint.

PART 3 EXECUTION

3.1 INSTALLATION

A. The installed fence shall conform to the alignment and finish grade indicated.

B. Installed fence shall connect to existing fencing where indicated on the Drawings. Connections shall be neat and taut.
   1. Bracing shall be installed at intersections with existing fence for additional stability.

C. All posts shall be plumb. Unless otherwise indicated on the Drawings, posts shall be spaced approximately 10 feet apart.
   1. Where posts are set in earth, concrete foundations 42 inches deep shall be provided. If bedrock is encountered, post excavation shall be continued to the 42-inch depth or 18 inches into the rock, whichever is less.
   2. Concrete foundations shall be circular in horizontal section, not less than 10 inches in diameter for line posts, and with a diameter not less than the post OD plus 9 inches for terminal posts, except that foundations in bedrock shall be a minimum of 6 inches larger than the outside dimension of the post.
      a. Foundations shall extend above the ground surface, and shall be crowned approximately one inch.
      b. Concrete for foundations shall conform to Division 3.
      c. Each foundation shall be cured for at least 72 hours before further work is done on the post.

D. Where necessary, the fence grade shall be adjusted to fit the ground contour by slipping the fence fabric links. Ground surface irregularities shall be graded, as required, to maintain not more than 2-inch clearance below the bottom of the fence fabric.
   1. Aggregate surfacing shall be placed prior to installing fabric, where applicable.

E. Top rails and bottom tension wires shall be installed before the fabric.
   1. Top rails shall be furnished in at least 18-foot lengths, and shall be securely connected to terminal posts.
   2. Tension wires shall be installed approximately 6 inches above grade, and shall be

attached to each post and securely anchored at terminal posts. Straight runs between braced posts, shall not exceed 1,500 feet.

F. A terminal post shall be provided at each change in slope.

G. Fabric shall be attached to the top rail and bottom tension wire at 24-inch centers, and to the line posts at 15-inch centers.

H. Barbed wire shall be fastened to each extension arm by internal clips or external fabric ties.

I. Stretcher bars shall be provided at each terminal post, corner post, and gate post.
   1. Each stretcher bar shall be threaded through the fabric and anchored to the post at 15-inch centers by positive mechanical means.

J. Each terminal post shall be braced by a horizontal pipe brace and an adjustable truss extending to an adjacent line post.

K. Corner posts shall be braced in both directions.

L. Fabric shall be stretched taut and anchored, so that a pull of 150 pounds at the middle of a panel, will not lift the bottom of the fabric more than 6 inches.

M. Manual-swing Gates:
   1. Install plumb and level.
   2. Install all hardware, tracks, framing, supports, and appurtenances as required for gate type.
   3. Adjust and lubricate as necessary, for smooth operation.
   4. Install drop bar, with galvanized steel receiver pipe, minimum 12" long, set into concrete footing. Concrete footing for drop bar receiver shall be 12" diameter, 36" deep, with top crowned to shed water.

N. Repairing Damaged Coatings:
   1. Repair any damaged coatings in the shop or field by recoating with compatible and similar coating.
   2. Apply per manufacturer’s recommendations.

END OF SECTION

SECTION 03300

MISCELLANEOUS CONCRETE

PART 1 GENERAL

1.1 GENERAL

A. The Contractor shall provide all concrete work as required to complete the concrete construction as specified herein and as shown on the Drawings.

1.2 RELATED SECTIONS

A. Section 01300 - Submittals

B. Section 02732 - Sanitary Sewer System

1.3 REFERENCES

The following publications form a part of these specifications to the extent indicated by references thereto. Only the most recent revisions of these publications shall be used.

A. ASTM A - 615 Deformed And Plain Billet Steel Bars For Concrete Reinforcement

B. ASTM C - 31 Test Methods of Making and Curing Concrete Test Specimens in the Field

C. ASTM C - 33 Concrete Aggregates

D. ASTM C - 39 Test Method for Compressive Strength of Cylindrical Concrete Specimens

E. ASTM C - 94 Ready-Mixed Concrete

F. ASTM C - 143 Slump Of Portland Cement Concrete

G. ASTM C - 150 Portland Cement

H. ASTM C - 185 Test Method for Air Content of Hydraulic Cement Mortar

I. ACI 304 Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete

J. ACI 305 Committee Report on Hot-Weather Concreting

K. ACI 306 Committee Report on Cold-Weather Concreting

L. ACI 309 Recommended Practice for Consolidation of Concrete

M. ACI 318 Building Code Requirements For Reinforced Concrete

N. ACI 347 Recommended Practice for Concrete Formwork

1.4 SUBMITTALS

A. Contractor shall submit product data for review on the following items required by this Division:
   1. Laboratory name.
   2. Aggregate testing and gradation.
   3. Design mix.

B. Product data shall be submitted in accordance with Section 1300 - Submittals.

PART 2 PRODUCTS

2.1. CEMENT: Cement shall conform to ASTM C150, Type I. Cement may be bagged or bulk. Cement shall be used from only one mill throughout the entire project.

2.2. FINE AGGREGATE: Fine aggregate shall conform to ASTM C33 and have the following gradation:

Sieve	% Passing	% Retained
3/8"	100	0
#4	95-100	0-5
#8	80-100	0-20
#16	50-85	15-50
#30	25-60	40-75
#50	10-30	70-90
#100	2-10	90-98

2.3. COARSE AGGREGATE

A. Coarse aggregate shall conform to ASTM C33 and have the following gradation:

Sq. Sieve	% Passing	% Retained
3/4"	90-100	0-10
3/8"	20-55	45-80
#4	0-10	90-100
#8	0-5	95-100

2.4. WATER

A. Treated and filtered water from a municipal or other public water supply district shall be used.

2.5. REINFORCING STEEL

A. All bars shall conform to ASTM A615, Grade 60. Bending details shall conform to ACI 318.

2.6. FORMS

A. The forms shall be true and rigid and conform to shape, line and dimensions as shown on the Drawings. All forms shall be rigidly constructed, braced and tied to prevent any deflection or displacement during placing of concrete. All exposed corners and edges shall have 1" fillets. All joints shall be mortar tight; open joints shall be sealed as required.

2.7 CONCRETE MIX

A. Proportioning: Concrete shall conform to the following:
   1. Cement: 6 sacks per cubic yard, minimum.
   2. Water: Water shall be kept to an absolute minimum to maintain slump as specified.
   3. Aggregate: The sand factor shall be as required to give the best workable mix within the range of 46 to 52 percent of total aggregate by weight.
   4. Strength: Minimum 4000 psi at 28 days.

B. Slump: The maximum slump shall not exceed 4 inches. Determination of slump shall conform to ASTM C143.

C. Mixing: Contractor shall use ready-mixed concrete, mixed and delivered in conformance with ASTM C94.

D. Admixtures: Air entraining agents shall be added to the concrete to provide 4 to 6 percent entrained air when placed, in conformance with ASTM C185.

PART 3 EXECUTION

3.1 PLACING REINFORCING STEEL

A. All bars are to be accurately placed and securely tied at <u>all</u> intersections.

B. Reinforcing steel shall be free from flaky or scaly rust which will destroy or reduce the bond strength at the time concrete is placed.

C. Unless shown otherwise on the Drawings, the following minimum concrete coverage shall be maintained:
   1. Against earth: 3"
   2. Against forms or when exposed to water or weather: 2"

3.2 PLACING CONCRETE

A. No concrete shall be deposited below water. The excavation may be damp but shall contain no free water.

B. Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent the separation or loss of materials. Retempering of concrete is not permissible.

C. All concrete shall be thoroughly compacted during placement by means of vibrators in conformance with ACI 309.

D. For formed surfaces, the Contractor shall break off ties, grout voids which are deeper than ½" and chip out honeycombed areas to solid concrete and grout flush with formed surface.

E. Curing shall be maintained continuously for seven days after placing concrete or until forms are removed and the surface finished. Concrete surface temperature is to be maintained between 50°F and 100°F for at least seven days.

F. Concrete shall not be placed on iced or frozen subgrade or when the air temperature is below 20°F. Concreting shall not be continued when the air temperature is below 45°F unless the following conditions are attained:

1. Mixing water shall be heated (to a maximum of 150°F).
2. Aggregates shall be heated until free of all ice and frost.
3. The concrete temperature after mixing shall be between 50°F and 70°F if the air temperature is 20°F to 45°F.
4. After the concrete is placed, it shall be covered, protected, and heated so as to maintain a minimum of 70°F air temperature for the first 24 hours and 50°F air temperature for the next six days. Open-flame type heaters are not permitted. Heating equipment not vented outside of the covering will not be permitted.
5. Moist conditions shall be maintained during the heating period.
6. All covering, heating equipment, etc., shall be on hand and approved by the Engineer before any concrete is placed.

G. Admixtures, such as calcium chloride, shall not be used.

H. Exposed concrete is not to be placed in air temperatures above 100°F. Cover, protect and cool work as required to maintain the temperature of the concrete below 100°F. The concrete temperature, after mixing, shall not be greater than 85°F. Spray and/or shade aggregate piles and cool mixing water as required.

3.3 CONCRETE TEST CYLINDERS

A. Not required for this project.

END OF SECTION

SECTION 11307

SUBMERSIBLE GRINDER PUMP STATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General: This Section includes equipment, material, and service requirements for furnishing and installing grinder pumps and accessories. The principal items shall include, but not be limited to, the following: submersible centrifugal grinder pumps; guide rails; wetwell access hatch; discharge seals, pump discharge and anchoring elbows, valves, bolts including anchor bolts, nuts and gaskets, controls, etc.

B. Single Source: The pumping equipment and controls shall be the product of a single supplier.

1.2 RELATED SECTIONS

A. Section 02732 - Sanitary Sewer System

B. Section 03300 - Miscellaneous Concrete.

C. Division 16 - Electrical

D. Section 16905 - Lift Station Controls and Instrumentation: For controls and panels.

1.3 REFERENCES

A. Reference Standards: Comply as a minimum with applicable provisions and recommendations of the following:

1. Standards of the Hydraulic Institute.
2. NEC, National Electric Code.
3. NEMA, Standards of National Electric Manufacturers Association.
4. IEEE, Institute of Electrical and Electronic Engineers.
5. AFBMA, Anti-Friction Bearing Manufacturers Association.
6. ANSI, American National Standards Institute.
7. SSPC, Steel Structure Painting Council
8. ASTM, American Society for Testing and Materials.
9. AISI, American Iron and Steel Institute.

1.4 DEFINITIONS

A. NPSH - Net Positive Suction Head.

B. NPSHR - Net Positive Suction Head Required.

1.5 SUBMITTALS

A. Submit shop drawings and product data under provisions of Section 01300-Submittals.

B. Submit locations of the nearest permanent service headquarters of the pump and motor manufacturers.

C. Submit descriptive literature, including a cross-sectional view of each pump and motor combination, which indicates materials of construction, weights, principal dimensions and other important details.

D. Submit characteristic curves showing the head-capacity relationship, brake horsepower, NPSH requirements, pump efficiency (ration of the water horsepower to brake horsepower) and pump speed. The curves shall be complete for the entire range of operation from shutoff to minimum head conditions.

E. Submit operation and maintenance data under provisions of Section 01300-Submittals and Section 01700 - Contract Closeout..

F. Record Drawings: Submit record drawing under provisions of Section 01700-Contract Closeout.

G. Submit copy of pump warranty.

1.6 QUALITY ASSURANCE

A. All materials used shall be new, of high grade and of properties best suited to the Work required.

B. Manufacturer's Qualifications:

1. Pumping equipment provided under this Section shall be standard product in regular production by manufacturers whose products have proven reliable in similar service for at least five (5) years.
2. Manufacturer shall satisfy the Engineer that they are capable of the following:

a. Providing local factory trained personnel to service the pumps and allied equipment when needed within 24 hour period.
b. Providing needed spare parts for the pumps within 48 hour period.

C. Coordination Responsibility:

1. Contractor shall retain overall responsibility for equipment coordination, installation, testing and operation.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver equipment to site under provisions of Section 01600 - Material and Equipment.

B. Store and protect equipment under provisions of Section 01600 - Material and Equipment.

C. Store all equipment off the ground in enclosed shelter.

1.8 WARRANTY

A. Provide warranty under provisions of Section 01700 - Contract Closeout.

B. Pump manufacturer shall furnish to the Owner a written warranty against defects in workmanship and materials for two (2) years or 10,000 hours of operation, whichever is less, under normal use and service. All parts shall be covered under warranty, and controls shall be included. Coverage shall be full and not prorated. Pumps shall be picked up by manufacturer's representative or shipping covered under warranty. Pumps shall be repaired under warranty and shall be returned to Owner freight-pre-paid. Warranty shall be in printed form.

C. Service Calls:

1. Pump manufacturer or his authorized representative may visit the installation as he sees fit to troubleshoot and inspect the pumps during the warranty period. Manufacturer's service personnel shall contact the Owner at least one working day prior to such visits.
2. When Owner has notified the manufacturer of a problem, manufacturer shall respond promptly. If a pump is out of service or if the controls system is experiencing problems, manufacturer shall arrive to service the installation not more than 48 hours after notification by Owner. A factory trained and authorized technician shall be available to address problems with the pumps and controls.
3. Manufacturer may elect to try and direct Owner's personnel to correct the problem, if the problem is simple and Owner is able to assist. If unsuccessful, such efforts shall not eliminate manufacturer's responsibility to make a service call.
4. Manufacturer shall maintain a log of all service performed on the equipment during the warranty period, and shall furnish Owner a copy of this log upon request, and at the end of the warranty period.
5. Manufacturer shall provide Owner with necessary forms to accurately keep records of maintenance.

D. Responsibilities of Owner: Owner will be responsible for the following activities:

1. Change the oil in the reservoir at manufacturer's recommended interval, but such interval shall not be required by the warranty to be less than 12 months.
2. Maintain the pumping units in good working order, including clearing pump blockages.
3. Allow the pumps to be alternated or exercised regularly to distribute wear and prevent prolonged periods of inactivity.
4. Perform routine troubleshooting and run diagnostics, as outlined in the Operation and Maintenance Instructions.
5. When a problem occurs, perform initial troubleshooting and assessment of situation, eliminating the problem if possible. Contact the manufacturer if expertise or service is required.
6. Owner shall maintain a log of all maintenance performed on the equipment during the warranty period, and shall furnish the manufacturer a copy of this log upon request.

E. Effective Date: The warranty shall become effective upon Substantial Completion of the Work, or the date which the last of the pumps is started, if it occurs first. Warranty shall not commence on the date of delivery nor of shipment.

1.9 MANUFACTURER'S FIELD SERVICES: In accordance with Section 01650 - Starting of Systems, an authorized representative of the manufacturer shall provide the following:

A. Start-up Services: As required, with a minimum of two 6-hour sessions, of which at least 3 hours shall be dedicated to demonstration and training. In addition to the requirements of Section 01650, demonstration and training shall cover the following:

1. Controls function and sequence of operation.
2. Maintenance procedures, including use of megohm meter and how to interpret results.
3. Proper removal and installation of submersible pumps.

B. Provide services for end-of-warranty-period inspection.

C. Provide additional services to repair or correct any deficiencies noted at start-up or warranty inspection.

D. On-site Testing: As specified herein.

PART 2 PRODUCTS

2.1 GENERAL

A. Pumps shall be designed for continuous operation without cavitation within the specified pump range as shown on the Drawings. Pumps shall be designed to operate up to one hour in air without damage. The pump shall have as high efficiency as possible at the rated capacity. The NPSHR at the maximum operating capacity shall not exceed 28 feet. All seals shall be solvent resistant.

B. Grinder pumps shall contain special cutters to reduce sewage to a fine slurry, using stationary and rotary cutters.

2.2 MANUFACTURER:

A. Base Bid Manufacturers: Contractor shall base his bid on products by the following:

1. ITT - Flygt Corporation, M-3085 with 258 impeller

B. Equivalent products of other manufacturers may be proposed to the Engineer. The burden rests on the Contractor and Supplier to prove to the Engineer that the proposed substitute meets the letter of the specifications. Engineer shall have sole authority in deciding if proposed product does or does not meet the specifications. Because Contractor has based his Bid on the named Base Bid Manufacturer, Contractor shall have no justifiable claim for additional compensation or Contract Time if Engineer does not accept the substitute.

2.3 DESIGN REQUIREMENTS:

A. Requirements:

1. Furnish and install 2 submersible wastewater grinder pump(s). Each pump shall be equipped with a 3 HP, submersible electric motor connected for operation on 240 volts, 1 phase, 60 hertz, 3 wire service, with 25 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 pump shall be supplied with a mating cast iron 2 inch discharge connection and be capable of delivering 25 GPM at 85'TDH. Shut off head shall be 97 feet (minimum). 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. Grinder pump(s) shall be available in the following configuration:

1. MP - Guide Bar Mounting - 2" Discharge.
2. The MP Grinder pump(s) shall be automatically and firmly connected to the discharge connection, guided by no less than 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.

C. Each grinder pump shall be a heavy duty pump modified to be used as a grinder. Each grinder pump shall contain special cutters to reduce sewage to a fine slurry. The stationary cutter shall consist of hardened 316 "L" stainless steel and the rotary cutter shall consist of chrome alloyed cast iron. The cutter materials shall provide maximum corrosion and abrasion resistance. The remaining portion of the grinder pumps, with the exception of seal materials and wet end, shall be

similar to the heavy duty pumps used in larger pump stations for daily operation.

2.4 WETWELL AND VALVE VAULT

A. The wetwells and valve vaults shall be as shown on the Drawings.

2.5 PUMP CONSTRUCTION

A. Casing:

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. All exposed nuts or bolts shall be AISI type 304 stainless steel or brass construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.
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 or optional Viton 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.
3. 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.
4. Motors are sufficiently cooled by the surrounding environment or pumped media. A water jacket is not required.

B. Cable Entry:

1. The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. **The assembly shall provide ease of changing the cable when necessary using the same entry seal. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.**
2. Cable shall be capable of operating under continuous submergence without loss of watertight integrity to a depth of 50 feet.

C. Submersible Motor

1. 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 bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for continuous duty handling pumped media of 40°C (104°F) and capable of no less than 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 125°C (260°F) shall be

embedded in the stator end coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The motor and pump shall be designed and manufactured by the same source.

2. The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided upon request showing curves for torque, current, power factor, input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.
3. The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater. The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

D. Bearings:

1. The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. **Sleeve or single row lower bearings are not acceptable.**

E. Mechanical Seal:

1. Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in an lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating, **ceramic** ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary **carbon** seal ring and one positively driven rotating **ceramic** seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable. For special applications, other seal face materials shall be available.
2. **The following seal types shall not be considered acceptable nor equal to the dual independent seal specified**: 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. No system requiring a pressure differential to offset pressure and to effect sealing shall be used.
3. Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication**. The motor shall be able to operate dry without damage while pumping under load.**

   Seal lubricant shall be FDA Approved, nontoxic.

F. Pump Shaft:

1. Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor

shaft. Couplings shall not be acceptable. The shaft shall be stainless steel – ASTM A479 S43100-T.

2. If a shaft material of lower quality than stainless steel – ASTM A479 S43100-T is used, a shaft sleeve of stainless steel – ASTM A479 S43100-T is used to protect the shaft material. However, shaft sleeves only protect the shaft around the lower mechanical seal. No protection is provided in the oil housing and above. Therefore, the use of stainless steel sleeves will not be considered equal to stainless steel shafts.

G. Impeller:

1. The impeller(s) shall be of gray cast iron, Class 35B, dynamically balanced, single shrouded design having a long throughlet without acute turns. The impellers shall be capable of handling fine slurry from the special cutters. Impeller(s) shall be taper collet fitted and retained with an Allen head bolt. All impellers shall be coated with an acrylic dispersion zinc phosphate primer.

H. Volute:

1. Pump volute(s) shall be single-piece grey cast iron, Class 35B, non-concentric design with smooth passages large enough to pass any media that may enter the impeller. Minimum inlet and discharge size shall be as specified.

I. Protection:

1. All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. At 125°C (260°F) the thermal switches shall open, stop the motor and activate an alarm.
2. A leakage sensor shall be available as an option to detect water in the stator chamber. The Float Leakage Sensor (FLS) is a small float switch used to detect the presence of water in the stator chamber. When activated, the FLS will send an alarm and, if desired, stop the motor. **USE OF VOLTAGE SENSITIVE SOLID STATE SENSORS AND TRIP TEMPERATURE ABOVE 125°C (260°F) SHALL NOT BE ALLOWED.**
3. The thermal switches and FLS shall be connected to a Mini CAS (Control and Status) monitoring unit. The Mini CAS is designed to be mounted in any control panel.

2.6 ACCESSORIES FOR WETWELL MOUNTED PUMPS

A. Pump Discharge Connection: Pump discharge connection elbow and discharge piping shall be installed such that pump will automatically connect and seal to discharge connection elbow when lowered into place.

1. Both pumps shall be fitted with at FYLGT (or approved equal) mix flush valve. The valve will be fitted to a heavy cast mounting face ‘boss’, on one side of the pump volute. The valve shall, upon initial pump operation, induce a powerful stream of wastewater throughout the wetwell thereby resuspending and breaking up and built up sludge, grease or sediment. The valve shall have an adjustable closing period of 20-50 seconds and operate solely by mechanical means making it suitable for use in hazardous locations Class 1, Division 1 or 2, Groups C and D.
2. Base elbow connected to discharge piping and anchored to sump floor with stainless steel anchor bolts. Pump supplier shall provide 304L or 316 stainless steel threaded rod anchors ¾” minimum diameter, 5" minimum embedment for anchorage of base elbow. Epoxy grout into concrete slab.
3. Note: Base shall consist of elbow integrally cast with mounting base. Base which requires attachment of a separate elbow will not be acceptable. Base shall have holes sized to accept ¾” diameter anchor bolts.

4. Designed to receive pump discharge connection without bolts.
5. Designed to receive guide rail(s).
6. Cast or ductile iron.
7. Flanges shall conform to ANSI B16.1.
8. Seal interface of the pump and discharge elbow by non-sparking metal-to metal contact, or by metal to rubber contact with the use of a profile gasket mechanically held in place between the pump and the sliding guide bracket.

B. Pump Lifting: Provide grab-link system, with short length of stainless steel chain, nylon cord, and link attachment device.

C. Guide Rails:

1. Stainless-steel pipe, Schedule 40 minimum.
2. All 316 or 304L stainless steel, including rails, brackets, and anchor bolts.
3. Size as recommended by pump manufacturer, 1-1/2-inch minimum dia.
4. Shall not support any portion of the pump weight.
5. Provide stainless steel guide rail supports bolted to wetwell walls, at maximum of 15 foot intervals along rails. Not required when length of guide rails is less than 15 feet.
6. Provide upper guide rail bracket, cast iron or stainless steel.

D. Power and Control Cable Holder: (Provide for tank or wetwell mounted pumps.):

1. 304L stainless steel, with mounting bracket.
2. Provide grip holders for pump and control cables.
3. Cables shall be easily adjusted to pumping level without splices.
4. Provide power and control cables which are sealed at the motor and continuous from the motor to the panel or intermediate waterproof junction box for removing submersible pump for maintenance.
5. Provide stainless steel Kellems grips for power cords.

E. Access Hatches:

1. Acceptable Manufacturers: Access hatches shall be of the size as required by pump manufacturer and shall be manufactured by the following or equal:
   a. Bilco Company
   b. Halliday Products
2. Description:
   a. Access hatches in exterior locations shall be floor door type, designed to withstand a live load of 300 pounds per square foot.
   b. Door leaves shall be 1/4 inch thick aluminum diamond pattern plate.
   c. Frame: Angle Frame.
   d. Hatches shall open to 90 degrees. Devices shall be provided for easy operation, including an automatic hold open arm with release handle for each door leaf. A snap lock with removable handle shall be provided for each hatch.
   e. Finish: Hatches shall be mill finished. All surfaces of aluminum which will be in contact with concrete or mortar when installed shall be given a heavy coat of coal tar or bituminous paint.

F. Other Accessories: Provide other accessories indicated on the Drawings.

2.7 PIPING AND VALVES

A. Pump Discharge Piping In Wetwell: As indicated on the Drawings.

B. PVC Ball Valves: PVC ball valves shall be provided where indicated on the Drawings.

1. PVC ball valves shall be full-size port, true-union design with two-way blocking capability, rated for 150 psi at 70 □F. Valves shall have PVC bodies, Viton or EPDM O-rings, and Teflon seats. Valves shall be provided with operating levers. Where noted on the Drawings, valves shall be provided with operating nuts, stem extensions with operating handle, and wall supports. The stem extensions and supports shall be a kit supplied by the valve manufacturer and designed to work with the valve used. PVC ball valves shall be Asahi/America "Duo-Bloc", Hayward "Safe Block", or equal.

C. Bronze Flapper Check Valves: Bronze flapper check valves shall be provided where indicated on the Drawings.

1. Bronze flapper swing check valves shall be class 125 and shall comply with MSS-SP-80 type 3. Valves shall have bronze bodies, caps, discs and hinges, brass hinge pins and side plugs and stainless steel retaining rings. Ends shall be threaded. Bronze flapper swing check valves shall be as manufactured by Watts, or equal.

2.8 SHOP PAINTING

A. All surfaces, other than stainless steel, coming into contact with the liquid media shall be protected by a shop-applied epoxy paint system, suitable for operation in sewage.

B. Machine finished surfaces:

1. Clean machined parts are to remove all dirt and grease.
2. Clean so as not to affect primer or deteriorate adherence to finish paint.
3. Store and transport in such a way that rust-attach on machined surfaces does not occur.
4. At assembly, coated surfaces are with a corrosion preventive coating.

2.9 PUMP PROTECTION SYSTEM: Furnished by pump manufacturer.

A. Furnish a complete pump monitoring and protection system consisting of a intrinsically safe solid state monitoring module to be installed in the motor starter cubicle and independent probes integral to the pump/motor, as specified herein, wired to a sealed cable entry terminal box for connection of submersible control cables.

B. Monitoring unit (or multiple such) shall be a solid-state module designed for mounting within the motor starter cubicle or as indicated on the Drawings. Monitoring unit shall employ conventional logic and noise isolated electronics. Monitoring unit shall accept inputs from the sensors (seal leakage, motor over temperature, motor auto-megger) specified and shall output independent contacts which close to alarm each condition, or separate independent output terminals suitable for direct connection to interposing relays for alarm contact development. Provide a separate N.C. alarm contact, rated at 120V, 5A inductive, which opens on any failure. The monitoring unit shall accept separate isolated N.O. contacts which close to indicate pump running and to reset after pump trip.

2.10 ELECTRICAL EQUIPMENT AND CONTROLS

A. Conform to NEC, NEMA, IEEE and DIVISION 16 on all electrical equipment and controls.

B. Refer to DIVISION 16 for electrical control panel, motor starters, and pump controls.

PART 3 EXECUTION

3.1 INSTALLATION: All Work shall conform to the Drawings, the manufacturer's recommendations, and the requirements of DIVISION 1.

A. Install wetwell cover and access hatch.

B. Attach base elbows, guide rails, and make piping connections.

C. Make all electrical and control connections, in accordance with DIVISION 16.

D. Provide a complete unit with all materials, components and adjustments as required for successful operation.

3.2 START-UP AND TESTING:

A. Provide all necessary lubrication for initial start-up, testing and as required for final acceptance.

B. Installation, start-up and testing of all equipment and associated construction shall conform to manufacturer's recommendations.

3.2 ON-SITE PERFORMANCE TESTS:

A. Conducted by pump manufacturer's authorized representative in presence of Contractor and Engineer.

B. Equipment Tests:

1. Check performance of all components as a functioning unit.
2. Check alignment of each unit.
3. Confirm proper rotation of impeller.

C. Operational Tests:

1. Conduct such operational tests as necessary to determine that the performance of equipment and controls is as specified.
2. Tests will generally consist of placing equipment in operation under varying conditions and verifying performance.
   a. Test all control sequences and functions.
   b. Perform complete megger testing.
   c. Take amperage and voltage readings.
3. Dry Run Test: No liquid is to be allowed to enter the inlet of the pump. The exterior of the pump shall be dry and remain dry during test. Test duration shall be a minimum of 30 minutes.

D. Capacity Test: On three occasions, wet well shall be filled with liquid to an elevation sufficient to allow each single pump to operate for three minutes, independent of the control regime. Time required to pump down known volume shall be measured as evidence of each pump's capacity. All portions of the force main must have been constructed and tested prior to this test.

E. Make all necessary equipment adjustments and corrective work indicated by tests. Repeat testing as necessary.

F. Submit a written test report to General Contractor (with one copy to Engineer) in a letter form stating operations performed and results obtained for each unit.

END OF SECTION

SECTION 14600

HOISTS AND CRANES

PART 1 GENERAL

1.1 GENERAL: Equipment and accessories provided under this section shall be fabricated, assembled, erected and placed in proper operating condition in full conformity with Drawings, specifications, engineering data, instructions and recommendations of the equipment manufacturer, unless exceptions are noted by the Engineer.

1.2 SECTION INCLUDES

A. Portable Davit Crane and Accessories

1.3 REFERENCES: Equipment provided under this section shall comply with the applicable requirements of the following. The revision in effect at the time of the bid opening shall be applicable.

A. Occupational Safety and Health Standards of the U. S. Department of Labor; Subpart N, Materials Handling and Storage

B. Monorail Manufacturer's Association (MMA) "Specifications for Underhung Cranes and Monorail Systems".

C. ANSI/ASME HST-2M, "Performance Standard for Hand Chain Manually Operated Chain Hoists".

D. ANSI/ASME B30.10, "Hooks".

E. ANSI/ASME B30.11, "Monorails and Underhung Cranes".

F. ANSI/ASME B30.16, "Overhead Hoists (Underhung)".

G. ANSI MH27.1, "Specifications for Underhung Cranes and Monorail Systems".

1.4 SUBMITTALS: The following items shall be submitted as required by this Division, in accordance with Section 01300 - Submittals, and Section 01700 - Contract Closeout:

A. Product Data for Review: Complete outline and assembly Drawings, together with detailed specifications and data covering materials used, parts, devices and other accessories forming a part of the equipment furnished, shall be submitted for all equipment provided in this Section, in accordance with Section 01300 - Submittals.

B. Operation and Maintenance Data: Approved Operation and Maintenance Instructions shall be provided in accordance with Section 01700 - Contract Closeout.

1.5 PERFORMANCE AND DESIGN REQUIREMENTS

A. Performance Requirements: Davit crane and hoist will be used to assist in servicing submersible pumps at lift stations. The equipment supplied shall be suitable for use and operation in an exterior location.

B. General Design Requirements: Loading, impact allowances and allowable stresses shall be in accordance with the governing standards.

PART 2 PRODUCTS

2.1 DAVIT CRANE: Provide one davit crane, shared between the lift stations. Install a crane base at each station.

A. Manufacturer
1. Davit Crane shall be as manufactured by Thern, Inc. "Model 5123M1GAL" or equal.

B. Components
1. Winch shall be equipped with bronze bearings for smooth and efficient operation.
2. Wire rope anchor shall be secured to an anchor hole in the flange of the drum, allowing rapid attachment or removal of wire rope from the crane, so that wire rope assemblies can be left permanently attached to submersed pumps and mixers while the crane is moved to a new location.
3. Boom and mast rotate 360 degrees under load, in a bearing sleeve in the base. A pivoting handle shall be provided.
4. Boom shall be adjustable to three different positions for operation, and shall fold down for storage or transport.
5. Loads shall be lifted with a stainless steel spur gear hand winch contained within the boom. The winch shall be equipped with an automatic disc brake for load control, and gear covers to protect gears and help prevent injuries. Winch components shall have zinc and iridescent dichromate plated finish for corrosion resistance.
6. Lifting Capacity: 1,000 pounds.

C. Accessories
1. One (1) Thern, Inc. "Model 523" pedestal base, or equal.
2. One (1) stainless steel 1/4" diameter wire rope, with stainless eye hook and swagged ball fitting, with minimum length of 28 feet.
3. Galvanized steel expansion anchor bolts for anchoring base, 5/8" minimum diameter.

D. Finishes
1. Crane and bases shall have a galvanized finish for superior corrosion protection.

PART 3 EXECUTION

3.1 INSTALLATION: All work shall conform to manufacturer's recommendations and the requirements of Division 1.

END OF SECTION

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 SUMMARY: Provide complete distribution systems for electrical power and lighting as shown on the Drawings or required by other sections of these specifications.

A. Work includes, but is not necessarily limited to:
1. Distribution system for power, including connection to existing panel, branch-circuit bolt-on type breakers, and any required metering equipment not provided by the electrical utility. Power system shall be 240 volt (V), 60 Hertz (Hz), 1-phase, 3-wire.
2. Installation of control panel, motor starters, combination starters, safety switches, manual transfer switch, and controls, whether provided under this section or other sections of these specifications.
3. Grounding system.
4. Other items and services required to complete the electrical systems.

1.2 APPLICABLE PUBLICATIONS: Industry publications controlling the work of this Section include:

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

ASTM B8:	Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard or Soft.

B. National Electrical Manufacturer's Association (NEMA):

NEMA FU 1:	Low Voltage Cartridge Fuses.
NEMA ICS:	Motor Starters.

C. National Fire Protection Association (NFPA):

NFPA 70:	National Electrical Code (NEC).
NFPA 78:	Lightning Protection Code.
NFPA 101:	Life Safety Code.
NFPA 110:	Emergency and Standby Power Systems.

D. Occupational Safety and Health Administration (OSHA):
Occupational Safety and Health Standards.

E. Underwriters Laboratories Inc. (UL):

UL 57:	Electric Lighting Fixtures.
UL 96:	Lightning Protection Components.
UL 96A:	Installation Requirements for Lightning Protection Systems.
UL 98:	Enclosed and Dead-Front Switches.
UL 198E:	Class R Fuses.
UL 498:	Attachment Plugs and Receptacles.
UL 943:	Ground-Fault Circuit Interrupters.
UL 1449:	Standard for Safety, Transient Voltage Surge Suppressors, Revised Edition, July 1987.

1.3 SUBMITTALS: Submit the following in accordance with Division 1. Submittals are for the record or approval, as indicated.

A. Catalog cuts of safety switches for approval. Provide time-current characteristic curves for all fuses supplied.

B. Catalog cuts of grounding conductor, ground rods and connectors for the record.

C. Catalog cuts of power and control cable and connectors for the record.

D. Upon completion of this portion of the work, and as a condition of its acceptance, submit operation and maintenance manuals. Include within each manual:

E. Copy of the Record Documents for this portion of the work.

F. Copies of all circuit directories.

G. Copies of all warranties and guarantees.

H. Emergency instructions.

I. Spare parts list.

J. Wiring diagrams.

K. Shop drawings and product data.
   1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
   2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions.
   3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.

L. Include the following information for equipment items:

1.4 COORDINATION: Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

A. Coordinate replacement of disconnect panel with on-site MoDOT staff for any required downtime of power supply to the rest area.

B. Coordinate the installation of the new disconnect panel with COMO REC. Contact information is noted on the plans.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Provide only materials that are new, of the type and quality specified, and free from defects and imperfections. Where Underwriters Laboratories Inc. has established standards for such materials, provide only materials bearing the UL label.

B. Manufacturers that can provide products meeting these specifications have been identified. Other manufacturers' products meeting these specifications may be acceptable subject to submittal of certificate of compliance, review, and approval. Where catalog numbers are shown, they should be verified with the manufacturer to assure continued accuracy and compliance with these specifications.

C. All materials and equipment of the same type shall be made by the same manufacturer.

D. All materials and equipment shall be acceptable to the authority having jurisdiction as suitable for the use intended.

2.2 DISTRIBUTION

A. Conduit, Fittings
1. Rigid Galvanized Steel Conduit (RGS)
a. Each length threaded on both ends.
b. All scale, grease, dirt, burrs, and other foreign matter removed from inside and outside prior to application of coating materials.
c. Galvanized by the hot-dip process as follows:
1) Interior and exterior surfaces coated with a solid, unbroken layer of 99% virgin zinc by dipping.
2) One coat of zinc chromate finish on inside and outside surfaces to prevent oxidation and white rust.
d. Couplings and elbows fabricated, coated, and finished by the same process as conduit.
e. Where conduits enter boxes or cabinets without threaded hubs, double locknuts shall be used plus a phenolic insulated metallic bushing on the open end.
2. Rigid Polyvinyl Chloride (PVC) Conduit
a. Fabricated from self-extinguishing, high-impact, polyvinyl chloride designed for above ground and underground installations.
b. Type EPC, Schedule 40, heavy-wall rigid conduit, Schedule 80 where noted on the Drawings, unless noted otherwise.
c. Fittings and accessories fabricated from same material as conduit.
d. Solvent-cement-type joints as recommended by manufacturer.
3. Flexible Liquidtight Nonmetallic Conduit Type B
a. UL listed and CSA Certified.
b. Conduit shall have a smooth inner diameter, and a smooth outer jacket approved for outdoor use.
c. Conduit shall be sunlight resistant and oil resistant.
d. Liquidtight fittings shall be designed for use with steel conduit or PVC conduit as required.
4. Conduit clamps, straps and supports shall be steel or malleable iron, hot dip galvanized.
5. Special Fittings: Conduit sealing, explosion-proof, dustproof, and other types of special fittings shall be provided as required by the Drawings ad these specifications and shall be consistent with the area and equipment with which they are installed. Fittings installed outdoors or in damp locations shall be sealed and gasketed. Outdoor fittings shall be of heavy cast construction. Hazardous area fittings shall conform to UL 886 and to NEC requirements for the area classification designated.

B. Wire and Cable
1. Sizes indicated on the Drawings.
2. Service-entrance cable shall have type RHW insulation.
3. Feeders and Branch Circuits:
4. Flame-retardant, moisture- and heat-resistant thermoplastic with single conductor copper cable, Type THHN/THWN, 600V.
5. Rated 75°C maximum conductor temperature in wet locations and 90°C in dry locations.
6. Conductor composed of 98% IACS, (International Annealed Copper Standards) soft annealed copper conforming to ASTM B8.
7. Conductor insulated with polyvinyl chloride to conform to or exceed Insulated Cable Engineers Association (ICEA) Standards.

C. Control Cable
1. Use size 14.
2. Multiple-conductor shielded control cable, each conductor polyethylene insulated with a polyvinyl chloride covering and the cable having an overall polyvinyl chloride jacket.
3. Rated 600V, 90°C maximum conductor temperature in wet and dry locations.
4. Individual conductors composed of 98% IACS soft annealed copper, 7-wire stranded.
5. ICEA Method 1 color coding, colored insulation, and printed, colored tracers.

D. Connections to Equipment
1. Power Cable Connectors:
a. For all wire, cable, equipment and bus terminals, designed and sized for the specific cable or bus being connected.
b. Solderless, pressure-type connectors constructed of high-strength, non-corrodible, tin-plated copper designed to furnish high-pullout strength and high-conductivity joints.
c. Rated current-carrying capacity equal to, or greater than, the cable being connected and with silver-plated contact surfaces for conductors of 500-kcmil copper capacity or greater.
2. Control Cable Connectors
a. For control, alarm, and instrumentation wiring, use pre-insulated, diamond-grip type with ring tongue. Spade lugs will not be permitted.
b. Designed for the specific size and type conductor being used.

E. Wiring Devices
1. GFCI Receptacles
a. Rated 20A, 125 VAC, specification grade, NEMA 5-20R.
b. Flush-mounted, ivory color.
c. A contrasting color band on the reset button provides visible indication of a ground fault trip.
d. Duplex, arc-resistant and prewired, 3-wire, grounding-type.
e. Five milliampere trip level, feed-thru type, capable of protecting connected downstream receptacles.
f. Provide matching cover plates.
g. Weatherproof receptacles shall be supplied with a die cast aluminum, spring held cover with a rubber, watertight gasket.

F. Disconnects
1. Provide safety switches of the heavy-duty type and rating as shown on the Drawings or required for proper completion.
2. Provide heavy-duty, dead-front, positive, quick-make, quick-break, fused type or non-fused, as indicated on the Drawings, rated 600 VAC for 480Y/277V system and 250 VAC for 240/120V system or 208/120V system.
3. Switch shall be selected according to poles, amperes, volts and NEMA type enclosure as indicated on the Drawings.
4. Unit shall be UL listed and externally operable with provision for padlocking.
5. Provide copper contacts in safety switches.
6. All switches shall have switch blades which are fully visible in the "OFF" position when the switch door is open.
7. The operating handle shall be an integral part of the box, not the cover. The handle position shall indicate whether the switch is "ON" or "OFF".
8. The covers shall be securable in the open position.
9. NEMA 3R switches shall have interchangeable, bolt-on hubs. Hub connections shall be watertight, dustproof, and airtight.
10. The finish shall be a baked enamel gray, electrodeposited on cleaned, phosphated steel.

11. Provide enclosures clearly marked for maximum voltage, current, horsepower rating, NEMA Type 3R, raintight.
12. Fuse clips for fusible units shall accommodate Class R fuses.
13. Sources: General Electric; Siemens; Square "D"; Westinghouse

G. Fuses
1. Fuses shall be Class RK1, dual element, current limiting, one-time fuse, 250V or 600V as required per NEMA FU1 and UL 198E.
2. Interrupting rating shall be 200,000 amperes rms.
3. Sources: Brush; Bussman

H. Supporting Devices
1. Conduit or equipment supports shall be galvanized steel support channel adequate for the weight of equipment or conduit, including wiring, which they carry.
2. Fastening hardware shall be corrosion resistant.

I. Identification
1. Identify all safety switches and other apparatus used for operation and control of circuits, appliances, and equipment. Provide plastic laminate nameplates, white face with black core letters, showing proper identification. Minimum size nameplate shall be 1" x 3" with 1/4" letters. Labels shall be secured using silicone glue.
2. Wire and cable markers shall be printed tape markers or split sleeve type.

J. Handhole/Junction Box: Handholes/junction boxes shall be fabricated from an aggregate consisting of sand and gravel bound together with a polymer and reinforced with continuous woven glass strands. The compressive strength shall be 11,000 psi, tensile strength of 1700 psi, and flexural strength of 7500 psi. The cover of the handholes must have a non-skid surface and must hold a vertical design load of 8000 pounds over 10' x 10" surface with no physical damage or excess deflection. The cover logo shall be “Lighting”. Size per NEC. It shall be as manufactured by Quazite.

2.3 POWER SYSTEM

A. Grounding
1. Ground all power distribution equipment, branch circuit loads, etc. by conductor to the grounding system. All metallic parts of electrical equipment which do not carry current shall be grounded with an equipment grounding conductor whether or not shown on the Drawings. The equipment grounding conductor shall be a green insulated copper conductor. Sizes of grounding conductors shall be in accordance with the NEC unless shown otherwise on Drawings. The NEC shall govern and shall not be violated.

B. Provide the following wire for direct buried grounds
1. Bare, uncoated copper cable, unless otherwise noted.
2. Conductors composed of 98% IACS soft or annealed copper to conform to the following requirements:
   a. 250 kcmil stranded, unless otherwise noted.
   b. Solid conductors in sizes No. 4 AWG and smaller.
3. Sources: Anaconda; General Cable; General Electric; Triangle

C. Ground Rods
1. Copper-clad steel or copper alloy, sectional type rods.
2. One end pointed to facilitate driving.
3. 3/4" diameter and 10'-0" long with diameter and length stamped near top of rod.

D. Connection Materials

1. Cable-to-cable, cable-to-rod, cable-to-connector, and cable-to-building steel connections of exothermic welding process, unless otherwise noted.
2. Cable-to-equipment ground lugs:
   a. Bolted to equipment housing with silicon bronze bolts and lock washers.
   b. All equipment grounding shall be free of paint or any other material covering bare metal.
3. Sources: Cadweld; OZ/Gedney; Weaver

E. Other Materials: The Contractor shall provide other materials, though not specifically described, which are required for a completely operational system and proper installation of the work.

PART 3 EXECUTION

3.1 LABOR AND WORKMANSHIP: All labor for the installation of materials and equipment furnished for the electrical system shall be done by experienced mechanics of the proper trades.

A. All electrical equipment furnished shall be adjusted, aligned and tested by the Contractor as required to produce the intended performance.

B. Upon completion of the work, thoroughly clean all exposed portions of the electrical installation, removing all traces of soil, labels, grease, oil, and other foreign material, and using only the type of cleaner recommended by the manufacturer for the item being cleaned.

3.2 COORDINATION: Coordinate as necessary with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

A. Coordinate the installation of electrical items with the schedule for work of other trades to prevent unnecessary delays in the total work.

B. Installation of exposed conduit, lighting fixtures, or other equipment shall not occur until all piping, pipe hangers, ducts and equipment which are above have been installed, and provided on site by others.

C. Where lighting fixtures and other electrical items are shown in conflict with locations of structural members, mechanical items, or other equipment, provide required supports and wiring to clear the encroachment.

D. Coordinate installation of Owner-furnished equipment and placement of conduits using vendor Drawings, plans, and the established construction schedule.

E. Data indicated on the Drawings and in these specifications are as exact as could be secured, but their absolute accuracy is not warranted. The exact locations, distances, levels, and other conditions will be governed by actual construction and the Drawings and specifications should be used only for guidance in such regard.

F. The electrical Drawings are diagrammatic, but shall be followed as closely as actual construction and work of other trades will permit. Where deviations are required to conform with actual construction and the work of other trades, make such deviations without additional cost to the Owner.

G. Perform trenching, bedding, and backfilling associated with the work of this Section in strict accordance with the provisions of Section 02210, EARTHWORK, of these specifications.

3.3 INSTALLATION

A. Conduits

1. Install using as few joints as possible.
2. Provide RGS conduit for all conduit penetrating concrete walls and floors and for all exposed, exterior conduit. Provide Schedule 80 PVC conduit where noted on the Drawings.
3. Provide Schedule 40 PVC or RGS conduit below grade, unless noted otherwise. Minimum burial depth outside of building shall be 24" clear to top of conduit, unless noted otherwise.
4. Install liquidtight nonmetallic conduit at all points of connection to equipment mounted on supports to allow for expansion and contraction or ease of maintenance.
5. The number of raceways shall be installed per Drawings. Circuits shall not be combined to reduce number of raceways.
6. Where conduit has to be cut in the field, it shall be cut square with a pipe cutter using cutting knives.
7. All conduits shall be swabbed clean by pulling an appropriate size mandrel through the conduit before installation of wire or cable. Clear all blockages and remove burrs, dirt, and debris.
8. Provide insulated grounding bushings for all conduits stubbed into equipment enclosures.
9. Where conduit size is not indicated, install ¾" conduit.
10. Plugs shall be installed in all unused openings of all fittings, boxes, and panel boards.
11. Contractor is responsible for protecting all conduits during construction. Temporary openings in the conduit system shall be plugged or capped to prevent entrance of moisture or foreign matter. Contractor shall replace any conduits and/or ducts containing foreign materials that cannot be removed.

B. Conductors
1. All wire shall be color coded as follows:

Description	208/120 Volt
Phase A	Black
Phase B	Red
Phase C	Blue
Neutral	White
Ground	Green

2. Single conductor and multi-conductor cable shall not be bent to radii smaller than that specified by the manufacturer or by the National Electrical Code. Special pull boxes or oversized conduits shall be used to meet this requirement.
3. Pulling lubricants shall be soapstone powder, powdered talc, or a commercial pulling compound. No soap suds, soap flakes, oil, or grease shall be used, as these may be harmful to cable insulation. Contractor shall use nylon or hemp rope for pulling cable to avoid scoring the conduit.
4. Cables shall be neatly trained, without interlacing, and be of sufficient length in all boxes, equipment panels, etc. to permit making a neat arrangement. Jackets of multiconductor control cables shall be removed as required to properly train and terminate the conductors. Cables shall be secured in a manner to avoid tension on conductors or terminals, and shall be protected from mechanical injury and from moisture at the unprotected end. Sharp bends over conduit bushings are prohibited. Damaged cables shall be removed and replaced at the Contractor's expense.

C. Wiring Devices
1. Install wiring devices as indicated, in compliance with manufacturer's written instructions, applicable requirements of the NEC and NEMA standards and in accordance with recognized industry practices.
2. Coordinate with other work as necessary to interface installation of wiring devices.
3. At time of completion, replace those items that have been damaged, including those burned and scored by faulty plugs.

D. Grounding
1. Install grounding system as shown on the Drawings.

2. Install ground rods as indicated on the Drawings, by driving and not by drilling or jetting.
3. Drive ground rods into unexcavated portion of the earth where possible.
4. Where ground rods must be installed in excavated areas, drive rods into earth after compaction of backfill is completed.
5. Drive to a depth such that the top of ground rods will be approximately 12" below finish grade, or subgrade, and connect to counterpoise.
6. Rotate each ground rod 180° for every foot it is driven to prevent undetected deflection. If it cannot be rotated, a new ground rod shall be driven.
7. Conform to manufacturer's instructions for grounding system connections. All ground connections shall be inspected for tightness. Exothermic-welded connections shall be approved before being permanently concealed.
8. Chemically degrease and dry connections completely before welding.
9. Apply one coat of asphaltic coating to all exothermic-welded connections to be buried.
10. Make connections to equipment as follows:
    a. Make up clean and tight to assure a low-resistance connection with resistance drop not exceeding 1 ohm.
    b. Install so as not to be susceptible to mechanical damage during operation or maintenance of equipment.
    c. Provide direct copper connection to counterpoise.
11. A separate, continuous, insulated equipment grounding conductor shall be installed in all feeder and branch circuits.
12. A separate neutral conductor shall be installed for each branch circuit. Combining neutrals shall not be allowed.
13. Bond all insulated grounding bushings with a bare #6 AWG grounding conductor to a ground plate or ground bus.
14. All grounding conductors embedded in or penetrating concrete shall be insulated.

E. Control Panels
1. Unless otherwise shown on the Drawings, install control panel with the top of the trim 6'-3" above grade. Mount on channel as indicated.

F. Lighting Fixtures
1. Completely install lighting fixtures for use and shall be located as shown on the Drawings.
2. Wire fixtures with conductors which comply with paragraph - Wire and Cable.
3. Use only galvanized steel and galvanized hardware for fixture installation to provide protection against rust and corrosion.
4. Install all lighting fixtures so that the weight of the fixture is supported either directly or indirectly by a sound and safe structural member of the building. Use adequate number and type of fastenings to assure safe installation.
    a. Screw or toggle bolt fastenings to ceiling material or wall paneling are not acceptable.
    b. Support fixtures directly from roof joists or roof trusses.
5. All luminaires shall be aligned and lenses and diffusers cleaned at the completion of the work. Failed lamps shall be replaced.

G. Hazardous (Classified) Locations
1. All work in hazardous locations shall be completed in accordance to the NEC and as shown on the Drawings. In the case of conflicts, the contractor shall notify the engineer in writing and await for written instructions.
2. All conduit shall be rigid galvanized steel, equivalent to Schedule 40 pipe. EMT and IMC, as defined in the NEC, shall not be used.
3. Conduit sealing fittings shall be installed as required by the NEC.
4. Drain seals shall be installed on vertical conduits immediately before entering equipment enclosures in order to prevent moisture from entering equipment. Drains shall be used at all

low points in the conduit systems and as required to prevent accumulation of moisture in conduit and equipment enclosures. All conduits passing through building walls shall be sealed within 18" of outside walls.

5. Conduit sealing fittings shall not be packed or poured until all systems have been inspected and tested.

3.4 ACCEPTANCE TESTING

A. General

1. Provide personnel and equipment, make required tests, and submit test reports upon completion of tests.
2. Provide temporary power source of proper type for testing purpose when normal supply is not available.
3. Make written notice to the Owner adequately in advance of each of the following stages of construction:
   a. In the underground condition prior to placing concrete floor slab, when all associated electrical work is in place.
   b. When all rough-in is complete, but not covered.
   c. After all exothermic-welded connections are made, but not concealed.
   d. At completion of the work of this section.
4. When material and/or workmanship is found not to comply with the specified requirements, the noncomplying items shall be removed from the jobsite and replaced with items complying with the specified requirements promptly after receipt of notice of such non-compliance.

B. Test Procedures

1. All feeders shall have their insulation tested after installation, but before connection to devices. The conductors shall test free from short circuits and grounds.
2. Prior to energizing circuitry, test wiring devices for electrical continuity and proper polarity connections.
3. After installation is complete, the equipment shall be demonstrated to operate satisfactorily and to conform to contract documents.
4. Measure and record voltages between phases and between phase wires and neutrals. Submit a report of maximum and minimum voltages.
5. Perform ground test to measure ground resistance of counterpoise. Resistance shall be 5 ohms or less.

C. System Functional Test

1. Upon completion of equipment tests, a system functional test shall be performed. It is the intent of this test to prove the proper interaction of the power and control systems.

END OF SECTION

SECTION 16905

LIFT STATION CONTROLS AND INSTRUMENTATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This Section includes control panels and instrumentation for pump stations\lift stations provided under this Contract. Provide materials, equipment, and installation.

1.2 RELATED SECTIONS

A. Section 11307 - Submersible Grinder Pump Station.

B. Section 16050 - Basic Electrical Materials and Methods

1.3 APPLICABLE PUBLICATIONS: Industry publications controlling the work of this Section include:

A. American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE):

ANSI/IEEE C37.90:	Surge Withstand (IEEE 472)
ANSI/IEEE C39.5:	Safety Requirements
ANSI/IEEE C39.6:	Digital Measuring Instruments
ANSI/IEEE S50.1:	Compatibility of Analog Signals for Electronic Industrial Process Instruments.

B. National Electrical Manufacturer's Association (NEMA):

NEMA FU 1:	Low Voltage Cartridge Fuses.
NEMA ICS:	Motor Starters.
NEMA WD 1:	Wiring Devices.

1.3 SUBMITTALS

A. Submit the following under the provisions of Section 01300 - Submittals:
1. Catalog cuts of all instrumentation.
2. Catalog cuts, panel layout, and wiring diagrams of the station control panel and all of its major components.
3. Control panel schematic
4. A system functional test procedure for use in system functional compliance testing.
5. Catalog cuts of the starters, selector switches, alternator, elapsed time meters, and indicator lights.
6. Upon completion of this portion of the work, and as a condition of its acceptance, submit the following:
   a. As-built drawings.
   b. Copies of all warranties and guarantees.

B. Submit operation and maintenance instructions under the provisions of Section 01700 - Contract Closeout. Include the following:
1. Copy of the Record Documents for this portion of the work.
2. Copies of all warranties and guarantees.
3. Emergency instructions.
4. Spare parts list.

5. Wiring diagrams.
6. Shop drawings and product data.
7. Include the following information for equipment items:
   a. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
   b. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions.
   c. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.

1.4 SYSTEM DESCRIPTION

A. Duplex Pump Operation Using Primary Controller

1. The Float Switch Controller uses float switches to sense water level. Three floats are used to control the two pumps. The OFF float is positioned at the level below which both pumps are to be off. The LEAD float is set at the level at which the lead pump should come on. The LAG float is set at the level at which both pumps should be on.
2. As the water level in the wet well rises it will reach the LEAD float. When this float closes the lead pump is started. This pump should pump the level down until it reaches the OFF float. When the level is pumped down below the OFF float and it opens then the lead pump is stopped. If the lead pump fails to pump the level down and the level reaches the LAG float then the lag pump is started. With both pumps running the level is pumped down to the OFF float and both pumps are stopped. All of the floats are normally open (open if above water) type floats.
3. If the alternator switch on the front of the controller is in the center position then each cycle the lead and lag pump will be swapped so that pump starts and run time is equalized. If the alternator switch is in the 1-2 position then pump 1 will always be the lead pump. If the alternator switch is in the 2-1 position then pump 2 will always be the lead pump. A timer is built into the controller so that both pumps cannot be started at the same time. This insures that at least 8 seconds will elapse between pump starts, to prevent simultaneous starting after power failures if the level is high in the wet well.
4. The controller has provisions for two alarm floats, a high level alarm and a low level alarm. If the water level is below the LOW WATER CUT-OFF float then the low alarm light on the front panel will light, the low alarm relay will close and both pumps will be stopped if they are not already off. If the water level is above the HIGH float then the high alarm light on the front panel will light, the high alarm relay will close and both pumps will be started (8 seconds apart) if they are not on already. All of the floats are normally open (open if above water) type floats.
5. The controller has two pump fail inputs. When these inputs are closed the associated pump will be disabled and the other called in its place. When this condition exists a continuous red error light for that pump will illuminate on the front panel. The controller also has two pump warning inputs which are for submersible pump seal leak sensors. The warning inputs, when activated, cause the pump error light to blink but do not disable the pump. The error and warning inputs are optional and if not used should be left unconnected. The fail and warning inputs are completely isolated and intended to connect directly to the sensors in the pumps without the need for any sensing relays. All float and sensor inputs are designed to operate at voltages and currents well below the intrinsically safe limits.

B. Duplex Pump Operation Using Backup Controller

1. In this mode BACKUP START float is suspended in the wet well above the operating range of float switches for the primary controller.
2. If the primary controller should be unable to maintain the level below this point the float switch will close and the backup controller will be activated in the single float backup mode. When this happens the alarm relay will be closed and the alarm light and flasher will be illuminated and the alarm horn will sound.
3. One of the pumps control relays will close calling one of the pumps. After a delay of 8 seconds the second pump control relay will close calling the second pump. The controller then waits for the level to pump down to a point where the float switch opens. After the high float switch opens the pumps remain on for a period of time selected by the delay time switches on the backup controller. After the delay has elapsed the two pumps will turn off. The alarm relay and lamp will remain energized. The backup controller will then wait for the high float to again close and repeat the above operation except that the two pumps will be called in the reverse order (alternated) to equalize pump wear. The delay time can be selected using 8 switches on the backup pump controller for a time between 0 and 255 seconds (4.25 min.).

C. Motor Megger Function: Each time a pump is called to start the motor megger module will test the insulation of motor insulation. If the winding resistance is below the setpoint value, the pump will not start and the “Motor Megger Fail” indicating light will illuminate.

1.5 QUALITY ASSURANCE: All materials used shall be new, of high grade and of properties best suited to the Work required.

A. Manufacturer’s Qualifications

1. Controls shall be furnished by a UL recognized supplier.
2. Controls shall be furnished by the pump supplier.

B. Coordination Responsibility

1. Contractor shall retain overall responsibility for equipment coordination, installation, testing and operation.

1.6 COORDINATION: Examine the areas and conditions under which work of this section will be performed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

1.7 SPARE PARTS: Provide the following spare parts for each type of material specified:

A. Fuses - 3 of each type used

B. Indication Light Bulbs - 100%

C. Float switches - 2

1.8 WARRANTY

A. Provide warranty under provisions of Section 01700 - Contract Closeout.

B. Controls Supplier shall furnish to the Owner a written warranty against defects in workmanship and materials for two (2) years. All parts shall be covered under warrantly. Coverage shall be full and not prorated. Written warranty shall include the following provisions:

1. Representative of Controls Supplier shall visit the site within two (2) working days after a problem is reported to Control Supplier's office.
2. Components replaced or repaired under warranty, if removed, shall be re-installed by Controls Supplier. Warranty shall be in printed form.
3. Damage resulting from natural events such as lightening may be excluded from warranty. However, if Supplier concludes that lightening damage is the cause of malfunction, Supplier shall present evidence of such to Owner and Engineer.

PART 2 PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS

A. Provide only materials that are new, of the type and quality specified, and free from defects and imperfections. Where Underwriters Laboratories Inc. has established standards for such materials, provide only materials bearing the UL label.

B. All materials and equipment of the same type shall be made by the same manufacturer.

C. All materials and equipment shall be acceptable to the authority having jurisdiction as suitable for the use intended.

D. Provide all components specified herein for each lift station, unless otherwise noted.

2.2 PUMP CONTROL PANEL

A. Each lift station shall be furnished with a complete assembled and pre-wired control panel suitable for mounting as indicated on the Drawings. Each control panel shall contain all necessary components specified below for automatic operation, protection, and alarm indication.
1. Each control panel shall have an "as built" wiring diagram or schematic attached to the inside face of the outer door of the control enclosure. The wiring diagram or schematic shall clearly indicate all equipment, devices, terminal designations, wire colors, and wire marking.
2. All control panels shall be tested and inspected before delivery to insure complete and proper operation.
3. Float switch operation shall be intrinsically safe.

B. Enclosure: Control panel enclosure shall be NEMA 4X with integral pedestal base unit (one piece) with stainless steel hinges and pins, stationary inner panel (located at the back of the panel), and a deadfront hinged swing-out panel.
1. Enclosure shall be made of .090 stainless steel or .125 aluminum with a light gray powder coat finish. (All holes in the aluminum shall be pre-cut or drilled prior to the powder coated to insure against corrosion). The outer door shall be hinged on the left side with heavy gauge stainless steel hinge and stainless steel pin. Stainless steel draw and turn latches shall be provided, One (1) with a locking hasp (the hasp shall accommodate a standard padlock) and five (5) without.
2. Provide padlock with plastic shield over keyhole. Furnish 3 keys to Owner.
3. The interior panels shall be .125 aluminum or 12 gauge steel with white powder coat finish. The swing out inner door panel and mounting hardware shall be finished with a white powder coat and be the manufacturers standard accessories. Hardware shall be 304 stainless steel. All screws bolts, washers, and nuts shall be stainless steel. All holes through the exterior of the enclosure or pedestal shall be sealed or include a sealing washer.
4. The swing-out deadfront panel shall have cutouts sized for the lights, selector switches, pushbuttons, cutouts for circuit breakers, and thru-door disconnect. All cutouts shall be

cut prior to powder coating and include a border of not less than ½" around each cutout, made of the 1/8", 2 part engraving plastic, with 1/4" letters describing the function of each component on the swing-out deadfront. The main breaker shall be interlocked with the swing-out deadfront panel to prevent opening interior deadfront panel unless the main breaker handle is in the off position.

5. A separate fused 120 volt fused cabinet heater with continuously operating fan and thermostat shall be installed inside the control enclosure to prevent internal condensation. Heater shall be sized to keep the panel interior a minimum of 5 deg. F above outside ambient.
6. An engraved nameplate with 3/8" upper case letters shall be affixed to each outer door of panels identifying each lift station by station number.
7. All components mounted on the back panel shall be accompanied by an identification name plate engraved with the component description. The letters shall be 1/4" and be unobstructed or visible while standing in front of the enclosure.
8. The pedestal shall be provided with 2 compartments below the main panel. The compartments shall be separated so not to allow gasses or air to pass from one compartment the other. The enclosure shall be separated from the pedestal by PVC or stainless steel cord grips. Below the lower component compartment and prior to the wetwell rigid seal-offs shall be provided for all conduits that enter the wetwell space. The pedestal shall have a cover which is securely attached with stainless steel screws.
9. An internal brace shall be provided for support of the externally mounted control transformer, and shall be minimum 2 x 2 x 1/4 stainless steel or aluminum. Control transformer shall not be mounted inside the enclosure.
10. Power supply wire shall be pre-wired from the main breaker to the terminal chamber in the pedestal, and provided with terminal lugs.

C. Wiring

1. Alpha or Belden 600V, 105°C, UL style 1015 wire or Houston Wire and Cable SI-57275, SIS Vulkene insulated switchboard wire. DC signal wiring shall be as specified in this Division.
2. Wire Sizes
   a. No. 12 AWG, 41 strand, for all convenience outlets, interior lighting, and other similar loads.
   b. No. 14 AWG, 41-strand, for low power loads of 115V or lower voltage.
3. Wire Markers
   a. Plastic coated hot-stamped tube-type, wire markers for snug fit for wire size. Printed tape markers are not acceptable.
   b. Identify both ends of wire with the same unique wire number.
   c. Assign wire numbers where specific designations are not indicated.
4. Wire Terminals
   a. All control wires shall be terminated with vinyl insulated pin terminals, copper with electroplated tin finish, Sta-Kon or equal, with 600Vrating. Terminals shall be attached with proper crimping tool.
5. Wiring Methods
   a. Route main groups of wires in plastic nonflammable wiring duct.
   b. Smaller groups of wire shall be cabled and secured with nylon cable clamps and ties or plastic spiral wraps.
   c. Route instrument dc signal wiring in separate ducts or groups from ac power and control wiring.
   d. For equipment and Terminal Block Connections install terminals with tool as recommended by manufacturer to apply required amount of pressure correctly.
   e. Solder Connections: Soldering iron used shall not exceed 100 W.
   f. Provide terminal blocks for all external connections.

g. Provide neutral/ground bar shall be provided for termination of neutral and equipment ground connections.

6. Identification
   a. Identify all apparatus used for operation and control of circuits, appliances, and equipment, including circuit breakers, control switches, and indicating lights Provide plastic laminate nameplates, black face with white core letters, showing proper identification. Minimum size nameplate shall be 1" x 3" with 1/4" letters. Labels shall be secured using silicone glue in a neat and properly aligned manner.
   b. Wire and cable markers shall be type written vinyl self laminating markers, which have a clear overlay of vinyl and an aggressive adhesive for adhesion to the wire.
7. Power Cable: Power supply wire to the inner door shall be stranded welding cable with heavy sheath.

D. Terminal Strips
1. Provide all end caps, clamps, dividers, terminal numbers, DIN rails, and any other items necessary to provide the terminal strip assemblies. Within each terminal strip the terminals shall be numbered consecutively. All terminal strips shall be 5 mm polyamide type similar to the Phoenix contact UK series or Weidmueller W Series.

E. Switch Action Fuse Blocks
1. Rated 600V, 30-A.
2. Sectional type nylon or polypropylene blocks.
3. Strap screw contacts or tubular clamp contacts.
4. Pressure sensitive marking tape for terminal identifications.

F. Main Circuit Breaker: Main circuit breakers shall be of voltage and phase suitable for the pumps, U.L. 489 listed, CSA rated, quick-make, quick-break, thermal and instantaneous magnetic trip with symmetrical interrupting rating as required to meet Utility's short circuit ampacity. Main breaker shall be lockable.
1. Trip rating as indicated or recommended by manufacturer of equipment being protected.
2. Main circuit breakers shall have factory-set thermal overload characteristics, with thermal trip rating set to carry total lift station load, and an adjustable instantaneous magnetic trip.
3. The main breaker shall be interlocked with the swing-out deadfront panel to prevent opening interior deadfront panel unless the main breaker handle is in the off position.

G. Pump Circuit Breakers: Circuit breakers and motor circuit protectors shall be of voltage and phase for the pump, U.L. 508 listed, quick-make, quick-break, thermal and instantaneous magnetic trip with required RMS symmetrical interrupting rating to match the main circuit breaker.
1. Trip rating as indicated or recommended by manufacturer of equipment being protected.
2. Main circuit breakers shall have factory-set thermal overload characteristics, with thermal trip rating set to carry total pump load, and an adjustable instantaneous magnetic trip.
3. Pump motor circuit protectors shall have field-adjustable thermal overload relays set to correspond with pump motor full-load current and operating conditions, field adjustable instantaneous magnetic trip, and an auxiliary contact to open when the breaker unit opens, wired in the motor starter control circuit. In lieu of integral adjustable thermal overloads in the breaker unit, a separate 3-pole manual reset thermal bimetallic overload relay unit may be used in conjunction with the starter contactor.
4. Mount on a panel inside control panel in a readily accessible location.

H. Pump Motor Contactors: Pump motor magnetic contactors shall be full voltage, non-reversing or reversing as indicated, rated in accordance with NEMA standards, sizes and horsepower ratings.
1. Necessary auxiliary contacts required by means of starter or relay.

2. Auxiliary relay, 120 VAC contacts rated 6A up to 300V.
3. Square D “Type S, Class 8502" or equal. Alternate sources: Allen-Bradley Co.; Cutler Hammer; General Electric; Westinghouse.

I Motor Controllers
1. Magnetic Starters
   a. Full voltage, non-reversing or reversing as indicated, rated in accordance with NEMA standards, sizes and horsepower ratings.
   b. Starters shall be horsepower rated.
   c. Solid state overload relays for overload, phase loss protection, phase unbalance. The relay shall have an LED power indication. It shall be resettable.
   d. Necessary auxiliary contacts required by means of starter or relay.

J. General-Purpose Control Relays
1. Control relays shall be 120 VAC general purpose plug-in type, furnished complete with front wired socket bases. Contacts shall be DPDT silver cadmium oxide, and rated 10 amp continuous at 120 VAC.
2. Time delay relays shall be 120 VAC general purpose plug-in type furnished complete with front wired socket bases. Contacts shall be DPDT silver cadmium oxide, rated 5 amp continuous at 120 VAC Time delay relays shall be "on delay" type (contacts operated on an adjustable delay after coil energization) and have an adjustment knob for field adjustment of time delay.
3. All control relays shall have an indicator light and check button.

K. Primary Pump Controller
1. Duplex Float Switch Controller shall be a microcomputer based device which automatically controls one or two pumps. The controller shall be designed to work with standard float switches, seal leak sensors and thermal switches in submersible pumps. All of the inputs shall be optically isolated. The unit shall be Digital Controls Corporation “Model 12036", or equal, and shall include the following features:
   a. A built in alternator with selector switch.
   b. One RS-232 serial port. If this port is connected to a telephone or radio modem the controller will function as both a pump controller and as a remote terminal unit in a SCADA telemetry system.
   c. Five float switch inputs for the float switch modes.
   d. Four error sensor inputs for pump failure.
   e. Two warning sensor inputs.
   f. Five relays for driving two motor starters, the high alarm lamp, the alarm horn, and the low alarm.
   g. 15 indicator light emitting diodes (lamps) as follows: high water alarm horn, high water alarm light, pump 1 run, pump 2 run, low water alarm, pump 1 seal fail, pump 2 seal fail, pump 1 temp fail, pump 2 temp fail, pump 1 disable, pump 2 disable, high float closed, lag float closed, lead float closed, off float closed.
   h. A power supply for system power.
   i. One input for a horn mute switch.
2. The five float switch inputs shall be self powered and optically isolated. The floats should all be normally open (closed when submerged) type floats. The float switch inputs shall have the following specifications:

Voltage when open	12.0 Volts DC
Current when closed	.8 milliamps
Isolation	2500 V rms

3. The four error inputs shall be self powered and optically isolated. They shall be able to be directly connected to the seal leak sensor in a submersible pump or to thermal sensor or both. They shall have the following specifications:

Voltage when open	12.0 Volts DC
Max current	2.3 milliamps
Isolation	2500 Vrms

4. The two warning inputs shall be identical to the error inputs except that they shall not disable the pumps.
5. The controller shall have five relays (pump 1, pump 2, high alarm, high alarm horn , and low alarm) which have the following specifications:

Contact Rating	10 Amps at 125 VAC
Breakdown Voltage	800 Vrms
Life	100,000 cycles minimum at max load 5,000,000 cycles unloaded

6. The Float Switch Controller shall be designed to run on standard line power. It shall be fused, surge protected, and transformer isolated. All internal power supplies are regulated. The system has the following input power requirements:

Input Voltage	115 VAC +/- 15% at 60 Hz. +/- 20%
Input Current	0.7 Amps Max
Transient protection	Metal Oxide Varistor

7. Mute Input: The Float Switch Controller shall have one input which is used to silence the high alarm horn. When it is shorted to ground the high alarm horn relay will be opened to stop the high alarm horn during a high alarm condition. The high alarm light relay will not be affected by this action. When the current high alarm condition is cleared the high alarm horn relay will again be armed so that any new high alarms will sound the horn.

L. Backup Pump Controller

1. The backup pump control system shall automatically control up to two pumps, and shall also have the ability to function as a primary float switch controller. It shall have four possible modes of operation, three backup and one primary. It shall automatically select the appropriate mode of operation. When operating as a backup controller it shall only call for a pump if the primary controller failed to maintain the wet well level within normal operating limits. If the backup controller senses that the level has exceeded the primary control upper limit then it will take over and operate the pumps. When the backup controller takes over control it sets an alarm relay and lamp which will not clear until the backup controller is manually reset. The backup controller shall have the ability to function with either one or two float switches, or with three switches when operating as a primary controller. The unit shall be Digital Controls Corporation “Model 11946", or equal, and shall include the following features:
   a. Five float switch inputs for the float switch modes.
   b. Three relays for driving two motor starters, and the alarm.
   c. Four indicator light emitting diodes (lamps). Two for pump 1 and pump 2 and one for alarm and a blinking OK light for normal standby mode.
   d. Eight switches for setting the delay time.
   e. A microcomputer.
   f. A power supply for system power.
   g. A reset push button for clearing the alarm.
   h. A 50 Ma. 12 volt battery charger.
   i. Eight switches for setting the delay time for the single float backup controller mode. (0 to 255 seconds.)
   j. An optional pressure transducer for measuring stand tube pressure.
2. The backup pump control system shall have three relays which have the following specifications:

Contact rating	10 amps at 125 VAC
Breakdown voltage	800 Volts RMS
Life	100,000 minimum cycles at rated load 5,000,000 cycles unloaded

3. The backup pump control system shall have 4 LED indicators which have the following functions:

OK:	Flashes green when the system is operating normally and the backup controller has not been called.
PUMP 1:	Illuminates yellow when pump 1 has been called by the backup controller.
PUMP 2:	Illuminates yellow when pump 2 has been called by the backup controller.
ALARM:	Illuminates red when the backup controller has been called.

4. Input Power: The system is designed to operate with an external 12 Volt transformer.

Input Voltage	12 VAC + 50% - 10%
Input Current	1 amps max

Input power is transient protected and current limited. Transient protection is a metal oxide varistor. The power system is regulated.

5. The Backup Pump Controller shall have a built in battery charger which is intended to charge a 12 Volt sealed lead acid battery for use in maintaining the alarm system or a SCADA remote terminal unit. Charging current shall be 50 Milliamps.

M. Pushbuttons, selector switches, and indicating lights: Pushbuttons and selector switches shall be U.L. listed, heavy-duty oil tight, and shall be in accordance with NEMA ICS.

1. Pilot Lights: Provide pilot lights for each pump, for “Run”, “Seal Moisture”, and “Motor Temperature” conditions. Provide also on each for “High Water Alarm”, “Low Water Alarm”, and operation of each float switch.
   a. Heavy-duty NEMA 4x rated.
   b. Full voltage type.
   c. Color caps as follows: Amber for “run”, green for float switches, red for level alarms, motor over-temperature, and seal moisture.
   d. Push-to-test type.
2. Selector Switches
   a. Three position switch operator shall be non-illuminated, with a black gloved hand knob, and lockable.
   b. The switch arrangement and legend plate shall be as indicated.
   c. Shall be UL and NEMA Type 4X.
   d. Source: Class 9001 Type SK-30.5 mm as manufactured by Square D or Engineer approved equal.

N. Elapsed Time Meters: Provide for each pump. Meters shall be mounted inside the enclosure on the interior dead front.

1. Non resettable.
2. Panel mounted.

O. Mounting of Relays and Control Devices

1. Complete accessibility to all terminals, relay sockets, and other devices without dismantling of panel equipment.
2. Do not block access to any instruments or control devices mounted on face sheet.
3. Installed on swing-out panels if necessary.
4. Mount all diodes, resistors and similar equipment between terminal points on terminal blocks.

P. Lightning arrester: A lightning arrester shall be connected to the incoming power terminals. Arrester shall be U.L. listed, and CSA Certified, rated 650 volts AC to ground for voltage and phase for the pump, 3-wire services. Arrester shall be mounted on exterior of cabinet. Square D “SDSA 1175" for single phase applications, and “SDSA 3650" for three-phase applications, or equal.

Q. Phase monitor: Provide for each lift station, three-phase or single phase as applicable. Power monitor shall be a panel-mounted unit designed to continuously monitor the three-phase, voltage as applicable, 60 Hz power source for abnormal conditions. Unit shall protect against: phase loss, low voltage, phase reversal, voltage unbalance, and high voltage. Unit shall be RK Electronics "Single Phase Voltage Monitor", or equal, and shall have the following features:

1. LED readout.
2. Time delays as follows: Pick-up of 0.1 seconds, and Drop-out of 0.2 seconds.
3. Isolated 5 amp SPDT relay contacts.
4. Undervoltage shall be adjustable to 12% below maximum nominal voltage.
5. Overvoltage shall be adjustable to 12% above maximum nominal voltage.
6. Operating temperature of unit shall be 0°C to +40°C.

R. Ground fault circuit interrupter: A ground fault circuit interrupting receptacle shall be mounted flush with the side of the pedestal enclosure, to provide 120 VAC power for maintenance personnel at each lift station site. GFCI receptacle shall be U.L. listed, meet U.L. class A tripping requirements, and have a NEMA 5-15R configuration. GFCI receptacle shall have a test/reset button.

S. Alarm beacon and Audio Alarm: Alarm beacon mounted on panel enclosure and at remote location as indicated on the drawings shall be a U.L. listed, weatherproof, 120 VAC flashing beacon light with an amber colored shatter resistant acrylic dome and stainless steel dome bands. Flash rate shall be 60 to 80 flashes per minute. Beacon lamp shall be a bayonet type #25T8DC rated at 200 hours. Alarm beacon shall be suitable for mounting on ½" rigid galvanized steel conduit. An audio alarm shall also be provided.

T. All equipment and devices shall be rated for operation in an ambient temperature of 50°C, minimum.

2.3 CONTROL DEVICES

A. Level controls: Level controls for automatic pump operation shall be mercury displacement switches encapsulated in solid polyurethane foam floats, approved by Underwriter's Laboratories, Inc. for hazardous atmospheres. The switch circuitry shall be designed to operate with intrinsically safe relays located in the control panel.

2.4 ELECTROMAGNETIC FLOWMETER

A. Provide one electromagnetic flow meter, complete with signal converter, cables, and other accessories required for a complete and functional installation. Flowmeter shall be a Danfoss "Mag 3100 W" with "MAG 500" signal converter, or approved equal. Flowmeter shall be installed in a meter pit as indicated on the Drawings. Signal converter shall be installed in the pump control panel and wired to a source of control power.

B. Meter Design Specifications:

1.	Type:	Sensor with ANSI Class 150 flanges
2.	Body material:	Carbon steel with 2-component coating
3.	Connection Size:	2-inch
4.	Required metering flow range:	15 - 100 gpm
5.	Liner:	Neoprene
6.	Temperature rating of medium:	32 to 200 deg F
7.	Ambient temperature rating:	-40 to 210 deg F
8.	Operating pressure:	0.15 to 600 psia

9.	Excitation frequency:	3.125 Hz
10.	Enclosure rating:	NEMA 6
11.	Earthing electrodes:	AISI 316 Ti

C. Signal Converter Design Specifications:

1.	Accuracy:	0.5%
2.	Supply voltage	115-230V a.c.
3.	Power consumption:	9 VA at 230V a.c.
4.	Current outputs:	0-20 mA or 4-20 mA
5.	Digital outputs:	Active or passive
6.	Relay output:	One, adjustable function (error, direction/limit, etc.)
7.	Totalizers:	Two 8-digit counters; forward, net, or reverse flow
8.	Display	Backlit alphanumeric,2 lines x 20 characters Reverse flow indicated by negative sign.
9.	Zero point adjustment:	Automatic
10.	Galvanic isolation:	All inputs and outputs
11.	Enclosure:	Insert type for mounting through panel deadfront IP 20 enclosure rating

D. Additional Features:

1. Flowmeter shall have a sensorprom unit which stores sensor calibration data and signal converter settings for the lifetime of the meter. At commissioning the flowmeter shall commence metering without any initial programming. User specified settings shall be downloadable to the sensorprom unit. If the signal converter ever needs to be replaced, the new converter shall be able to upload all previous settings and resume measurement without any need for reprogramming.
2. Signal converter shall have the following functions: Flowrate, totalizer, low flow cut-off, empty pipe cut-off, flow direction (uni- or bi-directional), error system, operating time, limit switches, pulse output.
3. Equalization of sensor potential shall be accomplished effectively and completely. Manufacturer may offer built-in grounding electrodes for equalization. If this method does not prove adequate, a grounding flange shall be furnished, installed, and properly grounded and bonded at no additional cost to Owner.

2.5 FLOW COUNTER

A. Provide an 8-digit non-resettable electro-mechanical counter and install on the outside of the pump control panel enclosure. Counter shall receive a pulse signal from the flowmeter's signal converter. Pulse size and counter units will be selected by Engineer. Counter shall be wired to control power in the pump control panel.

2.6 HIGH VISIBILITY STROBE LIGHT

A. Provide a high-intensity strobe warning light for communication of pump station alarms. Strobe light shall be wired from and mounted on the control panel and at a remote location as indicated on the Drawings. Strobe light shall activate as a common alarm.

B. Strobe light shall be Federal Signal Corporation "Starfire 131 DST" with the following specifications:

1.	Voltage:	120 VAC
2.	Flash Rate:	80 per minute, double flash
3.	Candlepower:	1,000,000 peak, 1,200 effective

4.	Lamp life:	2,000 hours
5.	Temperature rating:	-40 deg F to 149 deg F
6.	Dome color:	Amber
7.	Dome type:	High strength Lexan Fresnel dome
8.	Lamp base:	Anodized aluminum
9.	Enclosure rating:	NEMA 3R
10.	Overall size:	5-11/16" dia x 8-1/2" high
11.	Mount:	½" Pipe

2.7 CAPACITOR START KIT

A. Provide for each pump a capacitor start kit with starting and running capacitors. Capacitors shall be in separate enclosures for each pump within the panel enclosure. The kit shall be removable from the panel as a unit without the use of tools.

PART 3 EXECUTION

3.1 LABOR AND WORKMANSHIP: All labor for the installation of materials and equipment furnished for the electrical system shall be done by experienced workman of the proper trades.

A. All electrical equipment furnished shall be adjusted, aligned and tested by the Contractor as required to produce the intended performance.

B. Upon completion of the work, thoroughly clean all exposed portions of the electrical installation, removing all traces of soil, labels, grease, oil, and other foreign material, and using only the type of cleaner recommended by the manufacturer for the item being cleaned.

3.2 COORDINATION: Coordinate as necessary with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.

A. Coordinate the installation of electrical items with the schedule for work of other trades to prevent unnecessary delays in the total work.

B. Data indicated on the Drawings and in these Specifications are as exact as could be secured, but their absolute accuracy is not warranted. The exact locations, distances, levels, and other conditions will be governed by actual construction and the drawings and specifications should be used only for guidance in such regard.

C. Verify all measurements at the job sites. No extra compensation will be allowed because of dimensional differences between the drawings and actual measurements at the site of construction.

D. The electrical Drawings are diagrammatic, but shall be followed as closely as actual construction and work of other trades will permit. Where deviations are required to conform with actual construction and the work of other trades, make such deviations without additional cost to the Owner.

3.3 INSTALLATION

A. All installation practices shall be in accordance with the listed codes, standards, and manufacturer’s recommendations.

B. Hazardous (Classified) Locations

1. All work in hazardous locations shall be completed in accordance to the NEC and as shown on the Drawings. In the case of conflicts, the Contractor shall notify the Engineer in writing and await for written instructions.
2. All conduit shall be rigid galvanized steel, equivalent to Schedule 40 pipe. EMT and IMC, as defined in the NEC, shall not be used. Schedule 80 PVC shall be used only where specifically noted on the Drawings.
3. Conduit sealing fittings shall be installed as required by the NEC.
4. Drain seals shall be installed on vertical conduits immediately before entering equipment enclosures in order to prevent moisture from entering equipment. Drains shall be used at all low points in the conduit systems and as required to prevent accumulation of moisture in conduit and equipment enclosures. All conduits passing through building walls shall be sealed within 18" of outside walls.
5. Conduit sealing fittings shall not be packed or poured unit all systems have been inspected and tested.

C. Pump Power Wire Terminations: Terminations of pump power wires shall be made in the terminal chamber of the pedestal base, using aluminum-copper one-hole lugs rated 235 kV, 600V, with crimped connection. Crimps shall be made with proper crimping tool approved by manufacturer. Surfaces of lugs shall be clean and smooth, and before termination shall be cleaned with connection cleaner and not touched with hands after cleaning. Completed connections shall be taped with rubber tape rated for 600V, then covered with two layers of 3M “Super 88" tape. Tape shall be wrapped tightly with no voids.

3.4 ACCEPTANCE TESTING

A. General
1. Provide temporary power source of proper type for testing purpose when normal supply is not available.
2. When material and/or workmanship is found not to comply with the specified requirements, the noncomplying items shall be removed from the job site and replaced with items complying with the specified requirements promptly after receipt of notice of such non-compliance.

B. Test Procedures
1. Prior to energizing circuitry, test wiring devices for electrical continuity and proper polarity connections.
2. The control and instrumentation circuits shall be demonstrated to operate satisfactorily and to conform to contract documents.

C. System Functional Test
1. Upon completion of equipment tests, a system functional test shall be performed.

3.5 CONTROL PANEL SCHEDULE

A. Charleston MODOT Pump Station: Duplex pump control panel shall be provided with the following major features. This list is not intended to be all-inclusive, but is presented as an aid in bidding and construction of the panel. Panel shall be constructed as specified herein and as required for a complete and fully functional installation:

1. Pedestal enclosure. Refer to Drawings for elevation view of deadfront panel.
2. Main circuit breaker.
3. Phase monitor.
4. Single-phase Lightning arrestor.
5. Circuit breaker and motor contactor for each pump.

6. Motor megger for each pump.
7. Seal fail relays for each pump.
8. Elapsed time meters for each pump.
9. Primary Pump Controller, with face mounted through deadfront.
10. Backup Pump Controller, with 12 volt battery backup, charger for alarm system.
11. 12-volt alarm beacon and horn.
12. Switches, indicating lights, and fuse holders as indicated on the elevation view of panel deadfront.
13. Terminal strip for alarm contacts. Each alarm condition shall be provided with a set of normally open dry contacts on a common terminal strip. Alarm contacts shall include:
    For each pump: Seal failure, motor over temp, megger fail
    High water level
    Low water level
    Power fault (phase monitor alarm)
14. Flowmeter signal converter with face installed through deadfront panel.
15. Flow counter installed through side of panel enclosure.
16. Space in control panel for future autodialer.
17. High visibility strobe light (mounted on panel and at remote location)
18. 3 Kva Central Power Transformer.
19. Capacitor start kit for each pump.

END OF SECTION

Missouri
Division of Labor Standards

WAGE AND HOUR SECTION

JEREMIAH W. (JAY) NIXON, Governor

Annual Wage Order No. 17

Section 067

MISSISSIPPI COUNTY

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards, P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by
Carla Buschjost, Director
Division of Labor Standards

This Is A True And Accurate Copy Which Was Filed With The Secretary of State: **March 10, 2010**

Last Date Objections May Be Filed: **April 9, 2010**

Prepared by Missouri Department of Labor and Industrial Relations

Building Construction Rates for
MISSISSIPPI County

Section 067

OCCUPATIONAL TITLE	**Effective Date of Increase	*	Basic Hourly Rates	Over-Time Schedule	Holiday Schedule	Total Fringe Benefits
Asbestos Worker			$28.65	119	56	$12.36
Boilermaker			$32.30	57	7	$20.01
Bricklayers-Stone Mason			$26.57	75	40	$8.07
Carpenter			$21.63	62	43	$11.44
Cement Mason			$19.45	81	7	$14.70
Electrician (Inside Wireman)			$33.60	82	71	$7.96 + 42.5%
Communication Technician			$29.50	44	47	$7.43 + 29.75%
Elevator Constructor		a	$40.945	26	54	$21.505
Operating Engineer						
Group I			$25.92	86	66	$18.37
Group II			$25.92	86	66	$18.37
Group III			$24.67	86	66	$18.37
Group III-A			$25.92	86	66	$18.37
Group IV			$23.69	86	66	$18.37
Group V			$26.62	86	66	$18.37
Pipe Fitter		b	$34.00	91	69	$21.43
Glaizer			$21.13	89	50	$9.60
Laborer (Building):						
General			$19.56	49	7	$8.89
First Semi-Skilled			$20.88	49	7	$8.89
Second Semi-Skilled			$19.88	49	7	$8.89
Lather			$21.63	62	43	$11.44
Linoleum Layer & Cutter			$21.63	62	43	$11.44
Marble Mason			$26.57	75	40	$8.07
Millwright			$21.63	62	43	$11.44
Iron Worker			$23.38	90	61	$14.71
Painter			$19.23	106	62	$10.00
Plasterer			$20.40	121	20	$8.90
Plumber		b	$34.00	91	69	$21.43
Pile Driver			$21.63	62	43	$11.44
Roofer			$19.25	15	73	$8.87
Sheet Metal Worker			$34.82	32	25	$19.71
Sprinkler Fitter			$30.84	33	19	$15.80
Terrazzo Worker			$26.57	75	40	$8.07
Tile Setter			$26.57	75	40	$8.07
Truck Driver-Teamster						
Group I		c	$26.22	103	77	$9.40
Group II		c	$26.38	103	77	$9.40
Group III		c	$26.37	103	77	$9.40
Group IV		c	$26.49	103	77	$9.40
Traffic Control Service Driver			26.415	22	55	$9.045
Welders-Acetylene & Electric		*				

Fringe Benefit Percentage is of the Basic Hourly Rate

Attention Workers: If you are not being paid the appropriate wage rate and fringe benefits contact the Division of Labor Standards at (573) 751-3403.

OCCUPATIONAL TITLE	Effective Date of Increase	Basic Hourly Rates	Over-Time Schedule	Holiday Schedule	Total Fringe Benefits

* Welders receive rate prescribed for the occupational title performing operation to which welding is incidental.

Use Building Construction Rates on Building construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(2).

Use Heavy Construction Rates on Highway and Heavy construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(3).

a - Vacation: Employees over 5 years - 8%, under 5 years - 6 %
b - All work over $7 Million Total Mechanical Contract - $34.00, Fringes - $21.43
All work under $7 Million Total Mechanical Contract - $32.66, Fringes - $16.04
c - Group I:
Projects over $3 3/4 Million - $26.22
Projects under $3 3/4 Million - $22.72
Group II:
Projects over $3 3/4 Million - $26.38
Projects under $3 3/4 Million - $22.88
Group III:
Projects over $3 3/4 Million - $26.37
Projects under $3 3/4 Million - $22.87
Group IV:
Projects over $3 3/4 Million - $26.49
Projects under $3 3/4 Million - $22.99

MISSISSIPPI COUNTY
OVERTIME SCHEDULE - BUILDING CONSTRUCTION

FED: Minimum requirement per Fair Labor Standards Act means time and one-half (1 ½) shall be paid for all work in excess of forty (40) hours per work week.

NO. 15: Means the regular working day shall be scheduled to consist of at least eight (8) hours, but no more than ten (10) consecutive hours, exclusive of the lunch period. The regular working day may be scheduled to commence at any time between the hours of 5:00 a.m. and 10:00 a.m. All work performed in excess of forty (40) hours in one work week, or in excess of ten (10) hours in one work day shall be paid at the rate of one and one-half (1½) times the regular hourly wage scale. Any work performed on a Saturday shall be paid for at the rate of one and one-half (1½) times the regular hourly wage scale unless such Saturday work falls under the category of Saturday Make-Up Day. Any work performed by Employees anywhere on Sunday or recognized holidays, shall be paid for at the rate of double (2) time the regular wage scale. If, during the course of a work week, an Employee is unable to work for any reason, and, as a result, that Employee has not accumulated forty (40) hours of compensable time at the straight time rate, the Employer, at his option may offer the Employee the opportunity to work on Saturday at straight time; provided, however, if during the period worked by said Employee on Saturday, the Employee's compensable time at the straight time rate exceeds forty (40) hours, all time worked in excess of the forty (40) hours will be paid at the rate of one and one-half (1½) times the regular hourly wage scale.

NO. 22: Means a regular work week of forty (40) hours will start on Monday and end on Friday. The regular work day shall be either eight (8) or ten (10) hours. If a crew is prevented from working forty (40) hours Monday through Friday, or any part thereof by reason of inclement weather, Saturday or any part thereof may be worked as a make-up day at the straight time rate. Employees who are part of a regular crew on a make-up day, notwithstanding the fact that they may not have been employed the entire week, shall work Saturday at the straight time rate. A workday is to begin between 6:00 a.m. and 9:00 a.m. However, the project starting time may be advanced or delayed if mutually agreed to by the interest parties. For all time worked on recognized holidays, or days observed as such, double (2) time shall be paid.

NO. 26: Means that the regular working day shall consist of eight (8) hours worked between 6:00 a.m., and 5:00 p.m., five (5) days per week, Monday to Friday, inclusive. Hours of work at each jobsite shall be those established by the general contractor and worked by the majority of trades. (The above working hours may be changed by mutual agreement). Work performed on Construction Work on Saturdays, Sundays and before and after the regular working day on Monday to Friday, inclusive, shall be classified as overtime, and paid for at double (2) the rate of single time. The employer may establish hours worked on a jobsite for a four (4) ten (10) hour day work week at straight time pay for construction work; the regular working day shall consist of ten (10) hours worked consecutively, between 6:00 a.m. and 6:00 p.m., four (4) days per week, Monday to Thursday, inclusive. Any work performed on Friday, Saturday, Sunday and holidays, and before and after the regular working day on Monday to Thursday where a four (4) ten (10) hour day workweek has been established, will be paid at two times (2) the single time rate of pay. The rate of pay for all work performed on holidays shall be at two times (2) the single time rate of pay.

NO. 32: The regular working day shall consist of seven and one-half (7½) hours of labor on the job between eight (8) a.m. and four (4) p.m. and the regular working week shall consist of five (5) consecutive seven and one-half (7½) hour day's of labor on the job beginning with Monday and ending with Friday of each week. The normal work week is 37½ hours. All full-time or part-time labor performed during such hours shall be recognized as regular working hours and paid for at the regular hourly rate. **All work performed during regular work hours on Saturdays shall be paid at time and one-half (1-1/2).** All work performed outside of regular working hours and performed during the regular work week, shall be at double (2) times the regular rate, except that the first two (2) hours following the regular work day shall be paid at one and one-half (1½) times the regular rate. And, a flexible starting time as early as 7:00 a.m. may be implemented when mutually agreed upon by the interested parties. An early starting time of 6:00 a.m. may be used during summer months to avoid excessive afternoon temperatures. This early starting time to be used when mutually agreed upon by the interested parties. **SHIFT RATE:** Shift work would start after 4:00 p.m. to 6:00 a.m. The first 7½ hours would be at 115% of the basic wage rate. Overtime Monday through Friday would be at 1 ½ of base shift rate. Saturday first 7 ½ hours of work – 1½ of base shift rate. Saturday – work after 7½ hours – 2 times the basic wage rate. Sunday and Holidays – 2 times the basic wage rate. All work performed on recognized holidays and Sundays shall be paid double (2) time. Appropriate overtime rates to be based on fifteen minute increments.

NO. 33: Means the standard work day and week shall be eight (8) consecutive hours of work between the hours of 6:00 a.m. and 6:00 p.m., excluding the lunch period Monday through Friday, or shall conform to the practice on the job site. Four (4) days at ten (10) hours a day may be worked at straight time, Monday through Friday and need not be consecutive. All overtime, except for Sundays and holidays shall be at the rate of time and one-half (1½). Overtime worked on Sundays and holidays shall be at double (2) time.

MISSISSIPPI COUNTY
OVERTIME SCHEDULE - BUILDING CONSTRUCTION

NO. 44: Means forty (40) hours shall constitute a work week, Monday through Friday. Eight (8) hours shall constitute a work day. Hours of work shall be between the hours of 7:00 a.m. and 4:30 p.m. All work performed before 7:00 a.m. and after 4:30 p.m. and all work performed in excess of eight (8) hours in any one work day, over forty (40) hours in any work week and the first eight (8) hours of work on Saturday, shall be paid at the rate of one & one-half (1½) times the regular rate of pay. All hours worked in excess of eight (8) hours on Saturday, all hours worked on Sunday and on holidays, or days that may be celebrated as such, and as designated by the federal government, shall be paid at two (2) times the regular rate of pay. All shifts for work performed between the hours of 4:30 p.m. and 12:30 a.m. shall receive eight (8) hours pay at the regular hourly rate of pay plus ten percent (10%) additional for seven and one-half (7½) hours work. The ten percent (10%) differential shall apply to the basic pay rate and the percentage fringe benefit rates. All work performed between the hours of 12:30 a.m. and 8:00 a.m. on a third shift shall receive eight (8) hours pay for seven (7) hours work at the regular hourly rate plus fifteen percent (15%) differential shall apply for the basic pay rate and the percentage fringe benefit rates. All overtime work required after the completion of a regular shift shall be paid at one and one-half times (1½ x) the "shift" hourly rate.

NO. 49: Means eight (8) hours shall constitute a day's work to begin at 8:00 a.m. and end at 4:30 p.m. The starting time may be advanced one (1) hour or two (2) hours. Employees shall receive time and one-half (1½) for all time they are required to work before 8:00 a.m., during the lunch period or after 4:30 p.m. unless the starting time is advanced as provided above. Forty (40) hours shall constitute a week's work, Monday through Friday. If an Employer is prevented from working forty (40) hours, Monday through Friday, or any part thereof by reason of inclement weather (rain or mud), Saturday or any part thereof may be worked as a make-up day at the straight time rate. However, in the event that the laborer working such make-up day is assisting another craft drawing overtime pay, the laborer shall received the same overtime multiple as the craft assisted. The Employer shall have the option of working five (5) eight (8) hour days or four (4) ten (10) hour days Monday through Friday. If an Employer elects to work five (5) eight (8) hour days during any work week, hours worked more than eight (8) per day or forty (40) per week shall be paid at time and one-half (1½) the hourly rate Monday through Friday. If an Employer elects to work four (4) ten (10) hour days in any week, work performed more than ten (10) hours per day or forty (40) hours per week shall be paid at time and one-half (1½) the hourly rate Monday through Friday. If an Employer is working ten (10) hour days and loses a day due to inclement weather, he may work ten (10) hours Friday at straight time. However, in the event that the laborer working any such make-up day is assisting another craft drawing overtime pay, the laborer shall receive the same overtime multiple as the craft assisted. If workmen are required to work recognized holidays or days observed as such, or on Sunday, they shall receive double (2) the regular rate of pay for such work. **Projects that cannot be performed during regular workday:** If required by owner, the contractor may perform work outside the normal work hours and employees shall be paid applicable straight time hourly wage rate plus a premium of fifty cents ($.50) per hour for the first eight (8) hours worked. Any hours worked in excess of eight (8) hours shall be paid at the applicable overtime rate plus the fifty cent ($.50) per hour premium. **Shift work:** The Employer may elect to work one (1), two (2) or three (3) shifts on any work. When two (2) or more shifts are worked on any operation, the first shift or day shift will consists of eight (8) hours exclusive for lunch time; the second shift or swing shift shall consists of eight (8) hours work for eight and one-half (8½) hours pay, exclusive of lunch time; the third or graveyard shift shall consist of eight (8) hours work for nine (9) hours pay exclusive of lunch time.

NO. 57: Means eight (8) hours per day shall constitute a day's work and forty (40) hours per week, Monday through Friday, shall constitute a week's work. The regular starting time shall be 8:00 a.m. The above may be changed by mutual consent of authorized personnel. When circumstances warrant, the Employer may change the regular workweek to four (4) ten-hour days at the regular time rate of pay. It being understood that all other pertinent information must be adjusted accordingly. All time worked before and after the established workday of eight (8) hours, Monday through Friday, all time worked on Saturday, shall be paid at the rate of time and one-half (1½) except in cases where work is part of an employee's regular Friday shift. All time worked on Sunday and recognized holidays shall be paid at the double (2) time rate of pay.

MISSISSIPPI COUNTY
OVERTIME SCHEDULE - BUILDING CONSTRUCTION

NO. 62: Means eight (8) hours shall constitute a working day between 7:00 a.m. to 3:30 p.m. or from 8:00 a.m. to 4:30 p.m. exclusive of a one-half (½) hour lunch break. Monday through Friday shall constitute the regular work week. Starting and quitting time may be moved up or set back where conditions warrant; however, a notification for each project must be made prior to working 4-10's. All time over the regular work day as defined and all hours worked on Saturday shall be paid at the rate of one & one-half (1½) the regular rate of wages. If a job can't work forty (40) hours Monday through Friday because of inclement weather, Friday (if working 4-10's) or Saturday (if working 5-8's), may be worked as a make-up day at straight time. In the event that Friday (if working 4-10's) or Saturday (if working 5-8's) is utilized as a workday, any employee that has been absent from work during the week shall be paid the straight time rate until such time that the employee has earned forty (40) hours of straight time pay. If any employee is required to work recognized holidays or days observed as such, or on Sunday, they shall receive double (2) the regular rate of pay for such work.

NO. 75: Means the standard work day shall consist of eight (8) hours of work between the hours of 8:00 a.m. or C.S.T. or C.D.S.T. and 4:30 p.m., with a thirty (30) minute unpaid lunch period occurring in the middle of the shift. The standard workweek shall consist of five standard workdays commencing on Monday and ending on Friday, inclusive. The normal starting and quitting times may be changed by mutual consent of interested parties. All time worked before and after the established eight (8) hour work day, Monday through Friday, and all time worked on Saturdays, shall be paid for at the rate of one and one-half times the hourly base wage rate in effect. All time worked on Sundays and on recognized holidays shall be paid for at the rate of double the hourly base wage rate in effect. In a work day provided a job runs at least four (4) working days, a ten (10) hour per day, four (4) days per week work schedule may be utilized. Ten (10) hours work per day shall constitute a day's work, forty (40) hours a week, Monday through Thursday, exclusively, shall constitute a week's work. The normal starting time of said day shall be between 6:30 a.m. and 8:30 a.m. The normal quitting time shall be ten and one-half (10½) hours after the starting time. A thirty (30) minute unpaid lunch shall occur in the middle of the day. The normal starting and quitting times may be changed by mutual consent of the interested parties. Provided a job runs at least four (4) working days and in the event, the job is shut down for eight (8) hours or more in one (1) work day Monday through Thursday due to inclement weather at the job site, then, at the option of the employer, Friday of the same work week may be worked as a makeup day. The Friday makeup day will be considered identical in start and stop times as a ten (10) hour work day, (even if some overtime occurs or should ten (10) hours be lost to inclement weather), it would be worked as all other work days.

NO. 81: Means a workday of eight (8) hours, beginning at 8:00 a.m., Monday through Friday shall constitute a forty (40) hour work week. All time over the eight (8) hour day as above defined and all hours worked on Saturday shall be paid at the rate of one and one-half (1½) the regular rate of wages. If workmen are required to work the recognized holidays or days observed as such, or on Sunday, they shall receive double (2) the regular rate of pay for such work.

NO. 82: Means the workday shall consist of eight (8) hours worked between 7:00 a.m. and 4:30 p.m. Forty (40) hours will constitute the workweek from Monday through Friday inclusive. Up to four (4) hours of overtime work per day performed before or after the assigned normal workday, (twelve (12) continuous hours, starting no earlier than 6:00 a.m.), Monday through Friday, shall be paid at a rate of one and one-half times (1.5x) that employee's hourly rate. Any additional overtime, Monday through Friday, shall be paid at a rate of double (2x) that employee's hourly rate. For hours worked on Saturday, Sunday and recognized legal holidays, or days that may be celebrated as such, and as designated by the federal government, double (2) time shall be paid. All shifts for work performed between the hours of 4:30 p.m. and 12:30 a.m. shall receive eight (8) hours pay at the regular hourly rate of pay plus ten percent (10%) additional for seven and one-half (7½) hours work. The ten percent (10%) differential shall apply to the basic pay rate and the percentage fringe rates. All work performed between the hours of 12:30 a.m. and 8:00 a.m. on a third shift shall receive eight (8) hours pay for seven (7) hours work at the regular hourly rate plus fifteen percent (15%) differential shall apply for the basic pay rate and percentage fringe benefit rates. When a shift continues past the latest time at which a shift may operate, then the appropriate percentage overtime is paid.

MISSISSIPPI COUNTY
OVERTIME SCHEDULE - BUILDING CONSTRUCTION

NO. 86: Means the regular work week shall consist of five (5) days, Monday through Friday, beginning at 8:00 a.m. and ending at 4:30 p.m. The regular work day beginning time may be advanced one or two hours or delayed by one hour. However, the Employer may have the option to schedule his work week from Monday through Thursday at ten (10) hours per day at the straight time rate of pay with all hours in excess of ten (10) hours in any one day to be at the applicable overtime rate. If the Employer elects to work from Monday through Thursday and is stopped due to circumstances beyond his control, inclement weather or holiday, he shall have the option to work Friday at the straight time rate of pay to complete his forty (40) hours. If an employee declines to work Friday as a make-up day, he shall not be penalized. All overtime work performed on Monday through Saturday shall be paid at time and one-half (1½) of the hourly rate plus an amount equal to one-half (½) of the hourly Total Indicated Fringe Benefits. All work performed on Sundays and recognized holidays shall be paid at double (2) the hourly rate plus an amount equal to the hourly Total Indicated Fringe Benefits.

NO. 89: Means the normal workweek shall consist of five (5) eight (8) hour days for a total of forty (40) hours, starting on Monday at 8:00 a.m. and ending on Friday at 4:30 p.m. The starting time can be flexible between 6:00 a.m. and 8:00 a.m. and ending at 2:30 p.m. or 4:30 p.m. respectively. All work before designated starting time and after quitting time shall be paid for at the rate of time and one-half (1½) . An overtime rate of time and one-half (1½) the base hourly rate shall be paid on all hours in excess of eight (8) hours in a day Monday through Friday. Saturdays, Sundays and Holidays shall be paid for at the rate of double (2) time. Any work started after 12:00 midnight Sunday, will be classified as time and one-half (1½) up to the legal starting time on Monday.

NO. 90: Means eight (8) hours shall constitute a day's work between the hours of 7:00 a.m. to 5:00 p.m. from Monday to Friday, inclusive. The work week shall be forty (40) hours, Monday through Friday. Any work in excess of forty (40) hours in one week shall be paid at the applicable overtime rate. At the Employer's option the work week can consist of five (5) eight (8) hour days or four (4) ten (10) hour days. In case of bad weather, or equipment breakdown, Friday may be used as a make-up day if four tens are being worked. If five eights are being worked, Saturday may be used as a make-up day. If the Employer works five eight hour days, all time over eight hours in one day will be paid at the overtime rate. If the Employer works four ten hour days, all time over ten hours per day will be paid at the overtime rate. Time and one-half (1½) shall be paid for the first two (2) hours of overtime work on any regular work day and any work performed before regular starting time and after regular quitting time and for the first ten (10) hours on Saturday. All work in excess of ten (10) hours regular work day and ten (10) hours on Saturday and all work performed on Sunday and recognized holidays shall be double (2) time.

NO. 91: Means eight (8) hours shall constitute a day's work commencing at 8:00 a.m. and ending at 4:30 p.m., allowing one-half (½) hour for lunch. The option exists for the Employer to use a flexible starting time between the hours of 6:00 a.m. and 9:00 a.m. The regular workweek shall consist of forty (40) hours of five (5) workdays, Monday through Friday. The workweek may consist of four (4) ten (10) hour days from Monday through Thursday, with Friday as a make-up day. If the make-up day is a holiday, the employee shall be paid at the double (2) time rate. The employees shall be paid time and one-half (1½) for work performed **on Saturdays,** before the regular starting time or after the regular quitting time or over eight (8) hours per work day (unless working a 10-hour work day, then time and one-half (1½) is paid for work performed over ten (10) hours a day) or over forty (40) hours per work week. Work performed on Sundays and recognized holidays shall be paid at the double (2) time rate of pay. **SHIFT WORK**: When it is necessary for the project to operate in shifts, there will be three (3) eight (8) hour shifts commencing at 8:00 a.m. Shift work must continue for a period of not less than three (3) consecutive work days, two (2) days which must be regular work days (Monday through Friday). In the event the second or third shift of any regular work day shall fall into a Saturday or a holiday, such extension into a Saturday or holiday shall be considered as part of the previous workday and employees shall be paid at the regular shift rate. The first day shift shall work a regular eight (8) hour day at regular rates. The second shift shall be eight (8) hours regular time pay plus $2.00 per hour premium for seven and one-half (7½) hours work. Third shift will be for eight (8) hours regular time pay plus $2.50 per hour premium for seven (7) hour work.

NO. 103: Means a regular workweek of forty (40) hours will start on Monday and end on Friday. The regular work day shall be either eight (8) or ten (10) hours. If a crew is prevented from working forty (40) hours Monday through Friday, or any part thereof by reason of inclement weather, Saturday or any part thereof may be worked as a make-up day at the straight time rate. Employees who are part of a regular crew on a make-up day, notwithstanding the fact that they may not have been employed the entire week, shall work Saturday at the straight time rate. A Workday is to begin between 6:00 a.m. and 9:00 a.m. However, the project starting time may be advanced or delayed if mutually agreed to by the interested parties. For all time worked on recognized holidays, or days observed as such, double (2) time shall be paid.

MISSISSIPPI COUNTY
OVERTIME SCHEDULE - BUILDING CONSTRUCTION

NO. 106: Means the normal work week shall consist of five (5) eight (8) hour days for a total of forty (40) hours, starting on Monday at 8:00 a.m. and ending on Friday at 4:30 p.m. The starting time can be flexible between 6:00 a.m. and 8:00 a.m., and ending at 2:30 p.m. or 4:30 p.m. respectively. All work before the designated starting time and after the quitting time shall be paid for at the rate of time and one-half (1½). An overtime rate of time and one-half (1½) the base hourly rate shall be paid on all hours in excess of eight (8) hours in a day Monday through Friday. Any work started after 12:00 midnight Sunday, will be classified as time and one-half (1½) up to the legal starting time on Monday. Saturdays, Sundays and Holidays shall be paid for in the rate of double (2) time the prevailing scale.

NO. 119: Means the regular work day shall be eight (8) hours, between 7:00 a.m. and 5:00 p.m. The first two (2) hours worked in excess of the eight (8) hour work day, Monday through Friday, and the first ten (10) hours on Saturday, shall be paid at one and one-half (1½) times the regular straight time base rate. Sundays and holidays, time in excess of ten (10) hours a day, Monday through Saturday, shall be paid double (2) the regular straight time rate.

NO. 121: Means the regular work day shall be either eight (8) or ten (10) hours. The regular work week shall start on Monday and end on Friday, except where the Employer elects to work Monday through Thursday, ten (10) hours per day. All work over eight (8) hours per day (if working five eight hour days) and ten (10) hours per day (if working four ten hours days) and over forty (40) hours per week shall be paid at time and one-half (1½) the regular rate of pay. If a job cannot work forty (40) hours Monday through Friday because of inclement weather or other conditions beyond the control of the Employer, Friday or Saturday may be worked as a make-up day at straight time (if working four ten hour days). Saturday may be worked as a make-up day at straight time (if working five eight hour days). Make-up days shall not be utilized for days lost because of Holidays. All work performed on Sundays and Holidays shall be paid for at two (2) times the regular straight time rate of pay.

MISSISSIPPI COUNTY
HOLIDAY SCHEDULE – BUILDING CONSTRUCTION

NO. 7: The following days are assigned days and are recognized as holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, and Christmas Day. If a holiday falls on a Sunday, it shall be observed on the following Monday. If a holiday falls on a Saturday, it shall be observed on the preceding Friday. No work shall be performed on Labor Day except in case of jeopardy to work under construction. This is applied to protect Labor Day. When a holiday falls during the normal workweek, Monday through Friday, it shall be counted as eight (8) hours toward the forty (40) hour week. However, no reimbursement for these eight (8) hours is too paid to the workman unless worked. If workman are required to work the above enumerated holidays or days observed as such, or on Sunday, they shall receive double (2) the regular rate of pay for such work.

NO. 19: All work done on New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day, and Christmas Day shall be paid at the double time rate of pay. The employee may take off Friday following Thanksgiving Day. However, the employee shall notify his or her Foreman, General Foreman or Superintendent on the Wednesday preceding Thanksgiving Day. When one of the above holidays falls on Sunday, the following Monday shall be considered a holiday and all work performed on either day shall be at the double (2) time rate. When one of the holidays falls on Saturday, the preceding Friday shall be considered a holiday and all work performed on either day shall be at the double (2) time rate.

NO. 20: The following days or assigned days are recognized as holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veterans Day (to be observed November 11), Thanksgiving Day, and Christmas Day. If a holiday falls on Sunday, it shall be observed on the following Monday. If a holiday falls on Saturday, it shall be observed on the preceding Friday. No work shall be performed on Labor Day except in case of jeopardy to work under construction. This rule is applied to protect Labor Day. When a holiday falls during the normal work week, Monday through Friday, it shall be counted as eight (8) hours toward the forty (40) hour week. However, no reimbursement for these eight (8) hours is to be paid the workman unless worked. If workmen are required to work the above enumerated holidays or days observed as such, or on Sunday, they shall receive the double regular rate of pay for such work.

NO. 25: All work done on New Year's Day, Martin Luther King Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, the day after Thanksgiving, Christmas Day, Presidential Election Day, or days locally observed as such, and Saturday and Sunday shall be recognized as holidays and shall be paid at the double (2) time rate of pay. If a named holiday falls on a Saturday, the holiday will be observed on the preceding Friday. When a named holiday falls on Sunday, the Monday after will be observed as the holiday. Appropriate overtime rates to be based on fifteen minute increments.

NO. 40: The employer agrees to recognize the following holidays: New Year's Day, Memorial Day, Fourth of July, Labor Day, Veteran's Day, Thanksgiving Day, and Christmas Day. If the holiday falls on a Sunday, and is worked, the following work day will be double time wages for the holiday.

NO. 43: All of the following days or assigned days are recognized as holidays: New Years Day, Memorial Day, Independence Day, Labor Day, Veteran's Day (November 11th), Thanksgiving Day, and Christmas Day. If a holiday falls on Sunday, it shall be observed on the following Monday. If a holiday falls on Saturday, it shall be observed on the preceding Friday. No work shall be performed on Labor Day except in case of jeopardy to work under construction. This rule is applied to protect Labor Day. When a holiday falls during the normal work week, Monday through Friday, it shall be counted as eight (8) hours toward the forty (40) hour week. However, no reimbursement for these eight (8) hours is to be paid the employee unless worked. If the employee is required to work the above enumerated holidays or days observed as such, or on Sunday, they shall receive double (2) the regular rate of pay for such work.

NO. 47: The following holidays are recognized: New Year's Day, Memorial Day, Fourth of July, Labor Day, Veteran's Day, Thanksgiving Day and Christmas Day. When a holiday listed above falls on Saturday, it shall be celebrated on the Friday preceding the holiday. When a holiday falls on Sunday, the following Monday shall be observed. Holidays referred to above shall be paid for at the double (2) time rate of pay when worked.

MISSISSIPPI COUNTY
HOLIDAY SCHEDULE – BUILDING CONSTRUCTION

NO. 50: All work performed on Saturdays, Sundays and recognized holidays shall be considered overtime and work performed on these days shall be paid at double (2) the prevailing scale. The holidays of understanding are: New Years' Day, Decoration Day, Independence Day, Veterans Day, Labor Day, Thanksgiving Day and Christmas Day. Should any of these holidays fall on Saturday, the Friday before shall be observed as the holiday. Should any of these days fall on Sunday, then the following Monday shall be observed as the holiday. Under no circumstance shall employees be permitted to work on Labor Day (the first Monday in September).

NO. 54: All work performed on New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, the Friday after Thanksgiving Day, and Christmas Day shall be paid at the double (2) time rate of pay. When a holiday falls on Saturday, it shall be observed on Friday. When a holiday falls on Sunday, it shall be observed on Monday.

NO. 55: The following days are recognized as holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day. If a holiday falls on a Sunday, it shall be observed on the following Monday. No work shall be performed on Labor Day except in case of jeopardy to work under construction. This rule is applied to protect Labor Day. When a holiday falls during the normal work week, Monday through Friday, it shall be counted as eight (8) hours toward the forty (40) hour week; however, no reimbursement for this eight (8) hours is to be paid the workmen unless worked. An Employer working a four (4) day, ten (10) hour schedule may use Friday as a make up day when an observed holiday occurs during the work week. Employees have the option to work that make up day. If workmen are required to work the above enumerated holidays, or days observed as such, they shall receive double (2) the regular rate of pay for such work.

NO. 56: All work done on New Year's Day, Decoration Day (Memorial Day), Independence Day (Fourth of July), November 11 (which shall be recognized as Veterans' Day), Thanksgiving Day, The Friday after Thanksgiving Day, and Christmas Day shall be compensated at the double (2) time rate of pay. When an observed holiday falls on Sunday, the following Monday shall be observed as the holiday. No work shall be performed on Labor Day except in cases of emergency, and then only when triple (3) time is paid.

NO. 61: All work performed on recognized holidays shall be paid at the double (2) time rate of pay. No work shall be performed on Labor Day except to save life or property. The following holidays shall be observed: New Year's Day, Memorial Day, Fourth of July, Labor Day, Veteran's Day, to be observed November 11 (or a mutually agreed date of the Friday after Thanksgiving if agreed by other crafts working on project), Thanksgiving Day and Christmas Day. Any holiday which occurs on a Sunday shall be observed the following Monday.

NO. 62: All work performed on holidays shall be considered overtime and work performed on these days shall be paid at double (2) time rate of pay. The holidays of understanding are: New Years' Day, Decoration Day, Independence Day, Veteran's Day, Thanksgiving Day and Christmas Day. Should any of these holidays fall on Saturday the Friday before shall be observed as the holiday. Should any of these days fall on Sunday, then the following Monday shall be observed as the holiday. Under no circumstance shall employees be permitted to work on Labor Day (the first Monday in September).

NO. 66: All work performed on Sundays and the following recognized holidays, or the days observed as such, of New Year's Day, Decoration Day, Fourth of July, Labor Day, Veteran's Day, Thanksgiving Day and Christmas Day, shall be paid at double (2) the hourly rate plus an amount equal to the hourly Total Indicated Fringe Benefits. Whenever any such holidays fall on a Sunday, the following Monday shall be observed as a holiday.

NO. 69: All work performed on New Year's Day, Decoration Day, July Fourth, Labor Day, Veteran's Day, Thanksgiving Day or Christmas Day shall be compensated at double (2) their straight-time hourly rate of pay. Friday after Thanksgiving and the day before Christmas will also be holidays, but if the employer chooses to work these days, the employee will be paid at straight -time rate of pay. If a holiday falls on a Sunday in a particular year, the holiday will be observed on the following Monday.

NO. 71: All work performed on the following recognized holidays, or days that may be celebrated as such, shall be paid at the double (2) time rate of pay: New Year's Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, Day after Thanksgiving and Christmas Day. If a holiday falls on Sunday, it shall be celebrated on Monday. If a holiday falls on Saturday, it shall be celebrated on the Friday proceeding such Saturday.

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HOLIDAY SCHEDULE – BUILDING CONSTRUCTION

NO. 73: The following days are recognized as holidays: New Year's Day, Memorial Day, Fourth of July, Labor Day, Veteran's Day (or mutually agreed date of the Friday after Thanksgiving Day may be substituted for Veteran's Day), Thanksgiving Day and Christmas Day, or in the event that any of said Holidays falls on Sunday, then the day or days generally recognized as such. Any work performed anywhere on any of the aforesaid Holidays, or on the day or days recognized and observed as such, shall be paid for at double (2) time the regular hourly rate.

NO. 77: The following days are recognized as holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day. If a holiday falls on a Sunday, it shall be observed on the following Monday. No work shall be performed on Labor except in case of jeopardy to work under construction. This rule is applied to protect Labor Day. When a holiday falls during the normal work week, Monday through Friday, it shall be counted as eight (8) hours toward the forty (40) hour week; however, no reimbursement for this eight (8) hours is to be paid the workmen unless worked. An Employer working a four (4) day, ten (10) hour schedule may use Friday as a make up day when an observed holiday occurs during the work week. Employees have the option to work that make up day. If workmen are required to work the above enumerated holidays, or days observed as such, they shall receive double (2) the regular rate of pay for such work.

Heavy Construction Rates for
MISSISSIPPI County

Section 067

OCCUPATIONAL TITLE	*Effective Date of Increase	Basic Hourly Rates	Over-Time Schedule	Holiday Schedule	Total Fringe Benefits
CARPENTER					
Journeymen		27.87	23	16	$11.57
Millwright		27.87	23	16	$11.57
Pile Driver Worker		27.87	23	16	$11.57
OPERATING ENGINEER					
Group I		$25.00	21	5	$18.28
Group II		$24.65	21	5	$18.28
Group III		$24.45	21	5	$18.28
Group IV		$20.80	21	5	$18.28
Oiler-Driver		$20.80	21	5	$18.28
LABORER					
General Laborer		$24.56	2	4	$9.29
Skilled Laborer		$25.16	2	4	$9.29
TRUCK DRIVER-TEAMSTER					
Group I		$26.22	22	19	$9.40
Group II		$26.38	22	19	$9.40
Group III		$26.37	22	19	$9.40
Group IV		$26.49	22	19	$9.40

Use Heavy Construction Rates on Highway and Heavy construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(3).

Use Building Construction Rates on Building construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(2).

If a worker is performing work on a heavy construction project within an occupational title that is not listed on the Heavy Construction Rate Sheet, use the rate for that occupational title as shown on the Building Construction Rate sheet.

REPLACEMENT PAGE
MISSISSIPPI COUNTY
OVERTIME SCHEDULE – HEAVY CONSTRUCTION

FED: Minimum requirement per Fair Labor Standards Act means time and one-half (1 ½) shall be paid for all work in excess of forty (40) hours per work week.

NO. 2: Means a regular workweek shall be forty (40) hours and will start on Monday and end on Friday. The Employer shall have the option of working five 8-hour days or four 10-hour days Monday through Friday. If an Employer elects to work five 8-hour days during any workweek, hours worked more than eight (8) per day or 40 per week shall be paid at time and one-half the hourly rate Monday through Friday. If an Employer elects to work four 10-hour days in a week, work performed more than ten (10) hours per day or 40 hours per week shall be paid at time and one-half the hourly rate Monday through Friday. When working a five 8-hour day schedule and an Employer is prevented from working forty (40) hours Monday through Friday, or any part thereof, by reason of inclement weather, Saturday or any part thereof may be worked as a make-up day at the straight time rate. If an Employer is working a four 10-hour day schedule and loses a day due to inclement weather, he may work 10 hours Friday at straight time. All hours worked over the 40 hours Monday through Friday will be paid at 1 ½ overtime rate. A workday shift is to begin at the option of the Employer, between 6:00 a.m. and not later than 9:00 a.m. However, the project starting time may be advanced or delayed if required. If workmen are required to work the enumerated holidays or days observed as such or Sundays, they shall receive double (2) the regular rate of pay for such work. Overtime shall be computed at one-half (1/2) hour intervals. Shift: The Contractor may elect to work one, two or three shifts on any work. When operating on more than one shift, the shifts shall be known as the day shift, swing shift, and graveyard shift as such terms are recognized in the industry. When two shifts are worked on any operation, the shifts will consist of eight (8) or ten (10) hours exclusive of lunchtime. When three shifts are worked the first day or day shift will consist of eight (8) hours exclusive of lunchtime. The second or swing shift shall consist of seven and one-half (7 1/2) hours work for eight hours pay, exclusive of lunchtime, and the third or the graveyard shift shall consist of seven (7) hours work for eight (8) hours pay, exclusive of the lunchtime. All time in excess of normal shifts shall be considered overtime. Multiple shift (the two or three shift) operation will not be construed on the entire project if at anytime it is deemed advisable and necessary for the Employer to multiple shift a specific operation. However, no shift shall be started between midnight and six a.m. except the graveyard shift on a three-shift operation, or except in an unusual or emergency situation. If an Employer starts a shift between midnight and 6 a.m. except the graveyard shift on a three-shift operation, he shall reimburse all employees for the entire shift at the double time rate. Completion of the second shift on a two-shift operation or completion of the graveyard shift on a three-shift operation that carries over into Saturday morning, shall be at the straight time rate. Overtime shall be computed at ½ hour intervals.

NO. 21: Means the regular workday for which employees shall be compensated at straight time hourly rate of pay shall, unless otherwise provided for, begin at 8:00 a.m. and end at 4:30 p.m. However, the project starting time may be advanced or delayed at the discretion of the Employer. At the discretion of the Employer, when working a five (5) day eight (8) hour schedule, Saturday may be used for a make-up day. If an Employer is prohibited from working on a holiday, that employer may work the following Saturday at the straight time rate. However, the Employer may have the option to schedule his work from Monday through Thursday at ten (10) hours per day at the straight time rate of pay with all hours in excess of ten (10) hours in any one day to be paid at the applicable overtime rate. If the Employer elects to work from Monday through Thursday and is stopped due to circumstances beyond his control, he shall have the option to work Friday or Saturday at the straight time rate of pay to complete his forty (40) hours. If an Employer is prohibited from working on a holiday, that Employer may work the following Friday or Saturday at the straight time rate. Overtime will be at one and one-half (1½) times the regular rate. If workmen are required to work the enumerated holidays or days observed as such, or Sundays, they shall receive double (2) the regular rate of pay for such work.

NO. 22: Means a regular work week of forty (40) hours will start on Monday and end on Friday. The regular work day shall be either eight (8) or ten (10) hours. If a crew is prevented from working forty (40) hours Monday through Friday, or any part thereof by reason of inclement weather, Saturday or any part thereof may be worked as a make-up day at the straight time rate. Employees who are part of a regular crew on a make-up day, notwithstanding the fact that they may not have been employed the entire week, shall work Saturday at the straight time rate. A workday is to begin between 6:00 a.m. and 9:00 a.m. However, the project starting time may be advanced or delayed if mutually agreed to by the interested parties. For all time worked on recognized holidays, or days observed as such, double (2) time shall be paid.

REPLACEMENT PAGE
MISSISSIPPI COUNTY
OVERTIME SCHEDULE – HEAVY CONSTRUCTION

NO. 23: Means the regular workweek shall start on Monday and end on Friday, except where the Employer elects to work Monday through Thursday, (10) hours per day. All work over ten (10) hours in a day or forty (40) hours in a week shall be at the overtime rate of one and one-half (1½) times the regular hourly rate. The regular workday shall be either eight (8) or ten (10) hours. If a job can't work forty (40) hours Monday through Friday because of inclement weather or other conditions beyond the control of the Employer, Friday or Saturday may be worked as a make-up day at straight time (if working 4-10's). Saturday may be worked as a make-up day at straight time (if working 5-8's). An Employer, who is working a four (4) ten (10) hour day work schedule may use Friday as a make-up day when a workday is lost due to a holiday. A workday is to begin at the option of the Employer but not later than 11:00 a.m. except when inclement weather, requirements of the owner or other conditions beyond the reasonable control of the Employer prevent work. Except as worked as a make-up day, time on Saturday shall be worked at one and one-half (1½) times the regular rate. Work performed on Sunday shall be paid at two (2) times the regular rate. Work performed on recognized holidays or days observed as such, shall also be paid at the double (2) time rate of pay.

MISSISSIPPI COUNTY
HOLIDAY SCHEDULE – HEAVY CONSTRUCTION

NO. 4: All work performed on New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas Day, or observed as such, shall be paid at the double time rate of pay. When a Holiday falls on a Sunday, Monday shall be observed. No work shall be performed on Labor Day, except in case of jeopardy to life or property. This is applied to protect Labor Day.

NO. 5: The following days are recognized as holidays: New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and Christmas Day. If a holiday falls on a Sunday, it shall be observed on the following Monday. If a holiday falls on a Saturday, it shall be observed on the preceding Friday. No work shall be performed on Labor Day except in case of jeopardy to work under construction. This rule is applied to protect Labor Day. When a holiday falls during the normal work week, Monday through Friday, it shall be counted as eight (8) hours toward a forty (40) hour week; however, no reimbursement for this eight (8) hours is to be paid the workman unless worked. If workmen are required to work the above recognized holidays or days observed as such, or Sundays, they shall receive double (2) the regular rate of pay for such work. The above shall apply to the four 10's Monday through Friday work week. The ten (10) hours shall be applied to the forty (40) hour work week.

NO. 16: The following days are recognized as holidays: New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and Christmas Day. If a holiday falls on Sunday, it shall be observed on the following Monday. If a holiday falls on Saturday, it shall be observed on the preceding Friday. No work shall be performed on Labor Day except in case of jeopardy to work under construction. This rule is applied to protect Labor Day. When a holiday falls during the normal work week, Monday through Friday, it shall be counted as eight (8) hours toward the forty (40) hour week; however, no reimbursement for this eight (8) hours is to be paid to the worker unless worked. If workers are required to work the above recognized holidays or days observed as such, they shall receive double (2) the regular rate of pay for such work.

NO. 19: The following days are recognized as holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day. If a holiday falls on a Sunday, it shall be observed on the following Monday. No work shall be performed on Labor Day except in case of jeopardy to work under construction. This rule is applied to protect Labor Day. When a holiday falls during the normal work week, Monday through Friday, it shall be counted as eight (8) hours toward the forty (40) hour week; however, no reimbursement for this eight (8) hours is to be paid the workmen unless worked. An Employer working a four (4) day, ten (10) hour schedule may use Friday as a make up day when an observed holiday occurs during the work week. Employees have the option to work that make up day. If workmen are required to work the above enumerated holidays, or days observed as such, they shall receive double (2) the regular rate of pay for such work.

OUTSIDE ELECTRICIAN

These rates are to be used for the following counties:

Bollinger, Butler, Cape Girardeau, Dunklin, Madison, Mississippi, New Madrid, Pemiscot, Scott, Stoddard, and Wayne

Occupational Title	Basic	Total
	Hourly	Fringe
	Rate	Benefits
Journeyman Lineman	$39.36	$4.93 + 28.75%
Lineman Operator	$28.42	$4.93 + 28.75%
Groundman	$22.48	$4.93 + 28.75%

OVERTIME RATE: Eight (8) hours shall constitute a regular days' work between the hours of 8:00 a.m. and 5:00 p.m. with an hours' intermission for lunch; and forty (40) hours shall constitute a regular work week from Monday through Friday. A four (4) ten (10) hour day work schedule may be worked Monday through Thursday (Tuesday through Friday in the event a holiday is celebrated on a Monday) or a Tuesday through Friday (Monday through Thursday in the event a holiday is celebrated). If the parties work the four ten hour week the following shall apply:

(a) Ten (10) consecutive hours shall constitute a day's work between the hours of 7:00 a.m. and 5:30 p.m. One-half (1/2) hour shall be set aside for an unpaid lunch period.

(b) Friday may be used as a make-up day when the scheduled work week was interrupted and time lost of seven (7) hours or more was incurred.

Time and one half (1½) will be paid for all time worked in excess of the regular working day and Saturdays; double (2) time will be paid for all work done on Sundays and legal holidays.

HOLIDAY RATE: All work performed on New Year's Day, Memorial Day, Fourth of July, Veteran's Day, Thanksgiving Day, Labor Day, Christmas Day, or days celebrated as such, shall be paid at the double time rate of pay. When a National holiday falls on Sunday, Monday shall be observed as the holiday. When a National holiday falls on Saturday, the preceding Friday will be observed as the holiday.